NEW PRODUCT NEWNESS AND BENEFITS
A STUDY OF SOFTWARE PRODUCTS FROM THE FIRMS’ PERSPECTIVE

Sanjay Verma

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Akademin för hållbar samhälls- och teknikutveckling
Abstract

It is widely believed among researchers as well as practitioners that there is a link between new product newness, or innovativeness, and benefits to the firm developing and marketing a product; more innovative products are generally expected to create more profit and growth.

However, research findings are conflicting—positive-, negative-, and no-relationship have been reported between product newness and benefits by different researchers. Moreover, most research has been confined to hardware products. Software is a different kind of product. It is marked by low industry entry barrier, low marginal cost of production, intense competition for quick market leadership, subject to increasing rate of return, et al.

An ever larger part of investments in new products consist of computer software, software that is used in PCs, control industrial processes and give products like mobile phones, cameras and cars new features. To what extent newness gives benefits in software development is however still un-researched. Thus, the purpose this study was formulated as: To explore effect of newness of new software products on the benefits to the firms.

To fulfill this research purpose, first we had to find out “What are the relevant elements of (i) newness, and (ii) benefits of new products” in the context of firms that develop and market computer software products? This part of the study is reported in Part I. In a second step the effect of product newness on benefits was investigated quantitatively. This part of the study is reported in Part II.

Part I is based upon semi-structured in-depth interviews of managers responsible for seven new software products in firms from Finland, India, Sweden and the US. Supplementary secondary data were collected from archival sources to write case descriptions of each software product. Within- and cross-case inductive analysis of seven-case database led to identification of relevant elements of newness and benefits. As newness elements, distribution technology, and complementary technological-, and marketing-resources were found to be vital; as benefits element, non-monetary benefits of new products stood out.

Part II reports a quantitative study involving 321 Swedish software firms. Data were collected through a Web-survey, using a questionnaire based on findings of Part I, and analyzed through Factor Analysis and Structural Equation Modeling. Findings indicate that marketing fit, and technological familiarity enhance product-level benefits, whereas technological fit, and familiarity enhance firm-level benefits. From the three environmental factors only aggressive marketing practices was found to be of significance. Neither switching costs nor computer mediated transactions was found to have any moderating role on product newness and new product benefits relationship.

Overall, this study extends previous research in the area of product newness-new product benefits and fills the gap in the literature (i) by developing grounded measures for operationalizing new product newness and benefits concepts in the context of software product firms, and (ii) by identifying significant elements of new product newness that affect new product benefits. By limiting to a particular industry, this study provides useful findings—for both researchers of new product development, and for managers in software firms—such as marketing fit, and technological familiarity enhance product-level benefits, whereas technological fit, and technological familiarity enhance firm-level benefits.

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Keywords: New Product Newness; New Product Benefits; Computer Software Product; Software Firm.
Sammanfattning på svenska

Det är en ganska allmänt spridd uppfattning bland både praktiker och forskare att det föreligger ett samband mellan en produkts nyhetsvärde (newness), eller innovationsgrad (innovativeness), och den nytta (benefits) ett företag kan uppnå genom att utveckla och marknadsföra en produkt i det att mer innovativa produkter förväntas skapa högre nytta.

Dock har testerna av detta samband gett motstridiga resultat och pekat på allt från ett positivt till ett negativt eller inget samband alls. Dessutom har forskningen uteslutande varit begränsad till hårdvaruprodukter. Mjukvara har inte på samma sätt beförskats och är en produkt av delvis anorflunda karaktär med låga inträdhänder, låga kostnader för att tillverka ytterligare en enhet, intensiv konkurrens för att snabbt uppnå en marknadsledande position, en avkastning som ökar med marknadsandel, etc.

En allt större andel av industrins investeringar i nya produkter avser mjukvara som används i datorer, styr industriella processer och ger produkter som mobiltelefoner, kameror och bilar nya funktioner. I vilken utsträckning nyhetsvärdet ger fördelar inom mjukvaruutveckling är dock fortfarande outforskat och syftet med denna studie har därför formulerats som: Att undersöka effekten av nya mjukvaruprodukters nyhetsvärde på företagets nytta.

För att uppfylla detta forskningssyfte, blir vi först tvungna att identifiera och beskriva för mjukvara relevanta aspekter vad gäller (i) nyhetsvärde, och (ii) nytta. Denna del av studien redovisas i del I. I ett andra steg testas effekten av produktens nyhetsvärde på företagets nytta medelst en enkät. Denna del av studien redovisas i del II.

Del I bygger på intervjuer med chefer med ansvar för sju programvaror i företag i Finland, Indien, Sverige och USA, kompletterande med sekundärdata om dessa projekt och företag. Via analys av dessa sju fall och jämförelser mellan fallen identifierades för mjukvara relevanta operationaliseringar av nyhetsvärde och nytta.

Sambandet mellan identifierade mätt på nyhetsvärde och nytta testades i del II på ett sample av 321 mjukvaruprojekt genomförda i lika många svenska programvaruföretag. Data hade samlats in via en webbaserad enkät. Resultaten visar att överensstämmelse med marknadens krav vad gäller marknadsföring (marketing fit) och kännedom (familiarity) om teknologin bidrar till högre produktnytta, medans teknologisk överensstämmelse (fit) och kännedom bidrar till högre företagsnytta. Varken kostnaden att byta leverantör eller användningen av datorförmedlade transaktioner befanns ha någon dämpande effekt på dessa samband.

Denna studie har bidragit till ökad kunskap om sambandet mellan en produkts nyhetsvärde och nytta (i) genom att utifrån fallstudier av mjukvaruprojekt generera empiriskt baserade mätt på nyhetsvärde och nytta, och (ii) genom att identifiera betydelsefulla aspekter av nya produkters nyhetsvärde och nytta. Genom att avgränsa studien till en viss bransch, har det varit möjligt att generera mätt som är användbara både för forskare inom produktutvecklingsområdet, och programvaraföretag, såsom t ex att överensstämmelse vad gäller marknadsföring, och kännedom om teknologin, ger högre produktnytta, medans teknologisk överensstämmelse och kännedom ger högre företagsnytta.
Preface

The idea of this research crystallized while I was working as a marketing manager in a software firm. I had earlier been involved with development or marketing of three other new products in consulting, and FMCG industries. The success/failure of those four new products intrigued me and made me curious towards factors affecting success of new products.

Probably due to my background (business education, entrepreneurial inclination, and work experience) I wanted to study new products from the perspective of a firm rather than from the perspective of customers, or industry. Growing importance, uniqueness (discussed Chapter 1) and, last but not the least, my most recent association led to the selection of software products as the context of this research. As you will see this research has been carried out from the perspective of firms involved in developing and marketing computer software products.

There were two aims of this dissertation: the first one was to describe newness and benefits of new software products, and the second one was to investigate what effects newness of new software products have on the benefits. To fulfill the first aim an empirical study of seven software products was conducted as the first part of this study. The findings of this part of the study paved the way for the second part which was carried out to fulfill the second aim of this dissertation. It has been a fascinating journey for me from the beginning to the end of this research.

I was fortunate to have Prof. Esbjörn Segelod as my main research supervisor. I am extremely thankful to him for believing in me and for providing inspiration, guidance and support all the way. Late Prof. Dick Ramström helped me in giving a more concrete shape to my research proposal in the initial phase; Lennart Bogg has provided guidance as my secondary supervisor.

I am also thankful for the feedback I received in research seminars of my department, The School of Sustainable Development of Society and Technology (HST). Being a part of The Swedish Research School of Management and IT (MIT), I benefited a lot. Feedback provided by MIT teachers and fellow researchers in their seminars helped me immensely all along the research process. I owe my gratitude to Björn Abelli, Christina Keller, Leon
Caesarius, Magnus Hansson, Mathias Cöster, Niklas Johansson, Petter Ahlström, among others.

My sincere thanks to Alf Westelius for his comments and suggestions as the opponent at my licentiate seminar, and to Peter Lindlöf for his remarks and suggestions as the opponent at the final seminar for my PhD thesis. A special thanks to my colleague Leif Linnskog and to my good friend Ove Sundmark for their support and encouragement.

This research would not have been possible without the cooperation of the participating software firms. I am grateful to managers at the seven software firms that spared their time to participate in the in-depth interviews for the first phase of this research. For the second phase, 321 Swedish software firms shared their data; I appreciate their time and effort.

I am indebted to my friends and family, especially my wife Deepti and sons Manu and Aditya, who supported me, as always, with all their enthusiasm, love and patience during this research.

Linköping, January 2010
Sanjay Verma
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## Abbreviations

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<th>Abbreviation</th>
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<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
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<tr>
<td>CRM</td>
<td>Customer Relationship Management</td>
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<tr>
<td>DOS</td>
<td>Disk Operating System</td>
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<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
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<tr>
<td>FMCG</td>
<td>Fast Moving Consumer Goods</td>
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<tr>
<td>GNU</td>
<td>GNU's Not UNIX</td>
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<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>IM</td>
<td>Instant Messenger</td>
</tr>
<tr>
<td>OS</td>
<td>Operating System</td>
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<tr>
<td>PLC</td>
<td>Programmable Logic Controller</td>
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<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
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<tr>
<td>SQL</td>
<td>Structured Query Language</td>
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<tr>
<td>SBU</td>
<td>Strategic Business Unit</td>
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<tr>
<td>SRM</td>
<td>Supplier Relationship Management</td>
</tr>
<tr>
<td>UNIX</td>
<td>UNiplexed Information and Computing System</td>
</tr>
<tr>
<td>VPN</td>
<td>Virtual Private Network</td>
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<tr>
<td>WWW</td>
<td>World Wide Web</td>
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<tr>
<td>XML</td>
<td>Extensible Markup Language</td>
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Chapter 1: Introduction

1.1 Newness and Benefits of New Products: An Introductory Case

In 1999-2000 I worked as a sales and marketing manager for a Finnish software company. There I witnessed firsthand how newness of a new software product affected its success. Let me share this experience with you! For confidentiality reason I will call this company L.Co. and its product Lynx.

L.Co was established in the early 1990s. Initially the firm specialized in software related consulting services; it was engaged in developing software and turn-key information systems for private and public companies as well as for Finnish state agencies. In 1995 it started to provide sales and technical support services in Finland for a US-based Linux operating system (OS). Simultaneously it was developing programming expertise across Windows, Mac, Linux and different flavors of UNIX platforms as part of its consulting services. In 1997 L.Co. decided to focus on developing GNU/Linux and other open source software products. Lynx was introduced into Finnish market in 1998 as L.Co’s flagship product. It was aimed both at home and office users. Lynx claimed to be more stable (less prone to crashing); an important feature compared to the other popular OS at that time. It also had more functions, more security features and enhanced usability. In February 2000 at CeBIT trade fair, the firm showcased its enhanced Linux OS in English for the global market. It bundled office suite, multimedia applications, games, utilities, and Internet software with the Lynx. By 2001 it had become the most popular Linux distribution in Finland. It had a sizeable number of users in other Nordic countries as well. Despite having made a presence felt in the market, Lynx was not generating the kind of revenue the firm had expected.

The firm devoted most of its resources on further developing and marketing Lynx but after a few years of unsuccessful attempts L.Co. decided to discontinue Lynx and pursue other software related business. It re-started to focus on software consulting services and ICT\textsuperscript{1} infrastructure (e.g., VPN solutions). In 2000, when it was heavily focused on Lynx, it had sales and support office in Sweden and representatives in the US and Australia. After disappointing experience with Lynx, L.Co started to downsize its operations. It closed down its operations in Sweden, the U.S. and Australia. It was down to two offices in Finland, and one each in Estonia and Russia. In 2002 L.Co decided to give it one more try and re-launched Lynx under a different brand name but it did not make much of a difference. On December 2\textsuperscript{nd} 2003, Lynx was formally discontinued.

This introductory case of Lynx illustrates several facets of a new software product, its newness and its benefits to a firm. As L.Co was the leading software services firm of the third largest city in Finland, it had accumulated significant technical and marketing resources and expertise in the field of software. To chart further growth, this software firm adopted the

\textsuperscript{1} Information and Communication Technology
product-path - a not so uncommon practice in software industry. By moving its personnel from software services projects to Lynx L.Co took a risk as it had to forego immediate revenue from its software services with an expected higher revenue in the future from its first product Lynx. L.Co believed it had needed resources and expertise to develop and market Lynx successfully. In little over one year when it had provided sales and technical support for another Linux distribution, it had further accumulated knowledge and experience about the market for the Lynx-type of product.

As the events turned out over the life span of Lynx, it is apparent that L.Co’s technical and marketing expertise did not suffice to bring the kind of benefits L.Co was expecting. Here we have a few issues worth contemplating. Very soon from its launch in the market, Lynx became the most popular Linux OS in Finland. It even started to penetrate adjacent markets of Sweden and other Nordic countries. The firm saw further potential for Lynx in distant overseas markets and thus participated in the CeBIT. It started to open offices overseas and appointing representatives in far away markets like the U.S. and Australia. All these developments point towards a certain degree of success of Lynx in the market place. At the same time, L.Co’s inability to sustain the consolidation in those markets and lack of further growth casts a ray of doubt over Lynx’s success as it was ultimately wrapped up in 2003. Despite an initial (albeit limited) success the new product did not live up to the expectations of the firm. Why? Was it L.Co’s lack of technical and marketing resources needed for software products? Or was it L.Co’s lack of knowledge and experience about software product market?

Unfortunately, L.Co’s Lynx venture is not an isolated case. As it will be seen further in this chapter, software product industry has a very high failure rate when it comes to new products. There is interplay of within the firm and outside the firm factors. Within firm factors such as software development and marketing resources of a firm during the development phase and outside factors such as familiarity with customers and competitors in the market place during the marketing phase can be expected to be significant. From concept to launch is a long process for a software product. Resources of a firm that may seem sufficient at the time of conceptualization of a software product may not suffice all through the process. Moreover, a new product may lead a software firm to an unfamiliar market environment.
New products are important for firms for not only for growth but even for survival. Naturally it is imperative for firms to increase success rates of new products. The case of Lynx highlights the need to address the question of newness of new products and benefits expected by software firms.

This experience from L.Co. and my earlier involvement with development and marketing of three other new products in consulting, and the FMCG\(^2\) (a complete list of acronyms and other abbreviations is found on page x) industries intrigued me. It made me curious towards factors affecting the success of new products. I wanted to return to school and research to learn more about the phenomenon, and probably due to my background (business education, entrepreneurial inclination, and work experience\(^3\)) I relatively early knew I wanted to study new products from the perspective of a firm rather than from the perspective of customers, or industry. The choice of computer software products as the area of research felt natural due to its growing importance, uniqueness, puzzling economics, and my own background.

**1.2 Importance and Salient Features of Software**

**1.2.1 Importance of Software**
The growing importance of computer software is evident. In the US, it was rated the fourth largest industrial sector of the economy and was estimated to be globally a USD 180 billion industry (NASSCOM, 2004). It is not only growing but also becoming a vital industry. In 1984 software was being talked about as a new driving force (Business Week, 1984). By 1996, it was well on its way to gain stature as it had become a USD 200 billion\(^4\) industry and growing by 13% per annum (Anderson, 1996). With the time, and proliferation of IT\(^5\), software now touches, to use a cliché, almost every aspect of modern life—private or business—because it is at the core of IT (Jordan and Segelod, 2002). A computer software is basically a set of instructions which controls what a computer does (Cambridge Advanced Learner's Dictionary, 2003). The term “computer” still continues to create an image of a

\(^2\) Fast Moving Consumer Goods
\(^3\) Appendix I presents my background.
\(^4\) Estimates of global revenue in the software industry are fraught with risk and seem, at best, educated guess.
\(^5\) Information Technology
discreet computing machine such as a PC\textsuperscript{6} or a main-frame, although computers have traversed much beyond PCs and main-frames of bygone eras. In fact, a computer is now a generic artifact of the IT-world and is present in many, even every day, articles: from mobile phones to washing machines; from ATM\textsuperscript{7}’s to identity cards. All these \textit{computers} are accompanied by one or the other kind of software—visible or embedded\textsuperscript{8}. While drawing lessons from large successful global software companies, Hoch, Roeding, Purkert and Lindner (1999, pp. 5-6) observed:

“…life without software is hard to imagine. Without software, paper letters would be the fastest form of written correspondence. No fax, no e-mail, and no business voicemail. But that’s just the beginning of the impact of software. Across industries, software now enables and fuels economic growth…. Software tasks today range from controlling nuclear power plants, recognizing customer purchasing patterns, enabling stock trading, and running banking systems all the way to running cell phone systems and exploring for the oil”.

Writing a history of the software industry, Campbell-Kelly (2003, p. 3) observed: “The software industry is relatively new. Twenty-five years ago it was invisible and unacknowledged; today it is ubiquitous.” In addition to it assuming vital significance and becoming ubiquitous, the software industry is also asserted to represent future industries. In a study pertaining to innovation orientation of software firms, Nambisan (2002, p. 141) observed:

“The software industry can be considered the prototypical high technology industry characterized by innovation-driven market growth, rapidly shrinking product and technology life cycles, high knowledge intensity, and global markets.”

As per Paul Romer, one of the chief architects of New Growth Theory\textsuperscript{9}:

“The software industry is the best place to understand the changes that we have to make both in our business models and in our understanding of the economy. We must stop thinking of

\textsuperscript{6} Personal Computer

\textsuperscript{7} Automatic Teller Machine

\textsuperscript{8} Visible software is interactive with the user while embedded one is “hidden” from the user and takes its commands from sources other than the user. For example, an ATM runs a visible software, but a microchip concealed in an ID card runs a embedded software.

\textsuperscript{9} New growth theory assumes that the marginal product of capital is constant rather than diminishing as per the neoclassical theories of growth (See Hulten, 2001).
physical objects as the only inputs and outputs that we work with.” (Paul Romer, quoted in Hoch et al., 1999, p. 6).

It is obvious that the software has become significant not only for individuals but also for society at large as it runs or support almost all vital functions in modern society and can be a representative case of knowledge based industries which hold future promise for many industrialized countries because in such industries innovation sustains the continued firm growth (Nonaka and Takeuchi, 1995). Moreover, from a strategic management point of view, other industries are becoming increasingly knowledge based and akin to the software industry, and from a operational point of view, software has become enabler of other industries, thus an understanding of software could also be useful for other industries (Hoch et al., 1999).

1.2.2 Software: A Different Kind of Product
Computer software has not only gained increased importance it is also a different kind of product. The intangible nature and recent origin makes software a novel phenomenon; not much is known about it. In their survey of software firms from around the world, Hoch et al. (1999) listed three main features that make a software a different kind of product: first, low entry barriers in the industry; second, low marginal costs (make firms market their products globally); third, the competition for quick market leadership (to be able to set the industry standards). These three features together pose a great challenge for software firms (developing and marketing software products). Since the boundary between the product and the service has become much fainter in the software industry (Ibid.), the term “product” is used in this dissertation to denote both products as well as services in general discussion; unless the use of term “service” is justified in some cases. While within the software industry the term software product is used to differentiate it from the software services segment (for example, The Gartner Group uses the software product category for sales forecasting), scholars are ambivalent in their research. For example, in a study involving firms in knowledge-intensive industries, Sveiby (1992) has treated the computer software as a service. Here, knowledge-intensive industries are defined as those in which firms are primarily involved in activities related to complex problem identification, problem solution, or high-technology design and that result in innovative new products or services or create new ways of exploiting markets (Carlsson, 2004).
There is a general lack of reliable data pertaining to software industry. Hoch et al. (1999, p. 38) estimated the total number of software firms globally to be at least 150,000, including 35,000 that have more than five employees. Such a large number of firms in an industry, which is only 50 years old, confirm the existence of low entry barriers to the industry. One more reason which explains the large number (of firms) is the importance of knowledge rather than capital to set up such firms. There is much anecdotal evidence about software firms being started by young software professionals in a garage with a few computers. In due course of time, some of these start-ups become successful enterprises. A low capital requirement and a willingness of venture capitalists to invest abet more new firms to be set up leading to more competition in the industry. This competition naturally encourages firms to innovate in order to survive and flourish. Many new firms continually join the industry and try to create a niche for themselves based on their innovations. And in the process, major technological breakthroughs happen which again lowers the entry barriers paving way for new firms and more competition. While this feature may not be unique to the software industry but at the speed it all happens is certainly not common in many other industries.

The cost of design and development of the first unit of a typical software product is quite high compared to the marginal cost of second unit and onwards. This phenomenon poses a great challenge but also entails an equally attractive opportunity. Due to an upfront heavy cost of new product, a software firm needs to sell the product to a large number of customers to recoup the investment and make a profit. Since marginal costs are very low, it encourages firms to reach to as many potential customers as possible, from the very beginning, in markets far and wide. New Growth Theory protagonists concur that knowledge based products such as software are not subject to the diminishing return of capital in contrast to tangible products of traditional industries (Hulten, 2001).

The urge of software products to gain market leadership as quickly as possible emanates from, among other reasons, “the law of increasing scale.” This law articulates that an early market share advantage, or disadvantage, amplifies quickly—that a product that gains a significant initial market share tends to gain momentum and gains additional market share by selling more units; on the other hand, a product that fails to gain a significant initial market share loses whatever market share it has had to competitors (Arthur, 1989, 1996). After a
while, such a phenomenon leads to the survival of only few products, with the total market share split among few survivors. Hoch et al. (1999, p. 41) cite several reasons that makes software products subject to the law of increasing returns:

“The ability of programs to operate together and exchange information is critical; thus people buy the same software as the people they usually communicate with. Users enjoy “increasing returns” from their software as other users also begin to use it. Once users are trained on certain software products, they are less likely to switch to others because they would have to be retrained. Since software products are often difficult to evaluate objectively, decision makers often buy whatever is most popular.”

By setting standards at an early stage, when market for a completely new product is still evolving, swift software firms gain an advantage. This advantage paves the way for a gradually increasing market share because new customers choose products from the market leader as other complementary products and services conforming to the market leader’s standards start to appear in the market. By opting for a market leading product a customer hopes to get the maximum value for its money.

Innovations and rapid technological breakthroughs keep the software product market in a constant flux. Every major innovation and/or change in technology brings an opportunity for new start-ups to challenge established firms with new products which results sometimes in older firms giving way to new firms or, more often, new firms perishing in the process. But, the pursuit of new money spinners in the form of new products goes on. More than the two-third of the revenue in the computer industry (including the software) comes from products introduced in the last two years (The Economist, 1996). Not only products are short lived but also only a minority of new software (product) projects delivers the kind of product firms wanted in the first place. Pre-or post-IT boom of late 1990s, new software products continue to prove a challenge for their firms. Based on over 50 000 (9 236 in 2004) completed IT projects in last ten years, the Chaos report (The Standish Group, 2004, p. 2) summarizes:

“… 29% of all [software projects] succeeded (delivered on time, on budget, with required features and functions); 53% are challenged (late, over budget and/or with less than the required features and functions); and 18% have failed (cancelled prior to completion or delivered and never used) ....”
The Chaos report, though not exclusive to the software product industry, reflects the overall situation pertaining to new software projects. The report highlights the poor rate of successful software development and indicates risk involved in the new software development.

### 1.3 Nature of Product Newness-Benefits Research Findings and Research Problem

It is widely believed among researchers as well as practitioners that there is a link between new product newness and benefits to the firm (developing and marketing it). In new product literature, new product newness is sometimes also referred to as new product innovativeness and new product benefits is referred to as new product performance.

Pertaining to the newness and benefits link, if a product is new to the target market, it gives a first mover advantage to the firm or if the product has new features compared to competing products it makes it easy for the firm to differentiate its product. In both situations, such new products give competitive advantage which may result in better benefits to the firm. So, a new product having innovative features can be expected to beat the competition and emerge more successful than a not-so-innovative product. Kleinschmidt and Cooper (1991) rationalized that a firm pursuing highly innovative product believes its innovative product is unique and its uniqueness should enable the firm to a differentiated and proprietary position in the market and to better the new product’s benefits to the firm. But, neither all new products are highly innovative nor do all firms opt to pursue such a strategy of differentiation. It is argued that firms following a cautious approach of developing familiar products for familiar markets believe highly innovative products to be more risky as market and technical situation for highly innovative products are new to the firm (probability of something going wrong is higher) which may lower the chance of the product proving beneficial to the firm (Ibid.). Interestingly, such less innovative products can also prove beneficial to their firms since they carry less uncertainty and have more synergies with the firms’ other products in terms of developmental and marketing activities.

The external business environment, which Cooper and Kleinschmidt described long ago as of “shorter product life cycles; heightened competition from home and abroad; maturing industries and flat markets; and the quickening pace of technological developments” (1987a, p. 175), has become more chaotic in many industries. In a study of over 650 North
American and European firms, managers expected new product revenue to be 35% of sales by 2007 which stood at 21% in 1998 (Deloitte Research, 2004), which highlights the decreasing product life cycle. An increasing rate of new product introductions by competitors aided by an overall technological development is compelling firms to replace older products by new products in order to maintain revenue and profit margins. Brown and Eisenhardt (1995) observed that successful new products are indispensable for increased sales, profits and competitive advantage for many firms and are vital for the corporate survival, success and prosperity. Christensen and Raynor (2003) remarked that it is more so for firms in fast-paced and/or competitive markets.

The question arises: with shortening product life cycle, rapidly changing technology, maturing market (flattening demand), and increasing competition, can firms afford to rely in future on lowly-innovative, low-risk new products? The answer is highly unlikely to be in affirmative. Conducting a meta-analysis of literature on newness and benefits, Szymanski, Kroff and Troy (2004) observed that firms were already introducing increasingly highly innovative products as one way to differentiate their products in the market. A firm’s rationale, or compulsion, to develop and market a highly innovative product is understandable, but how far this strategy succeeds? Do new products, that are also new to the market, prove beneficial to their firms?

Unfortunately answers to these questions are largely ambiguous. Research findings on product newness and benefits are not straightforward— "conflicting and inconclusive" in words of Kleinschmidt and Cooper (1991, p. 242). They further add (p. 242): “...the literature and results of research studies (with several exceptions) are remarkably silent on the topic. The few that have commented on the role of product newness point to conflicting and inconclusive findings.” Some studies suggest greater the newness (to the market) better the benefits, some point to an opposite conclusion and some find no relation at all (see, Kleinschmidt and Cooper, 1991). In their study the relationship turned out to be U-shaped, highly and least innovative products achieving more success than moderately innovative products. Why these seemingly contradictory findings?

One clarification advanced for this ambiguity is poor conceptualization and operationalization of newness concept. Danneels and Kleinschmidt (2001, p. 358) remark:
“Prior studies have used widely varying conceptualizations and operationalizations of this construct (newness). Conceptual weaknesses include a rather unrefined and un-dimensional conceptualization, a failure to distinguish the perspective taken (customers’ or firms’), and a lack of distinction between newness as familiarity (close to the firm’s prior customers and technology) and as synergy (fit with the firm’s resources, skills and capabilities).”

In an newness literature review, Garcia and Calantone (2002) found fifteen constructs and 51 different scale items used to operationalize newness in only 22 empirical studies. The implication of inconsistent operationalization is that findings of subsequent studies do not add to the research field as they “re-label/redefine/reiterate” older findings (Ibid, p. 111). One should not be surprised if such findings do not create confidence among scholars from other subfields of new product research. New product research is carried out by scholars from various disciplines—e.g., marketing, management, R&D, engineering (Craig and Hart, 1992). In a meta-review Henard and Szymanski (2001) observed that scholars from one discipline tend to exclude findings from other disciplines due to poor conceptualization and operationalization. Their observation confirms the need of proper conceptualization and operationalization of newness in new products studies so that scholars, even from other disciplines, may feel confident to use them.

Similar to new product newness, new product benefits is also differently conceptualized and operationalized in new product studies. Financial criteria (e.g., new product’s revenue, profit, market share) are often used to measure benefits of new product, but sometimes non-financial criteria such as customer satisfaction and technical advantage are also used (Griffin and Page, 1993). Some less frequently used new product’s benefits measures are if new product complemented existing product(s), helped the firm in diversification, or even aided in corporate renewal (Schoohoven, Eisenhardt and Lyman, 1990). As strange as it may sound, a new product may be financially a failure for the firm but may be considered successful for other, non-financial benefits reason(s). A “failed” product may even help in enhancing the success probability of future products by augmenting the firm’s knowledge of new market or new technology (Maidique and Zirger, 1985). Storey and Easingwood (1999) used a wider range of measures to evaluate new products’ benefits to their firms. They included new product performance measures applicable not only to the product (e.g., sales, profits, market share) but also to the firm (e.g., developing a market, improving customer loyalty). It can be expected that inclusion of more measures should represent new
product benefits from the firm perspective in a more comprehensive way. Obviously there is a need of proper conceptualization and operationalization of newness as well as benefits in new products studies.

Given the increasing importance of software and largely unique features (distinguishing it from most other products), it is chosen as the context of this study of newness-performance of new products. Instead of relying solely on conceptualization and operationalization of newness and performance from the extant new products literature, a pragmatic approach has been adopted to develop them empirically capturing “the ground reality”. Commenting on the prevalent “inconsistent findings”, Craig and Hart (1992, p. 13) observed in their literature review of NPD that researchers need to verify validity of measures by conducting qualitative studies involving open-ended questions used as “…not enough is known about the issues involved….” Their remark was based on Link’s (1987) study in which he included open-ended questions to respondents which led to the identification of novel facts not identified by previous research. It has been quite common in new product research to measure a set of variables without verifying their validity (Lowe and Hunter, 1991).

Almost all research on the newness-performance relation has been done on hardware projects. One exception is Jordan and Segelod (2002, 2006) who tested the relation on 94 larger mainly European software projects and recorded a weak although positive correlation between innovativeness and performance. However, the operationalization of innovativeness and performance were based on studies of hardware projects which can have obscured the relation.

By asking directly the software firms there is a good possibility of developing measures of newness and benefits which are better valid in the context of software products and their firms. Later, when such empirically-grounded set of variables are measured in future studies, findings should be more valid than what it could be if a set of variables are chosen from the extant literature. By following a direct approach to begin the investigation with computer software firms one should be able to describe and interpret the firm’s perspective on new product newness and benefits. Since such findings would be empirically grounded they should add to the new product research field. Practitioners (managers at software firms) could also relate to and gain from the findings in selection and management of new products projects.
Effects of new product newness on benefits are not very clear. Some of the often cited reasons are lack of rigor in conceptualization and measurement of newness and benefits. Generalization across industries compromises study findings. Keeping in mind importance and special features of software it is surprising that there are barely any studies exploring newness and benefits of new software products. Based on the introductory case, its discussion, and considering the importance of software and its uniqueness, the research problem and aim of thesis are outlined below. The research problem can be stated as:

*What effects does newness of a new software product have on the benefits accruing to the firm?*

In order to address this research problem, first it has to be specified: What is a software product? What is meant by newness and benefits? And then it has to be found out: What are the elements of newness? What are the elements of benefits? As it will be seen later, both newness and benefits are quite broad concepts. Apparently the above mentioned overall research question leads to a need to first answer following two questions:

*What are the relevant elements of newness of a new product to the firms that develop and market computer software products?*

*What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?*

### 1.4 Definition of Key Terms
Some of the key terms used in this dissertation may have different meanings in different contexts. Hence, the important terms are defined below reflecting what they mean in the present context. These definitions are also vital for precise descriptions of the research purpose and the research questions to follow in the subsequent sections.

*Software:* A software is a set of instructions that control what a computer does (Cambridge Advanced Learner's Dictionary, 2003). Software not only makes the hardware run but also
tells how to process the data. There are two major types of software: (i) system software and (ii) application software. Typical application software processes data for the user, e.g., a spreadsheet program such as Microsoft Excel or a statistical analysis program such as SPSS. But, system software, e.g., an OS such as Microsoft Windows or a DBMS program such as Oracle, makes it possible to application software to run.

*Computer Software Product:* There is a great variety among software products which makes classification difficult. However, while tracing the history of software industry, Campbell-Kelly (2003) proposes a taxonomy (Figure 1.3) on the basis of characteristics of three different sectors of the industry. His taxonomy suffices for the definition of a software product for this study purpose. In his taxonomy of software industry, one sector consists of “mass-market software products” which aim at large number of customers (usually in thousands), have intuitive interfaces, require no customization and are designed in such a way that customers can use the product even without any after-sale support. Another sector consists of “corporate software products” which aim at a much smaller number of (usually in hundreds, rarely in thousands) but more demanding customers needing mission-critical applications, (products) require customization and need significant pre- and after-sale support to the customers.

For the purpose of this study, a computer software product is defined as a discreet software artifact (i) which is actively marketed, (ii) sold or leased to a computer user, (iii) for which the vendor is contractually obligated to provide training, documentation, and after sales service, (iv) and which requires either little or no customization (in case of mass-market software products) or moderate customization (in case of corporate software products) either by vendor, buyer or a third party (Campbell-Kelly, 2003). “Software contractors” sector differs significantly with other two sectors in terms of profitability, scalability of operations and necessary skills. The scope of this study, covering mass-market and corporate computer software products, is shown in Figure 1.3.
Figure 1.1: A Taxonomy of Computer Software Industry
(Note: Based on Campbell-Kelly, 2003, p. 9)

*Product Newness:* This term also has wide range of meanings, but for this study, it is used in a limited sense to describe product’s newness to the firm and is defined as the capacity of a new product to have an effect on the firm’s existing marketing and technological resources, skills, knowledge, capabilities, or strategies (Garcia and Calantone, 2002).

*Product Benefits:* A new product’s benefits to the firm can be defined and categorized into several ways depending upon the criteria used. Anecdotal evidence suggest that software firms’ expectations are not the same as other firms in many cases but it is not known through any study how software product firms treat and prioritize their products benefits to the firm. Since this study is an attempt to understand their (firms’) viewpoint, it is safe to define product benefits broadly until a finer and more precise definition emerges from the empirical finding(s). Those benefits which accrue to the product directly and are measured easily (e.g., sales revenue, profit, market share) are defined as product-level benefits and those wider benefits (e.g., a new product platform, a customer base) which are applicable to whole of the firm are defined as firm-level benefits (Storey and Easingwood, 1999).
Fit: This concept has roots in the resource-based view of the firm. The fit of a new product with the firm denotes how well internally available resources of the firm match with the new product project. It has two components: market and technological. Whereas the *market fit* stands for self-sufficiency of firm’s internally available market resources which enables the firm to serve the customers of the new product, the *technological fit* stands for adequacy of firm’s internally available technological resources for design and development the new product (Danneels and Kleinschmidt, 2001, Montoya-Weiss and Calantone, 1994).

Familiarity: This concept is based on the organizational theory, which deals in the relationship between an organization and its environment. The familiarity represents acquaintance with business environment a firm finds itself in for the development and commercialization of a new product. While the *technological familiarity* pertains to the familiarity with the technological environment for the design and development of a new product, the *marketing familiarity* describes the familiarity with the marketing environment a firm ends up for a new product (Normann, 1971).

1.5 Purpose
Based on the research problem outlined in section 1.3, the purpose of this study can be formulated as:

*To explore effect of newness of new software products on the benefits to the firms.*

And to be able to fulfill this purpose we first have:

*To describe the relevant elements of newness and benefits of new software products from the firms’ perspective.*

The need for such a description arise as earlier research on the connection between newness and benefits have been based on operationalizations of newness and benefits generated through studies of hardware products. To what extent these operationalizations apply to software products is relatively unknown and doubtful, that’s why there is a need to develop
empirical understanding of newness and benefits concepts of new software products for proper conceptualizations and operationalization of these concepts. Thus, this research project involves a two-stage investigation of the relationship. The first one is an empirical conceptualization of the concepts of newness and benefits and, the second one is a statistical test of the connections between these concepts based on a large sample of software projects. A similar two-stage research design, involving an exploratory qualitative research at the first stage followed by a quantitative study at the second stage, has earlier been used in a study of Israeli computer and electronics industry (Dvir and Shenhar, 1990).

The first part of the purpose has been pursued, as will be seen in Chapters 2-5, by carrying out a qualitative empirical study. Based on a literature survey of product newness and benefits, currently used measures to describe both the concepts have been listed. This list is point of departure for empirical data collection from purposefully selected seven cases of new software products from Finland, India, Sweden and the US. An approach of theory building from case studies, suggested by Eisenhardt’s (1989), has been followed for the data collection and analysis.

The second part of the purpose has been pursued as a quantitative empirical study, Chapter 6-9, testing the connections between newness and benefits on data from 321 Swedish computer software products.

1.6 A Preview of Chapters to Follow
This chapter provided an overall introduction to this dissertation. The final chapter of this dissertation presents overall conclusions, implications and recommendations for researchers and managers. In between the first and the last chapters, one qualitative study and one quantitative study is presented. Before moving to the qualitative study in Chapter 2, this section outlines the structure of rest of the dissertation. The aim is to provide readers a snapshot of the dissertation-contents at a glance.

The qualitative study begins with Chapter 2 (Literature Used in Qualitative Study) which describes the literature used for the empirical data collection and analysis as well as for the discussion of empirical findings. The following chapter (Chapter 3: Qualitative Research Method) presents the research methodology, its choice and the process of data collection and analysis.
Chapter 4 (Qualitative Data Analysis and Findings) covers analysis of empirical data and presents results of case-studies. The findings are presented in the context of research questions and are tabulated to give the reader an overview. In the last chapter of first part of dissertation (Chapter 5: Discussion and Conclusions of Qualitative Study), the empirical findings are compared with the extant new product newness and benefits literature appropriate for new software products. This comparison places empirical findings of this study in the context of extant product newness-benefits literature and helps in the identification of few peculiar elements of computer software product newness and benefits.

Figure 1.2: Layout of The Dissertation

The second part comprises of the quantitative study. Chapter 6 (Conceptual Framework and Hypotheses) presents the conceptual framework that has guided the quantitative study. It also presents the hypotheses tested in the study. Chapter 7 (Quantitative
Research Method) describes the research method employed for this quantitative study. Chapter 8 (Quantitative Data Analysis and Results) contains the empirical description and analysis at length and results of the hypotheses testing. The concluding chapter of quantitative study, i.e., Chapter 9, (Discussion and Conclusions of Quantitative Study) presents the discussion and conclusions of the quantitative study.

The last chapter (Chapter 10: Overall Conclusions, Implications, and Recommendations) presents conclusions, implications and recommendations of this research at a glance. Now let us move to Chapter 2 and begin our exploration of the qualitative study.
PART I: The Qualitative Study

An Introduction
The first part of the study is an attempt to understand the product newness and benefits concepts in the context of computer software products. It has been done through a rich description and a theoretical interpretation. The aim was not to generalize. Findings of this study should be seen in that vein as empirical cases were chosen on the basis of diversity to enrich the understanding of both the concepts. As pointed out in Chapter 1, for this study the computer software term excludes embedded software and pertains to computers normally used in homes and offices.

Merits of the use of Web-based Instant Messengers (IM) in lieu of face-to-face interviews for the collection of empirical data can be debated. However, for this study, IM made possible data collection from overseas cases but it excluded the interviewer from finer observations (such as the body language) during the interview. Hence, IM proved to be a valuable tool but it may have compromised on the quality of data and, in turn, findings based on such data.

Two different perspectives — “Fit” and “Familiarity” — has been used to understand and interpret product newness concept. As these two perspectives complement each-other (Please refer to Appendix II for a detailed discussion). It should be pointed out that the use of two perspectives lead to some findings which seem somewhat similar to each other, but when probed closely such seemingly similar findings point to different aspects of product newness.

There are four chapters in this qualitative study part: Chapter 2 is about the literature used in this qualitative Study, Chapter 3 presents the research method, data collection process and analysis, Chapter 4 covers the data analysis and findings, and Chapter 5 is about the discussion and conclusions of this qualitative study.
Chapter 2: Literature Used in Qualitative Study

The objective of this chapter is to present the literature that has been used in the empirical data collection, analysis, and discussion in this qualitative study, the first part of this research. The focus in this chapter is on presenting the theory and literature actually used in this study rather than on presenting a comprehensive literature survey of new product newness and benefits. Interested readers may refer, among others, to Danneels and Kleinschmidt (2001), Craig and Hart (1992), Damanpour (1991), Garcia and Calantone (2002), and Gopalakrishnan and Damanpour (1997) for detailed reviews of new product newness literature, and to Craig and Hart (1993), Johne and Snelson (1988), Montoya-Weiss and Calantone (1994) and Szymanski et al. (2004) for newness-benefits literature. A brief survey of literature is found in Appendix II.

Since a theory-building-from-case-studies approach has been followed, the literature has played a special role in this study. To start with, an a priori description of newness and benefits of new products served as a point of departure for the data collection. To develop such a description, major themes were identified from pertinent literature (meta-) reviews. These reviews presented a reasonably cumulative state of conceptualization and operationalization of new product newness and benefits. During the simultaneous data collection and analysis carried out in this study some new themes emerged while some borrowed from the extant literature got dropped for the want of relevance to the kind of new products being studied. To understand the emergent themes of product newness and benefits from the empirical data some theoretical perspectives were identified. These theoretical perspectives led to the formulation of two frameworks, one each for newness and benefits, for organizing the empirical findings and subsequently comparing those findings with the appropriate literature. The two frameworks also helped in placing the final results of this qualitative part of the study in the larger context of newness-benefits literature. Taking the flexible use of literature (during the process of empirical study) into account, this chapter presents mainly those literatures which have contributed to the final state of findings. To make it easy to read, the chapter is not organized chronologically but thematically.

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10 Not in the order of use made during the research process.
Likewise, themes are also organized according to the framework which evolved later in the research process.

The first section begins by defining product newness and then introduces two ways to conceptualize it. Themes of product newness with respect to software products are discussed further in the section. Similarly, in the second section, new product benefits is defined, and its two dimensions as used in this study are derived; themes pertaining to benefits of new software products are also presented in this section. The third section summarizes the two frameworks used to conceptualize and to discuss new product newness and benefits concepts.

2.1 Product Newness

A basic definition of new product newness is quoted in the first chapter. That definition presents a firm’s perspective of the product newness. In addition to the firm’s perspective the product newness is also studied from other perspectives, such as that of the consumer (e.g., Atuahene-Gima, 1995), the market (e.g., Kleinschmidt and Cooper, 1991), the industry (e.g., Colarelli O'Connor, 1998), the world (e.g., Olson, Walker and Ruekert, 1995). Naturally, depending upon the perspective chosen the product newness is defined differently. Since this study is concerned with the firm’s perspective, this discussion is limited to that end only. To start with, how the definition quoted in the first chapter is justified for this study is explained below. Further, the definition paves the way for exploring the product newness concept in an empirical study.

A new product is developed usually by a firm and introduced into the market. The new product could be from a first-of-its-kind, new to the world product to a simply me-too product. In any case, a new product is the result of a phenomenon quite appropriately described by the OECD’s (1991) definition of innovation: it, i.e. innovation, is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention. This definition treats innovation as a continually iterative process and explains why an improved product, which is not completely new to the world, can also be called an innovation. In this vein, every new product, to a certain degree, is an act of innovation for the firm depending upon how many and how much of new product activities were not new to the firm. Utterback and Abernathy (1975) had long
ago recognized the evolutionary nature of product innovation by proposing that products would be developed over time where emphasis would be first on product benefits, then on product variety and later on product standardization and cost.

A firm’s pursuit to improve and to improvise even the existing products creates discontinuity for the firm in terms of what resources it has and what activities it has been carrying out, because through a new product the firm is pursuing a new business opportunity. And this opportunity the firm may avail by improving benefits, adding variety, or reducing cost of the new product. Hence, innovation involved in the development and marketing of a new product represents newness of the product for the firm. This deduction based on OECD’s definition of innovation is particularly true in the case of technological innovations which are built upon inventions in “…industrial arts, engineering, applied science and/or pure sciences. Examples include innovations from the electronics, aerospace…and information system industries” (Garcia and Calantone, 2002, p. 112).

OECD’s definition of innovation also recognizes that there are two distinct aspects of a new product: (i) the technological development and (ii) the market introduction of an invention. This is also commonly recognized in the new product literature. Danneels (1998) and Dougherty (1992) agreed that technology and market components constitute new product development. Danneels and Kleinschmidt (2001) use technology and market as two sub-dimensions in their proposed model of product newness. The technological and marketing aspects jointly represent newness of the product to the firm is also found by Garcia and Calantone (2002) in a literature review of 22 studies from marketing, engineering and new product development. An adaptation of their definition of newness of an innovation from the macro perspective captures very well product newness from the firm perspective. Hence, for the purpose of this study new product newness is defined as the capacity of a new product to influence the firm’s existing resources and/or activities pertaining to marketing and technology, skills, knowledge, capabilities, or strategy (based on Garcia and Calantone, 2002, p. 113).

A new product warrants a firm to bring together technology and market if the product has to see the light of the day and become accepted by the customers. Danneels (1998) argued that for product innovation a firm needs technology-competence to make the product and market-competence to serve the customers, which are dependent upon technological resources
and customer/market resources respectively. His classification of resources for product newness matches the definition proposed by the Garcia and Calantone, because he also treated product newness to a firm as the extent to which firm is self sufficient for the development and marketing of the new product.

The characteristic of product newness having technological and marketing aspects is one step towards understanding this concept from the firm point of view. Based on a review of 24 empirical studies Danneels and Kleinschmidt (2001) presented a conceptual framework to conceptualize product newness. In their framework they distinguished between the customer perspective and the firm perspective. Figure 2.1 presents the firm perspective part of their conceptual framework; the customer’s perspective part is left out as that is beyond the scope of this research. Familiarity and fit are the two dimensions of product newness; while familiarity concept is based on the population ecology school of organization research, fit concept is based on the resource-based view of the firm which is modeled on resource dependence and differs significantly from the population ecology. These two approaches together yield a fuller picture of the product newness than any of these two could do on its own.

- **Familiarity**
  - Technological Environment
  - Market Environment

- **Fit**
  - Technological Resources
  - Marketing Resources

![Figure 2.1: Dimensions of Product Newness from Firm Perspective](Note: Adapted from Danneels and Kleinschmidt, 2001, p. 361)

### 2.1.1 Products Newness as a Familiarity Concept

The familiarity concept of product newness is based on the literature pertaining to the organization-environment relationship. This literature borrows analogies from biological sciences and sees organizations engaged in a struggle of survival against competing entities.
Those who survive are better at adapting and meeting new challenges emanating from changes in the environment. However, the adaptation brings a liability of newness.

This concept addresses a very pertinent situation a firm faces when it pursues a new product project. During the project the firm has to carry out many developmental and marketing activities. Every firm operates within an environment which Thomson (1967) termed “domain” and identified by the points at which the firm depends upon inputs from its environment. In the process of carrying out new product activities a firm often finds itself in a “foreign” environment. Normann (1971) explained this phenomenon as new products widen the domain of a firm and in the process make the firm face an unfamiliar domain; the extent of unfamiliarity depending upon how far new product is new to the firm. This unfamiliarity caused by a new product originates from the firm (or better said the people in the firm) having difficulty in perceiving and interpreting events and signals from a new domain, because stimuli from unfamiliar domain is either not accessible due to the absence of established communication channels, or not easily understandable because not fitting into existing cognitive structures (Ibid.).

The environment of a firm may be divided into two: a technological and a market part of the environment. Depending upon the nature or life cycle of an industry either of the two environments may be more significant for a firm for its new product project. For example, for a micro-chip firm the technological environment may be more pertinent while for a FMCG-firm marketing environment may be more significant. For a firm, importance of a particular environment may also depend upon the phase of a new product project, in other words, during the development phase technological environment and during product launch and marketing phase market-environment may assume more importance. Still, this conceptual division of a firm’s environment into two makes it easy for researchers as well as practitioners to comprehend the product newness concept and address the technological and market issues effectively. Keeping this feature in mind the adopted definition of product newness for this study treats it along the two dimensions.

2.1.2 New Product Newness as a Fit Concept
Danneels and Kleinschmidt’s (2001) fit concept of product newness is based upon the resource-based view (RBV) of the firm which assumes firms as a bundle of resources, that are
heterogeneously distributed across firms and cannot be easily transferred among firms (see Penrose, 1959, Wernerfelt, 1984). RBV emphasizes heterogeneity and immobility of firms’ resources and attributes competitive advantage to a firm to ownership of valuable resources which determines how effectively and efficiently firms’ carry out their functional activities so that their output is better or cheaper than that of competitors. Valuable resources are characterized as valuable, rare, inimitable and non-substitutable (Barney, 1991). These resources can be put to different use by a firm; new product development can be imagined as one of the important one.

To complete all activities of for a new product from development to marketing—product planning, design & prototype development, trial production & production, distribution, sales & marketing, after sales service—a firm needs resources involving, among others, R&D expertise, production facilities, knowledge of customer needs and preferences, market research skills, knowledge of competitive situations, sales force, and after sales service. Based on a review of 24 empirical studies Danneels and Kleinschmidt (2001, p. 361) concluded: “Many researchers have measured the fit of projects with firm resources, although they did not label it as product newness” but in the same paragraph claimed: “The extant literature has not couched the notion of ‘fit’ within the resource-based theory”. They defined fit of a project with the firm as the match between internally available resources and capabilities with the requirements for the new product (Ibid.). The objection raised by Danneels and Kleinschmidt seem to be founded more on a lack of use of clear cut terms (such as product newness and fit as an RBV-term) and less on an actual use of the concepts. Even if there were any anomaly, it has been rectified in the Garcia and Calantone’s (2002) definition of product newness adopted for this study purpose.

Familiarity and fit conceptualizations of product newness together provides a reasonable framework to understand product newness from the firm’s point of view. But, this framework is more at a theoretical level. To carry out an empirical study one needs a more detailed, more practical study-objects. To fulfill this need an attempt was made in the next section to identify the pertinent themes (defined as “the main idea in a piece of writing” by Oxford Advanced Learner’s Dictionary) which represent familiarity and fit of product newness in the extant literature.
2.1.3 Themes of Product Newness

A combination of several literature reviews and other articles were used to set out on a course of identification of product newness themes in the empirical study. Since Danneels and Kleinschmidt’s (2001) have combined findings from previous 24 studies and synthesized the product newness framework used in this study also, it became the foundation for compilation of newness themes. This process involved identification of main idea used in the various operationalizations of dimensions of product newness (viz. technological familiarity, market familiarity, technological fit and marketing fit). Second work referred to was Garcia and Calantone’s (2002) meta-review of 22 articles, where they recommended appropriate measures for future study of product newness. All their recommended measures were already tested in earlier studies by other scholars, which made their inclusion further legitimate. Taking into account the combined list of themes, an interview guide was prepared. As simultaneous data collection and analysis was part of the (building theory from case study) approach followed in this study, new themes emerged during the empirical study. Such themes are included under appropriate conceptualizations of product newness and are shown in the second column of Table 2.1. During the data collection and analysis, some of the initially selected themes proved not relevant for software products to the respondents and consequently dropped from the final list of themes. All the themes featuring in the final list are discussed below. The aim of the discussion is to understand and explain how and why these themes are applicable and relevant to software products and firms. Final themes are serial numbered as they appear in subsequent chapters, so that it is easy to cross-refer back and forth between chapters.

### Table 2.1: Product Newness Themes: From the Literature vs. Empirical Data

<table>
<thead>
<tr>
<th>Original themes</th>
<th>Final themes</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>(based on extant literature)</td>
<td>(based on empirical study)</td>
<td></td>
</tr>
<tr>
<td><strong>Technological Familiarity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New products make their firms acquire new product-development technology.</td>
<td>1(a). New products make their firms acquire new design technology.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products make their firms acquire new engineering and design technology.</td>
<td>1(b). New products make their firms acquire new programming technology.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products make their firms acquire new production technology and adopt new production process.</td>
<td></td>
<td>Dropped</td>
</tr>
<tr>
<td>Original themes (based on extant literature)</td>
<td>Final themes (based on empirical study)</td>
<td>Note</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-----------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Market Familiarity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New products require their firms to sell to new customers.</td>
<td>2. New products make their firms acquire new distribution technology.</td>
<td>New theme</td>
</tr>
<tr>
<td>New products make their firms to fulfill new, unfamiliar needs of existing customers.</td>
<td>3(a). New products require their firms to sell to new customers.</td>
<td></td>
</tr>
<tr>
<td>New products compel their firms to face new competitors.</td>
<td>3(b). New products make their firms to fulfill new, unfamiliar needs of existing customers.</td>
<td></td>
</tr>
<tr>
<td>New products lead to the creation of new product categories for their firms.</td>
<td>3(c). New products compel their firms to face new competitors.</td>
<td>Dropped</td>
</tr>
<tr>
<td><strong>Technological fit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New products necessitate their firms to increase and/or update R&amp;D and product development resources.</td>
<td>4(a). New products necessitate their firms to increase and/or update design resources.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products necessitate their firms to increase and/or update engineering and design resources.</td>
<td>4(b). New products necessitate their firms to increase and/or update programming resources.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products necessitate their firms to increase and/or update production and operations resources.</td>
<td>5. New products require their firms to access complementary technological resources.</td>
<td>Dropped</td>
</tr>
<tr>
<td><strong>Marketing Fit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New products require their firms to increase and/or update the sales force.</td>
<td>6(a). New products require their firms to increase and/or update the sales force.</td>
<td></td>
</tr>
<tr>
<td>New products require their firms to increase and/or update their advertising and promotion resources.</td>
<td>6(b). New products require their firms to increase and/or update their distribution channel(s).</td>
<td>Dropped</td>
</tr>
<tr>
<td>New products require their firms to increase and/or update their marketing research resources.</td>
<td>6(c). New products require their firms to increase and/or update their customer support.</td>
<td></td>
</tr>
<tr>
<td>New products require their firms to increase and/or update their sales and marketing partners.</td>
<td>6(d). New products require their firms to increase and/or update their sales and marketing partners.</td>
<td></td>
</tr>
</tbody>
</table>
Technological Familiarity

From the conceptualization to the shipping, a software development process consists of many activities (e.g. requirement analysis, product specifications, architectural design, coding, testing). These activities can be seen as happening in two distinct phases: design and programming—the first consisting from the requirement analysis to the product design, and the second one consisting of implementation of that design through programming into a final software product ready to be shipped. In the long process of a software product development, the point of inflexion is the nature of work involved, and skills and resources needed for such works. The design part involves converting a set of anticipated users’ requirements into a framework of deliverables taking into account software and hardware architecture, compatibility (backward and with other complementary software), etc. And the programming includes software code writing (using appropriate programming language, tools and processes), testing and fixing. In this sense, a combination of design- and programming-technology cover the full gamut of technologies a firm needs for the development of a new product, hence the choice of these two terms for this study purpose.

Theme 1(a): New products make their firms acquire new design technology.

The size of typical software has grown enormously. While in the beginning, in 1960s and 70s era, few hackers could produce a program without much planning and design, now it is not possible to create a successful software without systematic planning and design. It is not possible any more:

“This approach worked for relatively small computer programs that one person or several people could write, such as…Lotus 1-2-3, WordPerfect…. It became unworkable as PC software programs grew into hundreds of thousands and then millions of lines of code.”
(Cusumano and Selby, 1997, p. 57)

Not only due to growth in the magnitude of design and need for adoption of formal processes design technology has become vital for the development of new software but also the pace of change in design technology is rapid (Hoch et al., 1999). Developments in hardware (bigger, faster and cheaper simultaneously), conversion of ICT, and inclusion of multi-media and Internet has made enormous changes in the features expected by software-users. Designing such a product in the face of competing technological standards is a great task for any
software firm. To a firm, knowledge, familiarity and access to technological changes taking place which may affect a new product’s market acceptance can be easily realized.

**Theme 1(b): New products make their firms acquire new programming technology.**

As long as processing power of a computer was *limited* (due to slow processing and limited memory) software programs were “small” and written in lower level languages (machine or closer to machine level languages). With greatly enhanced processing power, huge memory and users expectations from a product, programming technology has changed greatly. Sophisticated higher level programming languages and formal processes are mandatory for quality and reliability of software.

There has been a gradual shift from low-level languages to high level languages, mainly because later class of languages is more suitable for meeting increased demands from new products. An example is widespread adoption of object-oriented programming which allows splitting a large software development project into several smaller sub-projects which could be developed simultaneously while allowing flexibility in incorporating new specifications during the course of development (see, Baetjer, 1998). At the beginning of a software project all users’ requirements are not known to the firm; in some cases even users themselves cannot articulate all their needs (Cusumano and Selby, 1997). Which one of competing technology will eventually become industry standard (or used by majority of users) is also difficult to estimate for a firm. In this situation of uncertainty, programming languages and processes which allow flexibility and creativity along the software development process seem mandatory for a successful completion of a software product project.

Traditionally, linear development processes (e.g., waterfall method) have been used in software development projects. Such linear processes does not allow for flexibility and creativity because product requirements and corresponding specifications are fixed at the beginning stage of the development project. It has been argued that such linear development processes are suitable only for tangible products (Jordan and Segelod, 2002), which Cooper (1990) put forward as stage-gate system for a new product development. Due to its nature, a dynamic, rather than a static, development process is warranted for software products. A right combination of programming language and development process makes flexibility and creativity possible maintaining the quality of the product.
To attain the required quality in the (software) product, the development process is targeted. In other words, by concentrating on how the development takes place, quality of what can be ensured by virtue of the analysis and certification (e.g., SEI CMM\textsuperscript{11}) of development process of a software (Chroust, 1996). The move from a linear model to an evolutionary, spiral model ensures the multiple feedbacks (from different teams involved in the project, from potential users and even from potential complementary products’ vendors) during the development process. This shift increases productivity of programming, decreases risks and improves quality (Boehm, 1988). Not only in the software industry but in other knowledge intensive industries also, an appropriate development process may lead to faster product development, higher-value product, lower-cost product, economical production and more responsiveness to a changing technological, marketing and regulatory environment (Smith, 1996).

To a software firm, along with the design technology, the programming technology is also vital for a new product development; keeping in touch with latest technological developments, and selecting, acquiring and internalizing the needed technology can be a significant challenge.

In a study of the role of users in the development of new application software, Voss (1985a) found that users commonly lead the development of new product. In such a situation, a firm pursuing a new product has a fair chance of adopting unfamiliar design and programming technologies. This is a risky proposition for the software firm as new product entails unfamiliar design and programming technologies.

**Theme 2: New products make their firms acquire new distribution technology.**

Software is a knowledge product in a digital form which makes it possible for the firms to distribute it even in non-physical forms. Currently, Internet is the most commonly used technology for the distribution of software in a non-physical form. In a discussion on effects of digitization and Internet on the productivity and efficiency in the economy, Carlsson (2004) have argued that in the long run the effect would be most significant in knowledge-based industries, and in the medium run the effect would be most visible in, among others, retailing; among others, the creation of more efficient markets is the reason cited. The

\textsuperscript{11} Software Engineering Institute’s Capability Maturity Model for Software
digitization of information-based products in combination with Internet may reduce costs, increase productivity and help firms respond more quickly to changing consumer demands (Ibid.). There are several studies indicating Internet’s market efficiency effects such as customers compare prices, selling firm and buyer bypass middlemen, reduced transaction costs and lower barriers to market entry for the firm (Smith, Bailey and Brynjolfsson, 2000). The use of Internet as a distribution channel also makes it possible for a software firm to market its product globally. This has the potential of making increasing returns of scale possible for the firm. As the product is “available for sale” to virtually all potential customers, the product may reap the first mover advantage, and in case of a radically new product, it may attain a significant market share quickly to set network effects in motion for customers and set the standards in the long run. Internet as a distribution channel also makes possible for the firm to offer potential customers to “sample” the product (e.g., limited feature version, or limited-life version), an act that makes (for interested potential customers) possible using an intangible product before committing a purchase. Moreover, a software firm may distribute one of its products economically at a very attractive price or even free of cost to create a substantial customer base and then sell another complementary product profitably. For example, Adobe distributes Acrobat Reader free of cost largely through Internet but sells Acrobat Writer at a price. A large user base of Acrobat Reader has created a market for Acrobat Writer.

It is not hard to imagine that using distribution technology such as Internet obviates the production function//firm need not get their products manufactured and shrink/wrapped for shipment. Not only this may reduce the cost involved but also saves the firm from obsolescent inventory. So, appropriate distribution technology has production effects as it has market efficiency effects as discussed earlier. But, the distribution function has not been one of the core functions of a software firm. Not only such firms lack the infrastructure (hardware and payment and distribution related software) and personnel but also not familiar with the intricacies of the market and distribution. While making a beginning at a small scale may not be big challenge but to scale the whole operation up in a short period of time may not be easy in the face of unfamiliarity with the (distribution) function and rapidly changing technology.
Market Familiarity

Theme 3(a): New products require their firms to sell to new customers.

New customers are important for firms in every business, even more so in software. With a new product, a firm wants to build a large base of customers, in addition to gain financial returns; due to the strategic importance of a large customer base (Johne, 1995). But, software is a different kind of product; it is an intangible and information product. Selling a software product is different from selling a physical product. Like other information products, it is very expensive to produce for the first time, but reproductions are virtually free. In other words, fixed costs are very high but marginal costs are almost negligible (the cost of medium of storage, if not distributed digitally through Internet). As an intangible product, a potential customer cannot evaluate the product before committing the purchase. Still, a large customer base is an imperative for software products due to the increasing returns to scale (Hoch et al., 1999): the more the customers, the more profitable the product. Moreover, these customers may buy other present or future offerings of the firm.

Despite the need and benefits of selling to new customers, it is a challenge for a software product firm, probably more than it is for firms in many other industries. A software product rarely meets the customer’s need as a standalone product; complementary products and services (of other firms) are invariably needed to “complete” the product. Non-availability of such complementary products and services can seriously affect the market acceptance of the new product. In knowledge-based industries, a firm seldom has knowledge and expertise even for a timely and cost-effective product innovation (Lam, 1997), providing complementary products also is too big a challenge.

Moreover, customers of software are subject to network effects (Shapiro and Varian, 1999). Network effects result from the fact that value of connecting to a network is determined by the number of already connected members. In case of a product which is first in its category, potential customers are hesitant to buy until some industry standard has evolved (Sorensen and Stuart, 2000), because a purchase may lock them with a product for which complementary products and customer support either never come in the market or do not remain in the market for long. And if the product is a replacement product for the customer, the customer is already locked-in (Ibid.) and may have disincentives to shift to a new product: the customer may be hesitant to learn a new software again (involving time and
efforts), may have own existing data, or may have others in his network with whom he has to exchange data, not compatible to the new software. To sell to new customers is vital for increasing returns but challenging for the dynamism of the industry, network effects and availability of complementary products.

**Theme 3(b): New products make their firms to fulfill new, unfamiliar needs of existing customers.**

It is obvious that selling more products to existing customers is not only easier but more profitable too. A software firm may be more inclined to do so because more products will further lock a customer to the firm’s products, particularly if the firm is using a proprietary technology. By locking-in to the firm’s the proprietary technology and increasing the switching costs for the customers (Shapiro and Varian, 1999), the firm will be in a better position to sell to those customers more profitably in future.

Having a better understanding of customers’ needs and evolving technologies aiming to fulfill those needs may help the firm in developing appropriate products meeting the new, unfamiliar needs of the firm’s existing customers. In an environment of “radical changes” and “technological discontinuities” prevalent in information technology in general (Abernathy and Utterback, 1988) and software industry in particular, keeping a track of and selecting new technology in time which has the potential of meeting new needs of customers profitably is not easy. Because when new technologies are introduced several alternatives compete for the market acceptance until one or handful of them prove dominant (Sorensen and Stuart, 2000).

If a firm waits long enough to see which technology is being ultimately proving to be dominant, it will be too late for many firms, because other firms will have gained first mover advantage and benefit from the experience curve effects. The experience curve effect means more often a task is performed, the lower will be the cost of doing it. Other than experience curve effects, the firm can improve the software product appreciably for later versions as rarely the first version of a software meets all the requirements of a customer, because for many kinds of software products, it is very difficult to understand customers’ needs and changes in hardware and software are rapid (Cusumano and Selby, 1997). The dynamism and the lack of predictability are, anyhow, widespread in the software industry. Meeting new, unfamiliar needs demands risk taking—in joining the technology rush in time, understanding
customers and a slice of luck, because which technology and associated product design finally takes off in the market is sometimes subject to luck also (Shapiro and Varian, 1999).

**Theme 3(c): New products compel their firms to face new competitors.**

In the resource-based view of firm, one of the characteristics of key assets and capabilities is inimitability (Barney, 1991). That means these key assets and capabilities are identified by comparison with competitors’ key assets and capabilities (Hamel and Prahalad, 1990). Powell and Bradford (2000) have argued for four reasons that make, in a dynamic business environment, knowledge about competitors vital for a firm: (i) to assess own key assets and capabilities, the firm must know about those of competitors; (ii) to know if the firm’s core competence can be imitated by competitors or not, the firm should know their capacity to imitate (or circumvent); (iii) to know what effect competitors may have, if the firm imitates their core competence; and (iv) to know competitors’ intention and capability to enter a market successfully, where the firm is interested to enter. When a new product takes the firm in a new market where competing firms are also new to the firm, it can have severe implications for the firm. New competitors mean a new competitive situation (Cooper, 1999) and lead to increased competitive intensity (Song and Parry, 1997).

In knowledge-based industries where rapid product innovations are almost a norm, firms come across new competitors very often (Chandy and Tellis, 2000). In IT (including software) industry, more than two-thirds of the revenue comes from products introduced within last two years (The Economist, 1996), new products and new competitors can be expected to be commonplace. Even in other industries, with increasing competition firms find new products leading them to face new competitors. In a study of industrial products of Fortune 500 firms, new products were found to pose challenge to their firms in competing in a market characterized by intense competition and rapid technological change (Calantone, Schmidt and Di Benedetto, 1997).

**Technological fit**

**Theme 4(a): New products necessitate their firms to increase and/or update design resources.**
As noted earlier, the design function is vital to the development of software. A software firm needs appropriate resources—appropriate skills, capabilities and infrastructure (hardware and software)—to carry out the (design) function. In a rapidly changing environment of software industry, it is not always possible to anticipate and develop design resources which meet all future needs. There are several ways common in knowledge intensive industries to meet, or be prepared to, the future technology gap: by investing in a number of firms pursuing different technologies, by acquiring firms which seem to have technology closer to evolving industry standard, by merger and acquisitions, etc.

Resources acquired in a rapid manner pose a challenge of internalization to the firm. As the unfamiliarity creates a gap of how the firm puts new resources to use quickly in an effective manner. In case of a software firm, resources are primarily of intangible nature consisting of various kinds of knowledge. If the knowledge is of new kind, the firm does not know how to make use of it. Prior related knowledge, called “absorptive capacity” by Cohen and Levinthal (1990), is required by a firm to assimilate and apply, new, unfamiliar knowledge successfully. In a recent study of 92 European software projects, Segelod and Jordan (2004) have found that external sources of knowledge are important for a successful software development.

In a dynamic environment of product development, software firms need to increase and update their design resources with the time, because increase in sophistication-in-design and features of typical software is continually on the rise (Cusumano and Selby, 1997) which makes the design task bigger and complicated than before.

**Theme 4(b): New products necessitate their firms to increase and/or update programming resources.**

The role of a new product in creating a gap for its firm for the programming function is very similar, and related, to the design function as described above. The move towards the use of higher-level software language for writing the code creates the need for such programmers. Not only a firm has to hire new personnel but has to hire many of them. The larger size of personnel and many of them being new to the firm make communication and coordination a difficult task (Ibid.).
The firm has to maintain an up-to-date hardware and software infrastructure needed for the use of new programming language(s) and tools. To ensure quality and reliability the firm has to adopt new development processes and meet quality certification requirements which demand, further, more resources. Acquisition of resources is a challenge in itself, over and above, the ability to make effective and efficient use of them adds to the challenge. Firms ability to leverage their technological resources, skills and experience pertaining to new offerings has been found important for their success (Zirger and Maidique, 1990, de Brentani, 1989, de Brentani, 2000, Montoya-Weiss and Calantone, 1994). In a study of multi-divisional Japanese firms, the technical proficiency was found vital for new products’ benefits (Song, Souder and Dyer, 1997).

**Theme 5: New products require their firms to access complementary technological resources.** Apple is a good example that a single firm cannot do everything so well that it can create and maintain market leadership in the software industry. In 1997, it suffered a loss of USD 1 billion on sales of USD 7 billion when it market share had come down to 3% from a 10% in 1987 (Hoch *et al.*, 1999). A software firm alone can seldom be able to produce a product and all related complementary products and services (so that customers can solve their problem and get the value out of their money) efficiently, quickly, and profitably. Theoretically it is difficult for the logistical challenge involved; practically it is difficult because of dynamic technological and marketing environment of the software industry. There are many anecdotal instances pointing to the fact that even large firms prefer to do it in alliances or partnerships for, among other reasons, of filling technological gaps (Ibid.).

In a study of semiconductor and health care sectors, Sivadas and Dwyer (2000) found firms accessing complementary resources via business alliances. Such complementary resources take unnecessary workload from a firm from the kind of activities which are not its core area. Still providing a complete solution for the customer is essential for the firm, otherwise a customer has little incentive to buy the firm’s product. Unless there is a pro-active attempt on the part of the software firm, potential partners who can provide complementary products and services making the complete solution will wait to see which product standard is going to emerge and gain market leadership.
This has been a classic dilemma—customers wait, before they buy the main product, to find which standard is going to attract complementary products and services, complementary product and service provider wait to see which product standard is going to rule the market. An example of VHS (vs. Betavision) illustrates this phenomenon, when VHS-recorders took off in the market as soon as movies on VHS-cassettes were available to be rented. As long as potential customers are not sure which technology platform will yield maximum network effects (Shapiro and Varian, 1999), they would hesitate to commit. This phenomenon results in many new products due to their underlying technology remain dormant or slowly accepted by the customers but as soon as a particular technology wins over competing technologies, concerned products take off rapidly and gain market (Henderson, 1999, Shapiro and Varian, 1999). In the context of software, Java’s example is appropriate when Sun Microsystems convinced firms like Oracle, IBM and Netscape to release software applications for Java (Sun Microsystems’ product). Within three years, 70 million computers worldwide were running Java (Hoch et al., 1999). Without applications to run on Java, the product was of hardly any use for a Java-customer.

**Marketing Fit**

**Theme 6(a): New products require their firms to increase and/or update the sales force.**

For the success of a new product, a marketing fit, including sales force among other things, is long recognized as a pre-requisite (Cooper and Kleinschmidt, 1986). The firm’s fit of sales force for selling a technology intensive product like software can hardly be overestimated. In addition to general selling skills (e.g., prospecting, presentation-, communication- and negotiation-skills), sales people in a industry like software need to have special skills such as understanding of business needs of potential customers, recognizing market and technological trends (Mohr, 2001). Rapid technological changes and frequent product innovations common in the software industry (Nambisan, 2002) makes skills of a sales personnel quickly out of date.

New product development teams in many high-technology firms believe in the superiority of technology as an end in itself and develop products which focus on the technical superiority rather than solving the customers’ problem in a simpler manner (Mohr, 2001). This tendency makes selling more challenging for the sales team. By the time,
typically within a year or two, sales personnel have gained proficiency, particularly in pre-
sales support to potential customers, a new, more complex version of the product is
introduced. In many instances, a short product (or version) life of typical software does not
allow sufficient time for existing sales personnel to upgrade their technological skills quick
enough to be able to sell the latest version most effectively leading firms to upgrade their
sales force. Continually increasing size of typical software (Gibbs, 1994) raises the cost of
product development necessitating more unit sales. The need to sell more units of software
which are more complex than before makes a software firm increase and update its sales
force.

**Theme 6(b): New products require their firms to increase and/or update their distribution
channel(s).**

Several types of traditional (e.g., computer retailers) and not-so-traditional (e.g., system
integrators, Internet) channels are used to distribute software products. In their global
software market research Gartner uses a simple framework to categorize all major distribution
channels used in the software industry into two: direct and indirect channels (Gartner
Dataquest Guide, 2004). The direct channel is used by a firm to sell and distribute products
directly to the end user. Examples of direct channels are firm’s sales force, *direct* phone and
Website. The indirect channel consists of all independent third-party firms that resell
products, peculiar to the software industry are value-added resellers and system integrators.
Others typical indirect distribution channel include dealers, firm specific agents (certified by
the firm), *indirect* phone and website (of such firms selling products of other firms).

The use of multitude of channels to distribute a software product emanates from the
fact that more units sold quickly means more benefits for the firm. Software products like any
other knowledge-intensive product are very expensive to create but the marginal cost of
production of additional units is almost negligible (Hoch *et al.*, 1999). Software is not subject
to the diminishing returns of capital (Hulten, 2001), so more units sold means more profits.
Additionally, more users of a product set network effects in motion causing additional new
sales (Shapiro and Varian, 1999). A significant initial market share helps in setting the
industry standard and gradually “locking-in” customers and increasing their switching cost
(Shapiro and Varian, 1999).
Due to rapid technological change (Nambisan, 2002) and changing customers’ needs and preferences, size and complexity of typical software is increasing significantly. For example, Gibbs (1994) estimated codes in software products getting double every two to three years. In such a situation, a firm needs to sell more units to amortize the cost and gain profit. Evidently, reasons are aplenty for software firms to distribute their products through as many as channels as possible. Banarjee (2003) argued that for a new software product’s success, a firm need to have access to an effective and large distribution channel. Software is, of course, not the first or only industry in which the distribution channel is vital for a new product’s success. Easignwood and Storey (1991) found fit with current delivery system having a positive effect on new product’s success. This view believes in leveraging existing distribution channel adding to new products’ profitably. This strategy might work in a situation where a firm can afford to select and develop a new product keeping its existing infrastructure in mind or in an industry where changes are not that profound. But in software industry, a firm might not be in such a situation because rapid technological changes and associated uncertainties are significant (Sorensen and Stuart, 2000) causing firms to (re)act according to new technological and market situations.

Theme 6(e): New products require their firms to increase and/or update their customer support.

To meet the expectations of a customer, a software product should meet the customer’s needs, have right features and deliver the benefits the customer is interested. In the context of ERP products, Elliott (2000, p. 973) articulates: “…[goal]…is to deliver effective ‘fit for purpose’ product…that satisfy real needs and thus provide tangible business advantage to customers.” While software firms generally give priority to development processes which focus on software architecture, design, coding and testing to make sure the product is reliable, scalable and adaptable to the customers’ needs, but underestimate factors such as customer support (and related) services (Leffingwell, 2002) which are important for the customer in order to make full use of the product. These support services make customer succeed with the product and include user documentation, manuals, On-line help, support materials (e.g., Read-Me, Help About, Setup Notes) and supporting software (e.g., User-friendly Installation software, Embedded Tutorials) (Ibid.).
Customer satisfaction is a pre-requisite for the success of most kinds of products and services (as long as a customer has an alternative). The role of customer satisfaction in the success of new offerings is found in several new product studies (e.g., Edgett and Snow, 1996, Avlonitis, Papastathopoulou and Gounaris, 2001, Cooper, Easignwood, Edgett, Kleinschmidt and Storey, 1994). In the context of software products, customer satisfaction reflects on the confidence in the quality of the product (Elliott, 2000) which, in the long run, can make or mar a product. Particularly, if the product generates an impression of difficult to work with among the users, and the firm behind the product does not provide adequate support services.

Theme 6(d): New products require their firms to increase and/or update their sales and marketing partners.

The practice of partnership for the purpose of sales and marketing is common in the software industry. Based on a study of large successful software firms, Hoch et al. (1999) concluded, among others, partners help these firms in increasing market share and decreasing time-to-market of their products. As noted earlier also, the need to gain a significant market share in a short period of time from the market introduction not only gives an advantage to the product but also, many times, vital for the survival of the product in the long run. A potential customer is motivated to buy a popular product to gain network effects (Shapiro and Varian, 1999). If the technology used in the product is proprietary, the firm can further increase the switching cost and lock-in the customer for future sales (Ibid.). A first-mover advantage can also translate into pre-emptying competitors in setting the industry standards. Moreover, selling more units is necessary to cover the continually increasing cost of development of new software products (Gibbs, 1994). Each additional unit-sale is more profitable than the previous because software is subject to increasing rate of returns (Hulten, 2001).

Given the knowledge-intensive nature of this industry, firms generally have core-competency in technical matters and not in sales and marketing matters. To make-up for such vital skills and competency deficiency, partnership could be a solution which helps firms meets those needs swiftly (Doz and Hamel, 1998). Depending largely on partners for sales and marketing, software firms focus on product development where there core-competency lies. In their study, Hoch et al. (1999) found successful firms had, on an average, four times
more partners than not successful ones. They have also argued that partnership with established firms provide recognition and legitimacy to new or comparatively unknown firms (Ibid.), which could be vital sales of products based on new, evolving technology. With increasing amount of development work required (due to increase in size and complexity of software) in new products, software products firms seem to have no choice other than to focus on their core areas and rely on partners and alliances (e.g., for Java) to gain recognition, sales volume and market share.

2.2 New Product Benefits

To evaluate success of a new product, firms commonly use financial measures such as revenue, profit, and profit margin. Reasons could be that these measures are directly linked to the new product and are easy to measure. Moreover, financial numbers readily provide to the firms a telltale sign of product benefits, at least in the short term period. But, is financial benefit, indicated by aforesaid measures, the only benefit firms expect from their new products? It has been recognized now for some time that firms introduce new products with other benefits in mind as well such as to complement existing products, to diversify in to new business, or even to achieve corporate renewal (Schoohoven et al., 1990). Shipley, Edgett and Forbes (1991) found firms’ motives behind new products include: to use optimally firms’ resources, to improve firms’ image, to enter new market, or to diversify. Scholars recognized the limitation of financial measures to indicate new products’ benefits expected by firms. In a study of Israeli computer and electronics industry, Dvir and Shenhar (1990) concluded that new product success in this industry should not be measured only in financial terms, and recommended two additional dimensions for success evaluation: positioning of the firm in the market, and preparing the necessary infrastructure for future development, manufacturing and marketing of new products.

Griffin and Page (1996) recommended use of multiple measures in evaluating new product (what they called product innovation) benefits to firms. A trend among scholars has started to include wide range of measures to evaluate new product benefits. For example, Edgett and Snow (1996) believed that sales and profit indicators present only a part of the new product benefits. They concluded improved customer loyalty, enhanced firm’s image and cross-sales opportunity are also important benefits for firms.
The use of multiple measures is getting recognition in the new product research but may be not as readily as it deserves. Storey and Easingwood (1999) observed, “…this is only slowly gaining acceptance in practice [emphasis added].” They included financial as well as non-financial measures to create three potential benefit-groups: sales benefits, enhanced opportunity benefits (such as opening up new markets and establishing new product platform), and profit-related benefits (such as improving customer loyalty and enhancing profitability of other products). (Alam, 2003) has used three dimensions to study product benefits to the firm: financial benefits (such as sales, market share and profit), customer benefits (such as attracting new customers and opening new market opportunity) and opportunities benefits (benefits applicable to the firm, in general: new product improving profitability of other products and establishing a platform for future new products).

While the use of multiple measures is certainly a step forward towards describing new product benefits but there are cases when existing benefit-measures fail to do justice to some products. The reason is benefit-measures are still not wide enough. Despite a failure in delivering financial benefits, new products can be overall beneficial for their firms, if wider and appropriate benefits are considered (Storey and Easingwood, 1999). The need to use appropriate benefit-measures was highlighted also by Griffin and Page (1996). They concluded that business and product strategy decide the criteria for the evaluation of success or failure of a new product. It is obvious what a firm expects from a new product has to be taken into account to describe the product benefits to the firm.

2.2.1 Dimensions of New Product Benefits
As noted earlier, different measures have been used in the extant literature to evaluate new product benefits to their firms (see, among others, Griffin and Page, 1993, Griffin and Page, 1996, Hart, 1993, Hutlink and Robben, 1999, Shipley et al., 1991, Storey and Easingwood, 1999, Alam, 2003, Hutlink and Robben, 1995). The sheer number of such measures is overwhelming. Based upon an extensive new product literature survey of 77 articles representing 61 research projects, Griffin and Page (1993) found up to 75 different measures being used by researchers and practitioners to evaluate new product benefits to firms. They identified fifteen commonly used core measures which indicate five independent new product
success measures: (i) firm benefits, (ii) program-level benefits, (iii) project-level benefits, (iv) financial benefits, and (v) customer acceptance (Ibid.).

Hultink and Robben found Griffin and Page’s recommended measures relevant in their study of 197 large (Dutch) companies (1995) and 272 new industrial and consumer products in The Netherlands (1999). Their choice of multiple measures reflects the emerging thinking that benefit of a new product is a multidimensional concept and a combination of financial and non-financial measures provides a more complete picture (Hart, 1993).

Since product benefits is a facet of firm benefits and contributes towards it, the literature on firm benefits forms a backdrop to study new product benefits (Hutlink and Robben, 1995). Venkataraman and Ramanujam (1986) developed a two dimensional classification scheme: one of their dimension is about financial benefits (such as sales growth, turnover, profit, and ROI) and the other about operational benefits (such as product newness, and market position). They made an explicit distinction between financial and operational benefits. At a product-level, many researchers have explicitly dealt benefits along number of dimensions and recommended a set of measures to be used in future research (see, among others, Hart, 1993, Cooper, 1984, Cooper and Kleinschmidt, 1986, Cooper and Kleinschmidt, 1987, Griffin and Page, 1993).

Building upon Cooper’s (1984) previous research, Cooper and Kleinschmidt (1987) suggested a set of product benefit-measures with three independent dimensions: (i) financial benefits (including relative profit to sales, payback period), (ii) opportunity window (including new market or opportunities opened by the new product), and (iii) market impact (including market share). Their suggestions included many recommendations of the time but were still narrow and did not account of “wider” benefits such as a new product improving firm’s image or employing firm’s resources more fully. Storey and Easingwood (1999) included such wider benefits and distinguished them from financial and other sales-based benefits. Benefits of a new product that accrue to the whole of the firm are termed as “firm-level benefits” but those benefits which are directly measured in relation to the individual product are termed “product-level benefits (Ibid.).” Various criteria can be used to categorize new product benefits to the firm, but the one used by Storey and Easingwood distinguishes between the benefits occurring directly to the product and to those occurring to the firm as a whole catches the nuances of the two kinds of product benefits in the context of software.
To test their conceptualization of the product newness to firms Danneels and Kleinschmidt (2001) have used a set of financial measures to gauge “product-level benefits.” Based on the new product success factor literature, Storey and Easingwood (1999, p. 194) have compiled a list of firm-level benefits. To start the data collection, a list of suggested themes\(^\text{12}\) was prepared (Table 2.2). Product-benefits themes were modeled on the basis of Danneels and Kleinschmidt (2001) and firm-benefits themes on the basis of Storey and Easingwood (1999).

### Table 2.2: New Product Benefits Themes: From the Literature vs. Empirical Data

<table>
<thead>
<tr>
<th>Original themes (based on extant literature)</th>
<th>Final themes (based on empirical study)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product-level benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New products generate sales revenue.</td>
<td>1. New products generate or are expected to generate sales revenue.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products gain market share.</td>
<td>2. New products gain or are expected to gain market share.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products earn profit.</td>
<td>3. New products earn or are expected to earn profit.</td>
<td>Modified</td>
</tr>
<tr>
<td><strong>Firm-level benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New products enhance profitability of other product(s) of their firms.</td>
<td>4(a). New products enhance profitability of other product(s) of their firms.</td>
<td></td>
</tr>
<tr>
<td>New products meet new needs of existing customers of their firms.</td>
<td>4(b). New products meet new needs of existing customers of their firms.</td>
<td></td>
</tr>
<tr>
<td>New products enhance loyalty of existing customers of their firms.</td>
<td>4(c). New products enhance loyalty of existing customers of their firms.</td>
<td></td>
</tr>
<tr>
<td>New products attract new customers and create a potential customer base for their firms’ other present or future offerings.</td>
<td>5(a). New products attract new customers and create a potential customer base for their firms’ other present or future offerings.</td>
<td></td>
</tr>
<tr>
<td>New products establish platforms for future new products of their firms.</td>
<td>5(b). New products establish platforms for future new products of their firms.</td>
<td></td>
</tr>
<tr>
<td>New products or promise thereof assist their firms in attracting venture capital.</td>
<td>6(a). New products or promise thereof assist their firms in attracting venture capital.</td>
<td>Modified</td>
</tr>
<tr>
<td>New products help their firms in repositioning themselves in the industry.</td>
<td>6(b). New products help their firms in repositioning themselves in the industry.</td>
<td></td>
</tr>
<tr>
<td>New products help their firms in attracting new partners.</td>
<td>6(c). New products help their firms in attracting new partners.</td>
<td>New theme</td>
</tr>
</tbody>
</table>

\(^{12}\) New themes were added during the data collection process. Justification for the same is provided in the method chapter.
2.2.2 Themes of New Product Benefits

*Product-level Benefits*

In past studies it has been found that new product benefits are multi-dimensional. Cooper (1984, p. 7) called it “…different facets of a firm’s new product benefits.” Long ago in an innovation diffusion study of new software products, the success (of a new software product) was classified into installation success, commercial success and composite measure of success (Voss, 1985). While the installation success conveyed if the product bought and installed was in the use after one year of installation, the commercial success was termed for all such new software products which were still being sold after one year of the market launch. The composite measure was related to the diffusion coefficient of innovation. The use of one year as the requisite time-period by Voss to comment on commercial success of a software product highlights the short-life period of typical software. In that limited time-period the new product is expected to deliver the benefits firm expects. Regarding product-level benefits profit margin and return on investment during first 12 months from the product launch was used in a recent multiple-industry study of firms earning more than USD 100 millions per year (Brockman and Morgan, 2003). Measures such as profitability, sales, sales growth and market share were found to represent product-level benefits in a study of financial services (Cooper *et al.*, 1994). Revenue, market share and profits were found as benefits-measure in a comprehensive product development literature review also (Brown and Eisenhardt, 1995).

**Theme 1:** *New products generate (or are expected to generate) sales revenue.*

Sales revenue is one of the most important benefits of a new product for a software product firm, like for firms in any other industry. Not only the cost of development of any knowledge-intensive product such as a software product is very high but also the marketing costs of software costs are substantial. A software firm needs commensurate sales revenue to cover the cost of development and marketing of the new product. With the time and technological development, program code-size (Gibbs, 1994) and complexity of software is continually rising (Hoch *et al.*, 1999), this phenomenon makes software products to earn still higher sales revenue for their firms to meet their revenue expectations.
Software firms offer a wide-variety of terms and conditions (e.g., perpetual license, term license), pricing models (e.g., per user), and billing and payment-models (Gartner Dataquest Guide, 2003). By a proper combination of terms and conditions a software firm tries to make the customer “sticky” so that the firm may realize revenues—product new license revenue, product update/upgrade license revenue, technical support revenue, services/training/consulting revenue—over a long period of time (Ibid.). However, many software products are from small firms with limited resources to market and continue the further product development (Nambisan, 2002). As few software products are fully developed to meet customer needs and evolve through initial few versions (Cusumano and Selby, 1997), new products from resource-poor firms never make through the “evolution” process of initial few versions to be able to meet customer needs in a meaningful manner. In such cases firms’ expected revenue benefits remain unmet.

Theme 2: **New products gain (or are expected to gain) market share.**

The value of market share for software firms are much more than other firms. A dominant market share of the product category makes it an attractive choice for new customers, because buying a product used by most other users new customers get advantage of network effects (Shapiro and Varian, 1999). Moreover, the firm is able to play a significant role in setting the industry standards (in that product category), which locks-in existing customers by increasing their switching costs (Ibid.). Of course a major market share in initial stages of emerging market for the product pre-empts or makes less attractive for potential competitors.

Varian (2001) has argued that better technology- and market-related information of incumbent firms, lock-in and increasing returns of scale lead to high market concentration in high-technology industries although minimum efficient scale and entry barriers are also low in those industries. This explains a high number of firms entering into the software industry and introducing new products but few achieving the sufficient market share to sustain for long. Varian compares the industry concentration of PC hardware and software industry and argues that proprietary standards prevalent in PC software (OS and applications) is the main reason of existence of only few firms having very high market share versus PC hardware where a number of firms with much smaller market share exist.
**Theme 3:** New products earn (or are expected to earn) profit.

As sales revenue is vital for any firm, so is the profit. In most cases, if a firm could not generate profit, it could not grow or even survive in the long term. In knowledge-intensive industries, product development activities are not only necessary for firm’s survival but also very expensive. To finance such vital developmental activities a firm needs internal resources as well; accumulated profit is one such vital resource. Due to technological and market uncertainty in a dynamic industry like software, many new products fail to break-even and become profitable for the firm. Rising costs of product development is also making break-even difficult to achieve.

The practice of using terms and conditions, and pricing models in innovative ways to generate more revenue over longer period of time is becoming popular (Gartner Dataquest Guide, 2003) so that profitability of software products can be enhanced. In several previous studies profit is found to be one of the most important benefits expected by firms (Alam, 2003, Avlonitis et al., 2001, Cooper et al., 1994, Brockman and Morgan, 2003, Chandy and Tellis, 2000). In a meta analysis Capon et al. (1990) found profitability as one of three major measures of financial success used by firms.

**Firm-level Benefits**

**Theme 4(a): New products enhance profitability of other product(s) of their firms.**

A new product software product may enhance the profitability of other products of the firm in many ways: customers of new products may also buy other products of the firm; the firm can amortize the cost of selling if a prospective customer buys more than one product; the firm may position itself as a supplier of full-range of products of a certain category pre-emptying the customers to look for alternative suppliers increasing the loyalty of customers for its products in the long run; if the firm uses proprietary technology, the firm may lock-in and increase the switching-cost of customers (Shapiro and Varian, 1999) and will be in a position to sell future products still more profitably.

A firm, through an appropriate pricing strategy of the new product, may cross-sell other (more profitable) products to new customers either by bundling the product with other products or simply by direct marketing (Hinterhuber, 2004). A software product, being a digital product, can be sold and distributed over Internet and provides the firm an opportunity
to cross-sell or pursue other revenue generating opportunities to even distant customers (Carlsson, 2004), enhancing profitability of other products. It is argued that in such cases where customers face uncertainty about product quality, customers learning is required to benefit fully from new products and compatibility among new and existing products (customers own) can be an issue for customers, cross-selling serves the purpose of both seller and customers (Li, Sun and Wilcox, 2005). Services and technology products are examples of such situations (Ibid.).

**Theme 4(b): New products meet new needs of existing customers of their firms.**

Selling to existing customers is generally easier and more profitable than selling to customers who are new to the firm. Accumulated information about customers and their needs and preferences reduces search cost of new customers (Song, Di Benedetto and Zhao, 1999). Moreover, cost of selling and servicing is shared. Meeting new needs is favourable not only to the firm but also to customers. A new product, particularly if based on an evolving technology, from a known supplier reduces the technological uncertainty for the customer, and the customer is assured of compatibility of new product with its existing system (Li et al., 2005). The learning cost of a new product is lowered for the customer because of similarity between the firm’s earlier and new products. However, over a period of time, this relationship has the potential of becoming more profitable for the firm but expensive for the customer due to increasing switching-cost (Shapiro and Varian, 1999).

**Theme 4(c): New products enhance loyalty of existing customers of their firms.**

A new product by satisfying its customers creates brand equity that increases loyalty of customers which benefits the firm in the form of future purchase (Selnes, 1993). In an industry where technology changes very quickly (Nambisan, 2002) and even potential customers have difficulty in articulating their needs and expected features in a product, satisfying customers can, at best, be an ongoing challenge for firms. However, as a software product often contain innovative solution; technology of the product is largely unexplored; product benefits requirements (compared to competing products) are not clear; the product is evaluated by customers on the basis of value they create for them (Abernathy and Utterback, 1988). This phenomenon helps a software firm in showing the benefits of an intangible
product very tangibly to the customer, and in the process, creates a brand loyalty. Aaker and Jacobson (2001) found that product features contribute to brand equity in computer industries.

As long as a competing product does not offer a significant value, a locked-in customer has no incentive to bear the switching costs to shift to a competing product (Shapiro and Varian, 1999). The apprehension of incompatibility also contributes towards a repeat purchase from the same supplier. Switching costs and risks associated with a new technology product (e.g., probability of incompatibility) can be two major “negative” reasons for customers’ loyalty for software products.

**Theme 5(a): New products attract new customers and created a potential customer base for their firms’ other present or future offerings.**

Customers buying a product from a firm for the first time can also buy another, present or future, product(s) of the firm. Developing a customer base through a new product is a strategic aim of a firm (Johne, 1995). This product benefit applies at the firm-level and can be crucial for software firms. If the new product is based on a proprietary technology, customers are locked-in (to the technology) and the firm may leverage the product’s customer base to sell related present or future products and services more profitably.

It is argued that, thanks to the increasing returns to scale of the new economy, the promise of profitability of future products can be so great that firms may give away a current product—free or at a less-than-cost price—with an expectation that customers may adopt future generations of the product (Sharma and Sheth, 2004).

New customers can also buy and enhance profitability of existing or future products because a firm can sell other products to them. But, attracting new customers is neither easier nor cheaper than selling to existing customers. Given the peculiar nature of software products—technological standards, backwards compatibility of products with older customer’s data, expensive for customers to learn new software, etc.—a customer base can be invaluable for software firms.

**Theme 5(b): New products establish platforms for future new products of their firms.**

A new product may also help the firm “prepare for the future” if the firm may use the technological and human resource infrastructure, developed for the new product, for the future development and marketing of new products (Dvir and Shenhar, 1990). The
technological infrastructure such as hardware and software used for one development and/or distribution of one new product can be used other new products in future. This can not only amortizes the cost over a larger unit of products but also provides an opportunity to put to use the knowledge and experience gained during the earlier new product project. In a study of 94 software projects, Jordan and Segelod (forthcoming) found that firms developing innovative products enhance their present and future product development processes.

Many software products are usually developed in association with other firms so that upon market introduction these products are compatible with other hardware and software so that customers can use them seamlessly. In this sense, the role of other firms, which may be treated as suppliers, assume significance. The barriers of supplier integration overcome for one product can be vital in the development of next new product of similar platform (Ragatz, Handfield and Scannell, 1997). Examples of barriers are sharing of (i) intellectual assets: such as customer requirements, technology information, and cross-functional communication; (ii) physical assets: such as linked information systems, technology and shared hardware and software and (iii) human assets: such as supplier participation on the project team and co-location of personnel (Ibid.). The nature of interdependence of software firms in new product development and distribution cannot be over emphasized. A firm gains market and technical knowledge during the process of development and marketing of a new product which increases the chance of success of future new products, even if the earlier product financially fails in the marketplace (Maidique and Zirger, 1985).

**Theme 6(a): New products (or promise thereof) assist their firms in attracting venture capital.**

The role of venture capital can be significant for firms who are pursuing new, highly innovative products and for whom traditional sources of financing (e.g., stock markets, institutional investors) are not easily available. For investors, such firms are characterized by inherent uncertainty, high risk, information asymmetry, intangible assets and whose benefits is difficult to evaluate (Gompers and Lerner, 2001). In a study of American firms in twenty industries over three decades, it was found that venture capital contributed to and accounted for 8% of industrial innovations (Kortum and Lerner, 2000). Although this study presents results at an industry-level but underlines the importance of venture funding in patents and
product innovations. For the firms in software industry where technological breakthrough(s) hold great promise, Kortum and Lerner’s findings should be more than applicable.

In software industry where many firms are single product firms (Nambisan, 2002), the struggle for survival and market acceptance may take a longer time than many firms can afford without any long-term financing. Time-to-market can be important not only for generating revenue quickly but also for setting the standards. In a study of Silicon Valley high-tech start-up firms, Hellmann and Puri (2000) found the empirical evidence of venture funding helping firms to reduce time-to-market, and affecting product market strategies. During initial market trial a new software product may not get very positive response but if the firm has alternate source such as venture capital to finance its day-to-day operations the firm may pursue market strategies keeping the long term benefits of firms in mind.

**Theme 6(b): New products help their firms in repositioning themselves in the industry.**

A firm may expect a new product to help the firm enter a more promising market, if the older market has become stagnant i.e., there is no more scope of growth, or simply, if the older market is not profitable any more. A new product can also enhance the profile of the firm in the eyes of customers and/or intermediaries. In the new product literature, an impact on firm’s image or on market position has been treated as a benefit in order to evaluate success of a new product (Easignwood and Storey, 1991).

In an industry like software where rapid changes cause technological uncertainty, a firm’s credibility can lessen a customer’s the perceived risk in making a buying decision of a product. Because for high-technology products the perceived risk of customers affects the customer relationship with the supplier in terms of trust and commitment (Ruyter, Moorman and Lemmink, 2001). It is observed that many software product firms are established as small, start-up firms to develop a product, but they have limited resources to develop and market the product very effectively (Nambisan, 2002). Perceived risks for potential customers of new products of such firms will be obviously high. Also for software services firms who want to graduate into products segment, perceived risk would be a factor for potential customers. But a new product which convinces (by means of good reviews of industry commentators or trials by potential customers) the technological capability of a firm, helps
immensely in surpassing the risk and uncertainty of a new product and eventually repositions the firm as a reliable producer of software products (in certain categories).

For the successful market acceptance of new software products, firms’ image is found to be important (Banarjee, 2003); for products in other industries as well, a firm’s image plays an important role (among others, Alam, 2003, Avlonitis et al., 2001).

**Theme 6(c): New products helped their firms in attracting new partners.**

The importance of partners for software firms is critical to the success of their products. The ERP major Baan’s ex-president rationalized the firm’s decision of keeping 20% of the business and leaving 80% for partners as:

“…you do not simply deliver a [software] product yourself to the customer…but together with two or three parties. And together, the group determines whether the product will ultimately be useful to customers. Partnering is absolutely fundamental to the success of a software company.” (Prof. Graham Sharman, quoted in Hoch et al., 1999, p. 180)

In a study of 100 software firms from around the globe, Hoch et al. (1999) found three main reasons for partnering to fill gap in technology, to speed time to market and to increase market penetration. The rapid change gives little time to a firm to master all the technologies involved for the development of a software product and necessary complementary products so that the product proves “useful” to customers. Not only time is in short supply but so are resources necessary for gaining mastery over all such technologies. The situation becomes still challenging when a firm has no way of choosing the technological platform (e.g., Java or .Net) which is ultimately going to become the industry standard. Partnering helps software firms share the risk and pool resources together to meet the requirement of developing products (or better called solutions) which prove useful to customers.

Market leadership is crucial for software firms in order to set the standards and become the default choice of new customers. Software products are subject to what Stalk (1988) calls “time-based-competitions.” Being first in the market and gaining an initial, significant market share may give the initial market leadership but in order to sustain the leadership a firm need to maintain high unit sales (of the product), technology leadership, and a complete product solution (Ibid.). In the face of ever changing technology, a firm has to
resort to strategic partners to be able to fill the skills and competency gap quickly (Doz and Hamel, 1998).

The use of partnership in product development is commonplace in many industries and is not unique to the software industry. But, such partnerships can command so much importance is probably not common in many industries. Athey (1998) recognized the need to form strategic partnership, for sharing technologies and developing new product, as one of the impending challenge for the management of the software firms. If a new product makes this partnership possible or helps in attracting vital partners, such a contribution can be a significant benefit for its firm.

2.3 Summary of Newness and Benefits Frameworks

Newness of software products can be conceptualized in two different ways: fit and familiarity, where fit pertains to technological and marketing resources of the firm to the required ones for the new product. On the other hand, familiarity with technological and market environment of the firm for the new product explains how much the firm is in sync with the environment and can perceive and interpret signals and trends of the environment about the new product and its potential market. Figure 2.2, a restatement and rearrangement of elements of Figure 2.1, summarizes the newness framework for this study.

<table>
<thead>
<tr>
<th>Familiarity with</th>
<th>Fit with</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>3. Technological resource</td>
</tr>
<tr>
<td>Marketing</td>
<td>4. Marketing resource</td>
</tr>
</tbody>
</table>

Figure 2.2: Dimensions of Product Newness: A Framework
(Note: Based on Danneels and Kleinschmidt, 2001)

The two conceptualizations used together covers software product newness in the following way: when the new product is very different from what the firm has been doing earlier, new product leads the firm to an unfamiliar technological and/or marketing environment, denoted in the Figure 2.3 by the Arrow 1. On the other hand, if the new product’s technology and market is familiar to the firm but existing resources are not sufficient for product development and/or marketing, such a situation is represented in the figure by Arrow 2. While Arrow 1 exhibits a gap in familiarity between pre and post new product situation, Arrow 2 shows the difference a firm has to meet in order to meet the fit of resources in order to develop and
market the new product successfully. These two are somewhat too simplistic situations for an industry like software which is so dynamic. Arrow 3 captures those situations when both fit and familiarity of the firm are not sufficient for the new product project, a more realistic scenario in the context of software products.

Figure 2.3: A Combination of Two New Product Newness Conceptualizations

Product benefits of new products can be grouped into two: (i) product-level benefits and (ii) firm-level benefits. Although this is an artificial categorization on the basis of measurability (easy-to-measure versus difficult-to-measure) and associability (directly associated with a particular product), this two-dimension framework includes new products’ long-term but equally important wider benefits to the firm, in addition to the short-term financial benefits most commonly treated as the major benefits of new products.
Chapter 3: Qualitative Research Method

The first chapter provides an introduction; the second one presents the literature used for the data collection, analysis and discussion of empirical findings of this qualitative study which constitute the first part of this dissertation. This chapter presents the methodology followed during the research process of this qualitative study. The first section presents the research design; the second one lays out the research process followed; the third presents the preparation carried out prior to the empirical study. The fourth section elaborates how the seven software products and firms were selected for the study. The fifth and the sixth sections are about the design of the research instrument and the data collection respectively. The seventh section describes the within-case and the cross-case analysis procedure of the seven cases. The eighth section discusses how the themes emerged from the analysis of the seven cases. Ninth one describes the motive behind the comparison of the research findings with the extant newness-benefits literature. And the tenth section presents steps taken to ensure the quality (construct validity, external validity and reliability) of the research.

3.1 Research Design

This part of the research explores newness and benefits of new software products from the firms’ perspective. The research questions guiding this investigation are: (i) what are the relevant elements of newness of a new product to the firms that develops and markets computer software products? and (ii) what are the relevant elements of benefits of a new product to the firms that develop and market computer software products? It is believed that the individuals directly responsible for the development and/or marketing of a new product (typically designated as new product manager) could provide the correct and detailed information about the new product. The information reported to top managers could be limited or even manipulated depending upon the top manager’s attitude towards the new product project. It is pointed out that the information gathered from the top management may differ from the information reported by the manager directly responsible for a new product (Cooper and Kleinschmidt, 1995, Griffin and Page, 1996). It is not impossible for a top manager to be fully knowledgeable about a new product but a manager directly responsible for the new product will have more information readily available to answer first hand a
researcher’s questions. New product researchers invariably collect primary data about the product from the managers responsible or most knowledgeable at the firm (for example, Goffin and New, 2001, Jensen and Harmsen, 2001, Muffatto and Roveda, 2000, Olson, Walker, Ruckerf and Bonnerd, 2001, Rahim and Baksh, 2003, Woodcock, Mosey and Wood, 2000).

As this study concerned description of newness and benefits in the context of new software products, an almost unknown context, the qualitative methodology seemed a more suitable research approach. Many qualitative studies are descriptive and exploratory in nature, and build rich descriptions of complex issues which are little explored in the literature (Marshall and Rossman, 1999). Moreover, the qualitative analysis is particularly recommended for those research in which potential variables worthy of study are yet to be identified (Creswell, 1998, Marshall and Rossman, 1999). Even though the software industry is more than 50 years old (Campbell-Kelly, 2003), significant variables such as product newness and benefits remain little documented and their constituting elements have not been empirically identified. The development of newness and benefits concepts in terms of constituting elements is needed so that both concepts can be appropriately operationalized in the future studies.

For this qualitative study I conducted—either face to face or through Internet—in-depth, semi-structured interviews to collect primary data with new product managers (or someone responsible for the function). I used the purposeful sampling method to select the software products which met the eligibility criteria (outlined in Section 3.4) and for which respondents were likely to provide rich, detailed information. Main questions in the interview were used to pinpoint specific newness- or benefits-aspects of the software product. Supplementary open-ended questions were framed so as to permit respondents to express spontaneously on the topic. During the interviews they spoke at length about aspects of newness and benefits which they thought relevant and almost ignored other, irrelevant aspects.

To prepare myself to conduct interviews and, later again, to complement respondents’ primary data for writing case-descriptions, I referred to secondary, archival data from firms’ Web-sites, industry newsletters and media-clippings. For each studied product the data collection and analysis was carried out practically side by side. I frequently referred to the
literature during the entire research process which resulted in the refinement of not only the questions in the interview guide but also the research questions. After covering seven products in the study I felt myself nearing the theoretical saturation. The process from the start of the research project to the completion of this Licentiate stage is detailed in the next section.

3.2 Research Process
I have followed a research process that is highly influenced by Eisenhardt’s (1989) approach where she suggests a roadmap for building theories from qualitative research. The main feature of this approach is that it integrates influential works in qualitative methods (Miles and Huberman, 1994), case study research (e.g., Yin 1981) and grounded theory building (Glaser and Strauss, 1967), and charts out a step-by-step process to conduct an empirical study. Her suggested roadmap may seem normative but it allows for sufficient flexibility to suit the context of the research. It helped an inexperienced researcher like me to organize and carry out this study almost without any significant time overrun or wasted efforts. This approach to investigate the newness and benefits of software products suited the research aim as in her schema “theory building” from cases includes development of concepts (p. 545). In the context of this research, it meant development of software product newness and benefits concepts from the perspective of their firms.

I adapted Eisenhardt’s roadmap to suit the context of this research while maintaining the spirit of her approach. I made use of the replication logic of case study method (Yin 1981) by covering seven cases where every new case was largely similar to but slightly different from the previous one so that the emerging findings from previous cases(s) can be tested as well as contrasted in a slightly different (software product’s) context. I followed analytical tools of qualitative methods (Miles and Huberman, 1994) in with-in case and cross-case analysis of the seven cases. While doing content analysis of case-database I used graphical layouts which made identification of emergent themes easy. Finally, I used tabular forms to present findings at an abstract level still showing links to the appropriate cases.

By adopting a grounded theory approach I attempted to understand newness and benefits perceived by the respondents. Given the limited time available, a full-fledged grounded theory approach was not feasible so I resorted to an *a priori* conceptual framework
to expedite the research process by building upon the extant literature rather than starting from the scratch. I adopted the spirit of the grounded theory in extending and modifying the concepts of newness and benefits in the context of software products by getting into the respondents’ shoes. Table 3.1 shows various stages of the research process, major activities carried out during each stage and the purpose of those activities.

**Table 3.1: The Research Process Followed**

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Preparation</td>
<td>Research question definition</td>
<td>To focus efforts</td>
</tr>
<tr>
<td></td>
<td>Use of <em>a priori</em> concept definition</td>
<td>To ground better and to gain incremental development of newness- and benefits-concepts</td>
</tr>
<tr>
<td>2. Selection of cases</td>
<td>Specified population</td>
<td>To limit extraneous variation and sharpen external validity</td>
</tr>
<tr>
<td></td>
<td>Purposeful sampling</td>
<td>To concentrate on theoretically useful cases (to replicate or extend theory)</td>
</tr>
<tr>
<td>3. Development of data</td>
<td>For primary data collection through interviews; Secondary data from archives</td>
<td>For better grounding of elements of concepts by triangulation of data</td>
</tr>
<tr>
<td>collection instrument</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(the interview guide)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and use of secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Data Collection</td>
<td>Simultaneous data collection and analysis</td>
<td>To enable useful adjustments in remaining data collection</td>
</tr>
<tr>
<td></td>
<td>Flexible and opportunistic data collection methods</td>
<td>To take advantage of emergent themes and unique case features</td>
</tr>
<tr>
<td>5. Analysis of data</td>
<td>Within-case analysis</td>
<td>To gain familiarity with data and to identify case specific themes</td>
</tr>
<tr>
<td></td>
<td>Cross-case analysis</td>
<td>representing elements of newness and benefits</td>
</tr>
<tr>
<td>6. Emergent themes</td>
<td>Iterative tabulation of themes for newness- and benefits- concepts</td>
<td>To identify empirically grounded themes for elements of newness and benefits; to refine both concepts’ definition, validity and measurability</td>
</tr>
<tr>
<td></td>
<td>Replication logic across cases</td>
<td>To confirm, extend and refine both concepts in the context of software products</td>
</tr>
<tr>
<td>7. Comparison with literature</td>
<td>Comparing with similar and conflicting literature</td>
<td>To sharpen generalizability, improve concept definition and raise theoretical level</td>
</tr>
<tr>
<td>8. Reaching closure</td>
<td>Theoretical saturation</td>
<td>To call off additional data collection process when marginal theoretical contribution becomes negligible</td>
</tr>
</tbody>
</table>

(Note: Based on Eisenhardt 1989, p. 533)
Case studies vary in depth and scope; the seven products I have studied are examples of case studies of moderate depth. However, to maintain consistency of terms with Eisenhardt’s roadmap I call and treat each studied software product as a case. I found the definition of preliminary research questions at the onset of the research process helpful. It helped me to focus my research efforts. Although the preliminary research questions evolved over the period, those were still helpful in guiding minor changes made during the entire research process. Eisenhardt (1989) suggested use of a priori concept’s definition for incremental development of concept’s measures (called elements in this study). As existing elements of newness- and benefits-concepts in the extant literature seemed ill suited for software products, I saw a rationale for making a judicious and limited use of a priori dimensions and associated elements for the development of the interview guide questions. She recommended the purposeful sampling in order to concentrate on the theoretically useful cases, and the use of multiple data collection methods. I conducted some interviews face-to-face while some via IMs (Instant Messenger\(^\text{13}\)) on Internet and found this opportunistic combination serve my purpose very well. The use of secondary data collection methods—such as firms’ Web-site, archival data in few cases, and media clippings—reinforced empirical database and made triangulation of data possible. As it is pointed out “…the publications may also include descriptive materials concerning events, actions, settings, and actors' perspectives, that can be used as data…” (Strauss and Corbin, 1990, p. 52). The simultaneous data collection and analysis permitted me to make appropriate changes in remaining data to be collected. In some deserving cases, I reverted to already “covered” cases and collected supplementary data. I found her suggestion of being flexible and opportunistic in data collection methods sensible as these permitted further exploration of emerging themes and unique features of a particular case.

While within-case analysis allowed the familiarity with each case and the identification of unique themes, cross-case analysis reinforced emergent themes supported by multiple pieces of evidence drawn from several cases. As some of these themes were closely related, they were grouped together and converted to a list of elements based on one or several themes; each element representing a distinct aspect of newness and benefits. A back and forth\(^\text{13}\) A type of communications service that enables one to create a private chat room with another individual in order to communicate in real time over the Internet.
tabulation of pieces of evidence for elements of newness- and benefits-concepts increased finally their definition, validity and measurability. When I compared identified elements with the extant literature, I found some refinement in both the concepts in the context of new software products\textsuperscript{14}. By the seventh case I found the empirical process nearing theoretical saturation as new insights ceased to emerge. Overall, Eisenhardt’s (Ibid) roadmap guided me in carrying out the research process resulting in an empirically-grounded description of newness- and benefits-concepts.

3.3 Preparation
The research process started with the preliminary definition of the two main research questions. The purpose of those broadly defined research questions was to specify the type of organization to be approached and the type of data to be collected. This was necessary so as not to lose the focus of the research and get lost in the magnitude of data. Such a practice of initial definition of the research questions is recommended also in qualitative studies which seek to explore little researched concepts (Eisenhardt, 1989), because it is conceded: “No matter how small our sample or what our interest, we have always tried to go into organizations with a well-defined focus—to collect specific data systematically” (Mintzberg, 1979, p. 585).

For the research design I adopted an \textit{a priori} specification of dimensions of concepts (e.g., technological fit, market familiarity, etc.) which are based on the resource-based view of the firm, and on the organizational theory literature regarding the organization-environment relationship. Because Eisenhardt (1989, p. 536) argues:

“A priori specification of constructs can also help to shape the initial design of theory-building research. Although this type of specification is not common in theory-building studies to date, it is valuable because it permits researchers to measure constructs more accurately. If these constructs prove important as the study progresses, then researchers have a firmer empirical grounding for the emergent theory.”

These dimensions were explicitly investigated through questions contained in the interview guide. During the data analysis process pertinent themes emerged for newness and benefits in the context of new software products. These empirical data-based themes were

\textsuperscript{14} Presented in Chapter 5, Section 5.4.1 and 5.4.2.
converted to a concise list of elements which represents valid measures to ground emergent theory about both concepts.

It can be noted that the preliminary research questions and dimensions were tentative and, actually, did evolve during the research process as their function was to guide and not to limit the study. New elements constituting newness- and benefits-concepts came to fore; some initially assumed elements such as new product development necessitates market research proved superfluous as the research process unfolded which consisted of simultaneous data collection and analysis process. Ideally, theory-building research should begin with no theory under consideration and no hypothesis to test (Eisenhardt, 1989)—a challenging proposition in short research project but I tried to keep an open mind during data collection and analysis process and not to be strictly limited only to the initial elements of both concepts.

3.4 Selection of Cases
In qualitative methodology a variety of methods are used for selecting data sources and gathering data. One of the most popular sampling method is the purposeful sampling (Patton, 1990, Lincoln and Guba, 1985). It is defined as, “The process of data collection for generating theory whereby the analyst jointly collects, codes, and analyses his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges (Glaser and Strauss, 1967, p. 45).” I adopted this sampling method for it suited the nature of inquiry at hand. It is noted that “The logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research…” (Patton, 1990, p. 169).

Instead of the random sampling, commonly practiced in the quantitative research to increase the potential for generalizing results to a larger population, the qualitative research seeks samples that will permit detailed, in-depth exploration and understanding of the phenomenon under study. Purposeful sampling accommodates the existence of multiple realities that are closely aligned with respondents’ actual experiences (Lincoln and Guba, 1985). I anticipated the value of “accommodating multiple realities” for a rich description and chose the purposeful sampling method to select cases. To accommodate multiple realities
sometimes I had to reconcile diverse empirical findings and that proved to be an opportunity to select next case which could illuminate the conflicting emergent intermediate findings.

In order to select cases I adopted a set of criteria for software products as well as for firms developing and marketing those products. The research questions guided in deciding those criteria and in demarcating the population—the set of entities from which the research sample was to be selected. The first criterion was that it should be a software product (e.g., a virus scanning product), not a service (e.g., a virus scanning service provided through Internet). The main features of the software product (defined in Section 1.4) were that it should be a self-sufficient product (not merely a module or service), actively marketed and supported (documentation, training and customer support) by the firm, and for which no major customization was required by the customer. Though software products can be classified in different types, based on various criteria such as function, user-group, OS, etc., this study did not aim to distinguish among types of software products. In future, such a (product) type-specific study can be meaningful in understanding intricacy of newness and benefits in a narrower context but, to begin with, first a general understanding at an overall, software product-level is necessary to define and operationalize these concepts. Obviously it was beyond the scope of this study to delve deep and distinguish between different types of software products.

The second criterion for the product was that it should have/had been in the market for at least one year. In a study of software firm growth, Nambisan’s (2002, p. 146) observation: “…in the software industry, product life can often be measured in months and weeks” highlights the shortness of a software product’s life. One year time span could be too short for “traditional” products to evaluate their benefits to the firm but given the fact that most software products are replaced—if they survive that long—by new versions every one to two years (some even earlier than one year), one year in market is a reasonable time for the software firm to evaluate product’s benefits.

The third criterion related to the firm behind the product. It had to be independent (not SBU or part of conglomerate) and solely engaged in the software business. It is common for firms, involved in non-software activities, to develop a software program for their own use and then, in due course, market the same. The reason to exclude all those firms—SBUs, firms

15 Strategic Business Unit
part of a conglomerate or engaged in other businesses—was that there are differences between such firms and typical software firms in terms of their business environment and their resource-set. The aim of defining the research population in this way was to control extraneous variation (viz., difference in business environment and resource-set) and to define the generalization limits of findings (Lincoln and Guba, 1985).

Using the purposeful sampling method I selected seven software products in seven different software companies, each product forming a case study, over a period of time (February 2004 to November 2004). See Table 3.2. The case selection basis was inspired by the Eisenhardt’s logic that a researcher can break “simplistic frames” by cross-case comparisons among apparently similar cases resulting in new categories and concepts (Eisenhardt, 1989). She has pointed out that the key to a sophisticated understanding of a phenomenon is to list and then attempt to discover fine similarities and differences between pairs of cases which are similar in most but not all aspects. To make such comparisons possible, I selected each new case which was similar to earlier case(s) in many respects but not all; the exact feature of each case I wanted to select next changed as I proceeded with the empirical study, which is common to this type of study. Because “Unlike the sampling done in quantitative investigations theoretical sampling cannot be planned before embarking on a grounded theory study; the specific sampling decisions evolve during the research process itself (Strauss and Corbin, 1990, p. 192).”

As I had to get familiar with the process and to learn to distinguish between important and not-so-important interview questions I expected the data collection for the first few cases to be comparatively more extensive. Fortunately, I lived in a city where Mjärdevi Science Park is located. It is one of the Sweden’s major technology parks and is home to over 180 firms—mostly in telecommunication and software industry. I met the Managing Director (MD) of Mjärdevi Science Park, explained the research project to him and asked his help in identifying a couple of appropriate cases. He referred two firms: Nescit’s TermMate and I.Co’s IarP. Both fulfilled criteria for the case study. Moreover, one firm was small and one large, one a recent startup and another well established. These variations suited my wish to have large dissimilarities in the first pair of cases so that I can contrast role of resources and familiarity with business environment and then select additional cases which were not so much different.
The idea was to begin with two highly different cases and then to pursue the study with slightly different cases to refine the understanding.

**Table 3.2: The Seven New Software Products Forming the Case-Database**

<table>
<thead>
<tr>
<th>Case</th>
<th>Product</th>
<th>Product Type</th>
<th>Firm</th>
<th>Country</th>
<th>Respondent(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COB</td>
<td>e-procurement product</td>
<td>Commerce One</td>
<td>US</td>
<td>Business Development Manager</td>
</tr>
<tr>
<td>2</td>
<td>IarP</td>
<td>ERP product</td>
<td>I.Co</td>
<td>Sweden</td>
<td>i. Chief of Research &amp; Innovation, and ii. Product Manager</td>
</tr>
<tr>
<td>3</td>
<td>Lynx</td>
<td>Linux operating system</td>
<td>L.Co</td>
<td>Finland</td>
<td>Product Development Manager</td>
</tr>
<tr>
<td>4</td>
<td>Q&amp;A</td>
<td>Database management product</td>
<td>Symantec</td>
<td>US</td>
<td>Product Development Manager</td>
</tr>
<tr>
<td>5</td>
<td>Swelog</td>
<td>ERP product</td>
<td>QVIQ</td>
<td>Sweden</td>
<td>i. Managing Director and ii. Product Development Manager</td>
</tr>
<tr>
<td>6</td>
<td>TermMate</td>
<td>Terminology management product</td>
<td>Nescit</td>
<td>Sweden</td>
<td>i. Managing Director and ii. Product Development Director</td>
</tr>
<tr>
<td>7</td>
<td>Vitrak</td>
<td>SCM product</td>
<td>Dataman</td>
<td>India</td>
<td>Managing Director</td>
</tr>
</tbody>
</table>

I contacted Nescit and I.Co via e-mail describing the research project and the criteria for the case study (see Appendix III for the text of a sample e-mail). Nescit quickly responded to my e-mail. I was put in touch with the MD of the firm, with whom I scheduled an introductory meeting. As my e-mail elicited no response, I called I.Co and after talking to few managers I finally found the appropriate person. It was R&D officer at I.Co. I fixed an appointment also with him. In both introductory meetings I explained the research project and answered their queries related to the project. I.Co requested to be kept anonymous in the study. During these first meetings I also collected printed marketing materials and corporate brochures to file in the case database. We agreed on dates for the first formal interviews. The very first interview took place at Nescit in the first week of February 2004. I.Co’s first interview was held in the second week of March. After the first interview, Nescit’s MD recommended me to interview the Technical Director. At I.Co, the R&D officer later referred me to interview a project manager who has been involved with the product development of last four versions of IarP.

The data collection at Nescit went smoothly and quickly. Since it was a small, young firm, information was easily accessible. At I.Co, due to its large size (more than 320
employees at the corporate headquarter, where interview took place, and 3 600, in total, in 41 countries) and after eight versions of the product, information was not easily available, particularly about the early versions of the product. Despite the difficulty, IarP proved an interesting case. This was a product which had grown from a modest product to a highly successful ERP product now being sold in 41 countries providing numerous benefits to its firm which has grown to become a major, global ERP firm. On the contrast, Nescit was struggling to leverage benefits of TermMate in the larger interest of the firm. Nescit was established to actualize TermMate and its newness was significantly different than newness of IarP, after eight versions, for I.Co. In order to extend the observations from IarP’s, I asked the respondent at I.Co to suggest a couple of Swedish ERP products. He suggested two products: one similar to theirs and the other, QVIQ’s Swelog, a niche product from a far smaller firm. The first product was in the same league as IarP but the other was a languishing product with a long history.

I chose to pursue Swelog. Questions intriguing me were: while I.Co has benefited greatly from IarP, what were the benefits that QVIQ had availed from Swelog? How newness of Swelog to QVIQ was different than IarP’s newness to I.Co. I approached QVIQ in a similar way as I had Nescit and I.Co—sent e-mail and then had an introductory meeting. The founder and MD of QVIQ became my first respondent for Swelog; later, I also interviewed the product manager.

At this stage I wanted to bring variation in the product type and decided to select next case of a mass-market software product, as first three cases were corporate software products. These three cases were from Sweden and now was the time to extend the scope of study by including overseas software products as well. L.Co’s Lynx, a Linux OS, became the fourth case. I had worked for the firm and knew about the product. This Scandinavian firm, located in Finland, had many similarities with the Swedish firms in the earlier three cases but the product differed greatly from their products. The product development manager became the respondent; the firm preferred to remain anonymous.

Preliminary observations from Lynx case seemed very interesting. I wanted to pursue again a mass market product but one from the outside of Scandinavia. As I had already covered four Scandinavian cases, a software product study without representation of USA seemed incomplete as “The United States dominates the world’s software industry, especially
in software products. Campbell-Kelly (2003, p. 9).” His book on a history of the software industry is flush with American cases reflecting the historical prevalence of American firms in software products industry.

Symantec’s Q&A—a mass market, entry level database management software product—from USA became the fifth case. To increase variety among cases further, at this stage, I wished to include a product which was meant to be used on Internet. Despite recent disappointing benefits of many Internet firms, it was interesting to contrast newness and benefits of a product made solely to be used on Internet. Such products were largely unique because firms behind them were a recent phenomenon; their business models were hardly tested; their markets were spread all over the world from the word go. I scouted to find such an Internet product as the sixth case because all earlier five cases were products for standalone computers or for Intranet. After some serious attempts, I was able to enlist Commerce One’s COB (Commerce One Buysite), the second American case for this study.

It was not easy to find the appropriate cases and willing respondents from USA. I wrote to SIIA\textsuperscript{16}, the main trade association of American software firms, but could not elicit any response. As I was a member of few online communities and had seen members soliciting all kinds of information, I thought to ask for help. My postings—requesting assistance in identifying appropriate cases and recruiting respondents—on my engineering college\textsuperscript{17} and business college\textsuperscript{18} alumni communities led to few useful tips. For the first four cases, I had scouted for the software products and firms in the first place; later, these firms suggested the respondents. But this time, I had to look for persons who were responsible for, or aptly knowledgeable about, the development and marketing of a software product. After communicating with several of such persons who were recommended at my Online Communities I ultimately found a respondent for a suitable new mass market product (Symantec’s Q&A) as the fifth case. But finding a respondent for a suitable product made for use on Internet took many repeated efforts at online communities and following email communications. Finally, I found a respondent for CommerceOne’s COB, a product meeting

\textsuperscript{16} Software and Information Industry Association
\textsuperscript{17} It is one of the leading Indian engineering university parting education in, among others, computer-, electronics-, and electrical- engineering. Graduates are working mostly in global IT firms, many in US.
\textsuperscript{18} Other than business studies this college offers a popular Masters in Computer Application (MCA) course, hence alumni include professionals working in software industry as well.
criterion for this study. At the time of data collection Q&A’s respondent had left the firm and was a freelance software consultant in Silicon Valley. CommerceOne was virtually winded up; COB’s respondent was working for a UK firm.

For a seventh software product I realized an Indian case would allow me to contrast products from firms with dissimilar resource endowments and business environments. At that time (first half of 2004) Indian software firms were getting a lot of attention in popular media; they were entering North American and European markets; many software services firms were graduating to software products firms. To locate an Indian case I contacted NASSCOM\textsuperscript{19}, an industry association of Indian software firms, via email and requested them to suggest suitable firms. They were prompt and put me in touch with six firms. Followed NASSCOM’s leads I finally selected Dataman’s Vitrak meeting the study’s criteria and willing to participate.

During the seventh case study, I realized I was approaching theoretical, a point where researcher observes repetition of phenomenon and additional learning is negligible (Glaser and Strauss, 1967). I had found during the last couple of case studies incremental insights decreasing sharply and becoming minimal. I decided to conclude with the seven cases. Eisenhardt (1989) has suggested that between four and eight cases should serve the purpose. In recent qualitative studies of new products, number of cases ranges between two to six with one exception of nine cases (see Table 3.3).

For practical considerations of time and cost I had to be creative and flexible in data collection from the overseas firms. Instant Messenger, as we shall see in section 3.6, served the purpose effectively and efficiently. But first a description of how I designed a guide to be used during interviews for data collection.

\textsuperscript{19} National Association of Software and Service Companies
Table 3.3: Some Recent New Products Studies Employing Qualitative Methods

<table>
<thead>
<tr>
<th>Author</th>
<th>No. of Firms</th>
<th>Data collection method</th>
<th>Data presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goffin and New, 2001</td>
<td>5</td>
<td>Semi structured interview, Workshop</td>
<td>Generalization of cases, Case-description</td>
</tr>
<tr>
<td>Jensen and Harmsen, 2001</td>
<td>4</td>
<td>Interview</td>
<td>Case-description, Graphical maps</td>
</tr>
<tr>
<td>Lewis, 2001</td>
<td>2</td>
<td>Semi structured interview</td>
<td>Comparative case-description, Table for comparison</td>
</tr>
<tr>
<td>Muffatto and Roveda, 2000</td>
<td>5</td>
<td>Interview, Follow-up sessions</td>
<td>Case-description, Table for comparison</td>
</tr>
<tr>
<td>Olson et al., 2001</td>
<td>9</td>
<td>Interview, Written survey</td>
<td>Table</td>
</tr>
<tr>
<td>Rahim and Baksh, 2003</td>
<td>5</td>
<td>Semi structured interview</td>
<td>Case-description, Table for comparison</td>
</tr>
<tr>
<td>Trueman, 1998</td>
<td>2</td>
<td>Semi structured interview</td>
<td>Case-description</td>
</tr>
<tr>
<td>Twigg, 1998</td>
<td>6</td>
<td>Interview</td>
<td>Case-description, Table for comparison</td>
</tr>
<tr>
<td>Woodcock et al., 2000</td>
<td>6</td>
<td>Semi structured interview, Company documents</td>
<td>Generalization of cases, Table for comparison</td>
</tr>
</tbody>
</table>

3.5 Development of the Interview Guide
In qualitative research, interviews are commonly used to collect data (Patton, 1990, Creswell, 1998). Through an interview a researcher gets to understand a respondent’s perspective of the phenomenon under study. According to Patton (1990), qualitative researchers seek to understand, through in-depth interview, people’s perceptions and knowledge. The aim of the researcher is to capture the perspective of the respondent in his/her own words without allowing own biases to affect the findings (Marshall and Rossman, 1999). It is a challenge to portray genuine viewpoints of respondents when presenting meaningful information with respect to research questions. A semi-structured interview allows the researcher to pose same set of open-ended questions to all respondents and, simultaneously, permits flexibility to pursue opportunistically interesting leads with detailed supplementary questions. An open-ended question allows a respondent to speak at will and in as much detail as the respondent feels necessary as per the importance of phenomenon. Through responses of open-ended
questions a researcher understands and captures points of view of a respondent (Patton, 1990). As this study aimed to understand firms’ perspective open-ended questions were formulated in the interview guide. Commenting on the prevalent “consistent findings”, Craig and Hart (1992) observed in their literature review of NPD that researchers need to verify validity of measures by asking open-ended questions. Link’s (1987) inclusion of open-ended questions led to the identification of novel facts not identified by previous research. It has been very common in new product research to measure a set of variables without verifying their validity (Lowe and Hunter, 1991). It was assumed that by asking open-ended questions directly to the respondents at the software firms there was a good possibility of developing measures of newness and benefits which are valid in the context of software products and their firms. The respondents’ replies representing their firms’ perspective were primary data in the case studies.

I conducted face-to-face interviews with six respondents for three cases (IarP, Swelog and TermMate); two respondents for each product. For remaining four cases (Lynx, COB, Q&A and Vitrak), I conducted a series of brief interviews using Web-based Instant Messengers with four respondents; one respondent for each case. I e-mailed them questions from interview guide, which they answered and e-mailed me back. Their primary response was used as a starting point for a series of mini-interviews (or better called chat) through Instant Messengers. While face-to-face interview typically spanned between one hour and one and half hours, each session of Web-based interview lasted anywhere between ten-minutes to half an hour.

The guide used to conduct interviews was developed taking into account recommended measures for product newness (Garcia and Calantone, 2002, pp. 128-129, Danneels and Kleinschmidt, 2001, p. 366) and benefits (Danneels and Kleinschmidt, 2001, p. 365, Storey and Easingwood, 1999, pp. 194-195). Using these measures Danneels and Kleinschmidt carried out an empirical test of product newness and benefits; they called them newness and benefits respectively. Based upon a critical review of new product development literature from marketing, management and engineering fields, Garcia and Calantone suggested how to operationalize product newness. Similarly, product benefits themes were initially developed from measures used by Danneels and Kleinschmidt, and Storey and Easingwood. The use of tested and recommended measures in the interview guide was meant
to have a solid base to start the empirical study. As the data collection progressed changes were made in the interview questions as new insights from case studies emerged making some of the questions unnecessary and introducing some new ones. Later, findings of the case studies which tallied with initial recommended measures gained additional theoretical support from the existing literature; findings which differed indicated gaps in the newness-benefits literature which need to be pursued in future studies.

I carried out a pilot test of the interview guide to validate and adapt the questions. A software firm located at Mjärdevi Science Park, Linköping was selected for close proximity and easy access. Based on the feedback of the pilot test, some questions from the interview guide were dropped and some were modified to suit software products and firms. Revised questions of the interview guide were subsequently validated by three industry experts. These experts—two based in the US and one in India—had 39 years of collective industry experience of working on or leading new software product projects. Based upon their recommendations, I made further changes in the questions. An initial version of sample interview guide is shown in Appendix II. It was customized for every case incorporating appropriate changes to reflect the software product and firm under study.

3.6 Data Collection
To collect primary data, as already mentioned, I conducted face-to-face interviews for the three cases and through Instant Messengers for the remaining four cases. For face-to-face interviews, I scheduled time and location as per the respondent’s convenience. Three respondents preferred their office for interview, while one her home. At the beginning of the interviews I made sure that respondents understood key terms such as newness and benefits by explaining the terms and answering their queries.

While conducting the interview, I used the interview guide in a flexible and liberal manner. Questions and supplementary questions were posed selectively to provide a framework for the respondent to describe product’s newness and benefits for the firm. Supplementary questions varied from interview to interview depending upon relevance to the particular case. It is suggested that a qualitative researcher should convey to respondents that their views are valuable and useful (Marshall and Rossman, 1999). Prior to the interview, I revised secondary information contained in the case-database (prepared from the firm’s Web-
site, brochures, media clippings, etc.) and made notes for the interview. This home work helped me in posing relevant and appropriate supplementary questions, giving an opportunity to confirm or refute secondary information contained already in the case-database, and showing seriousness of the study to the respondents. I listened attentively with minimal interruptions when respondents were describing their viewpoints.

To conduct interviews of overseas respondents I used Instant Messengers (IM) such as MSN Messenger. I had planned to conduct telephone interviews but IM idea was suggested first by the L.Co’s respondent for Lynx. In fact, L.Co uses IM extensively for internal communication. To my pleasant surprise, IM also suited well to all later distant respondents (for Q&A, COB and Vittrak). Probably due to the common use of and the familiarity with IM of software industry professionals, this arrangement worked well. It not only helped me in saving time and cost but also proved to be an equally effective alternative to face-to-face interview. I started the process by first emailing an adapted version of questions from interview guide (they had received the research project description and key terms definition before agreeing to participate in the study) to the respondents. They replied to these questions by email. This flexibility was convenient for them as they had not to schedule a meeting with me but it had its own limitations as many of the replies did not address the issues to the extent I had expected. To clarify such ambiguous responses and to get the fuller picture IM proved invaluable for conducting several brief sessions of interview. In the beginning I used to request them through e-mail to “ping” me at their convenience.

Similar to face-to-face interviews, I clarified respondent’s queries (and there used to be many) before taking up my questions. It took several short sessions to complete the interview. If this interview-in-parts was the cost of conducting interview using IM, it gave ample opportunity for unscheduled chat sessions. Once I became acquainted with the respondents I usually skipped the formality to request them to ping me; I myself pinged them and we had a chat session whenever they were online and not very busy. Sometimes when they were busy, I asked them to ping me when they get “free”. This flexibility and informality also helped them to be more “vocal”, to be more straight-forward and to describe newness and benefits in a more informal manner (as obvious in some of the respondent citations in Chapter

20 It means "to get the attention of" or "to check for the presence of" another party Online.
21 I was about to type a :-) (smiley) here as was common during those chat sessions.
For ease of compilation and analysis, interviews were audio-recorded and, later, transcribed; IM chat sessions were saved as text-file. Finally, these inputs were merged to create individual case database.

### 3.7 Data Analysis

The data analysis of the case database was carried out in two ways. Each case was analyzed individually (called within-case analysis) as well as collectively (called cross-case analysis). First within-case analysis and then cross-case analysis process is described.

#### 3.7.1 Within-Case Data Analysis

Data analysis for each case aimed to generate concepts through the coding process. “[The coding] process represents the operations by which data are broken down, conceptualized, and put back together in new ways. It is the central process by which theories are built from data (Strauss and Corbin, 1990, p. 57).”

To start this coding process, at first I prepared a text file for each of the seven software product case. This text file contained primary data collected through interview(s). In this part of analysis I had to label and categorize the phenomena of newness and benefits, using open coding, as dictated by the data. Open coding involves “the comparative method”—asking questions and then making comparisons. Data are first disintegrated by asking simple questions such as what, where, how, when, etc., and then data are compared and alike incidents are grouped together and given a conceptual label. The process of grouping concepts at a higher, more abstract level is called categorizing.

To begin with data contained text file was overwhelming; considerable data reduction and reorganization was necessary to carry out the analysis process meaningfully. I began sifting through each case text file and marking the relevant part of text according to the pertinent research question it addressed. Even though interview questions were arranged to elicit research questions-wise information, free flowing response of respondents contained portions which were sometimes more relevant to the other research question. Hence, the need for little reorganization of also realized. These reorganized text files contained all primary data; some of them were not directly related to the research topic and had crept in during the “conversation” process. At the next stage (Stage II in Figure 3.1), I created second text file for each case in which I left out the superfluous text from the primary data which were not
This alteration left only the pertinent text under each research question headings.

To start open coding, first I highlighted the key words and phrases which appeared repeatedly in the case text and/or which seemed to be significant to the respondent(s), and then serial numbered them. These identified key words and phrases for each research question were in random order, and somewhat in an aggregated form, in the text. In order to categorize these scattered key words and phrases I began grouping similar key words and phrases together which seemed to represent a certain incident. Each one of these categories expressed a theme which respondents had expressed. I made sure that every identified key word and phrase was included in one or the other theme.

However the process of data collection and within-case analysis was somewhat iterative for each case, because additional data collected through supplementary questions were added to the second text file at appropriate places giving sometimes rise to new insights in the case leading to some more new primary data. While this repetitive process of one case

Figure 3.1: The Data Reduction and Analysis Process

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However the process of data collection and within-case analysis was somewhat iterative for each case, because additional data collected through supplementary questions were added to the second text file at appropriate places giving sometimes rise to new insights in the case leading to some more new primary data. While this repetitive process of one case
was going on, to save time, the data collection process for the next case was already started. This overlapping process continued till the end of the seventh case. Figure 3.2 shows this iterative process graphically.

Figure 3.2: The Overlapping and Reiterative Process of Data Collection and Analysis

Even at this stage of the within-case analysis, comparisons across pair of cases helped in taking additional measures at appropriate time to improve individual case-studies. On pairwise comparison, some themes were found present in only one of the cases. After a number of
such pair-wise comparisons it became clear that few themes were present in majority of cases while some were present in only few or isolated cases. These “rare” themes were pursued further. I approached concerned respondents with additional questions for confirmation and further clarification. Keeping such peculiar instances in mind I revised questions for remaining interviews. On some occasions I even re-approached respondents for whom I had already reorganized and edited primary data at Stage II (see Figure 3.1). Making changes in the data collection instrument mid-way through the research process can be questioned. However, it can be justified if such a change helps the researcher to follow a new line of thinking to understand a phenomenon better or to ground an empirical finding theoretically (Eisenhardt, 1989). She has called it “controlled opportunism in which researchers take advantage of the uniqueness of a specific case and the emergence of new themes to improve resultant theory (p. 539).” I made use of this flexibility to get a better understanding of respondents’ view points on both phenomena: product newness and benefits.

Labeling the identified themes posed some challenge. When I considered only empirical data I could see several themes in combination describing newness and benefits. On the other hand, the extant literature readily offered labels describing many of themes found in the empirical data. While the urge to be original was compelling, I chose not to add new terms (theme-labels) unless absolutely necessary. The reason was I was not willing to contribute to the proliferation of new terms, since new products literature has already too many different definitions and operationalizations of very similar key terms which has hindered the progress of knowledge in new product development field (Garcia and Calantone, 2002, p. 126). It was a delicate act of balancing between maintaining the spirit of empirical finding and “forcing” terms borrowed from the extant literature. That explains why most of the themes (mentioned in Chapter 4) have familiar labels while some have new ones.

At the next stage (Stage III in Figure 3.1) of within-case analysis, I created a third text file for case description for each software product which consisted of two parts. In the first part (Part A), I imported the secondary data about the case I had collected from the firm’s Web-site, media clippings, trade newsletters, etc. In the second part (Part B), I arranged the emergent themes for both research questions based on primary data. Part A provided a storyline—a descriptive narrative about the central phenomenon of newness and benefits
described in Part B. Secondary data not only supplied a context to the primary data but also corroborated firm’s perspective by triangulation of data.

Courtesy mainly the ten respondents, now I had an intimate understanding of each of seven cases. But before proceeding to cross-case analysis I had to make sure that I understood the respondents’ view-point correctly and case descriptions presented their firm’s perspective.

**Respondents Vetting of Case Descriptions**

I needed to verify the accuracy of data reduction and analysis carried out until this stage as well as the genuineness of case descriptions. Member checks—whereby data, interpretations and conclusions are verified with whom data was originally collected to enhance the rigor of the study—are recommended to establish credibility of qualitative research (Lincoln and Guba, 1985). I sent case descriptions via email to all the respondents. Four of the ten respondents pointed out discrepancy between my interpretation and what they had meant or factual error (in secondary data) in case descriptions. I made revisions accordingly and re-sent them revised case descriptions. Ultimately, all ten respondents vetted, singularly or in pair, their cases and believed that it conveyed the respective firm’s perspective.

**3.7.2 Cross-Case Data Analysis**

Part A and Part B together made a story which helped in conceptualizing a case at the highest abstract level. During analysis this story representing the studied product and the firm became a core category for each case. All other categories related to the case assumed the role of subsidiary categories. This simplification helped me to think systematically about the data and to relate different cases in multiple ways. The idea was to discover patterns and search for the data for validation by making comparisons across the cases.

I had initially compared pairs of cases during data collection and within-case analysis process. At that stage the purpose was to pursue insights gained from one particular case into another case(s). This comparison, done in “real time” when data was still being collected, permitted the additional data collection for previous cases and refinement in questions in interview guide for later case studies.

Another and probably a more important occasion for cross-case analysis was when I got final case descriptions vetted by respective respondents (or pair of respondents in three
cases). Each case description already contained identified themes. At Stage IV in Figure 3.1 I listed all the themes separately for each research question. Under each theme I assembled pertinent evidence from all the cases, in which particular theme was found. In order to ground these themes into empirical data and to substantiate that these themes expressed viewpoints of the respondents, I reviewed text file of each case and borrowed respondents’ quotation to illustrate each theme. For the ease of understanding and presentation I tabulated cross-case charts for each research question showing themes and their presence in relevant cases, an appropriate tool for the presentation of qualitative data (Miles and Huberman, 1994).

3.8 Emergent Themes
During within-case analysis tentative themes began to emerge. By the time of completion of cross-case analysis a set of themes were identified which described newness and benefits of these seven studied products for their firms. During this rather long process of cross-case analysis I compared systematically each theme with evidence from the seven-case database. This was a re-iterative process: looking for evidence in the case-database for emergent themes and in the process, according to the evidence refining the emergent theme and again looking for evidence for refined emergent theme. The idea was to make sure that emergent themes were firmly grounded in empirical data (Eisenhardt, 1989). This repetitive process resulted in the identification of themes which were properly grounded in empirical data.

Although it led to identification of themes of newness and benefits, open coding resulted in a certain degree of disintegrated data and concepts. The numbers of themes were too large to offer a concise description of either newness or benefits. One of the criterion of good theory-building study is parsimony (Ibid.). To meet this criterion I needed to raise the level of abstraction which I did by using axial coding. This process consisted of reorganizing fractured data (in the form of individual themes) in a cohesive way by making connections between main (i.e., a higher level than that at theme-level) categories and their sub-categories but not across discreet categories (Making connections across discrete categories, called selective coding, conceptual frameworks of newness and benefits are developed in Chapter 5). Connecting related themes I arrived at a set of main categories, much shorter than the set of themes. Each one of the main category is termed an element. The set of elements describing newness and benefits phenomena in a concise way are exhibited in Tables 4.1 and 4.2.
The purpose of describing newness and benefits empirically was to refine these phenomena in the context of new software products. Eisenhardt (1989, p. 541) calls it “sharpening of constructs”. Tables 4.1 and 4.2 present the findings fulfilling the research purpose. As these elements (through their constituting themes) contain empirical evidence showing measures the themes are based upon, they provide information how these elements can be operationalized in future research.

### 3.9 Comparison with Literature

The elements and their constituting themes were compared to the extant literature by focusing on similarity to or divergence from findings reported in earlier new product studies. One of the aims of this exercise was to understand respondents’ version of newness and benefits; another aim was to relate their version to new product development literature in general, so that peculiar features of newness and benefits of new software products can be identified.

Similarity in findings of this study with extant literature added to generalizability (Eisenhardt, 1989). Conflicting findings with literature were an opportunity for exploring the reason of such divergence. This led to, in some cases, to new insights in the nature of software product and appropriate delineation of newness and benefits. If conflicting findings were overlooked, conclusions of the study could have been questioned or supposed to be peculiar to only the studied seven products.

In Chapter 5, this comparison of elements and themes with extant literature forms the basis of discussion and conclusions about relevant elements of newness and benefits of new software products. This comparison also leads to some theoretical insights about both of them. The use of an extant literature-based conceptual framework helped in organizing the discussion and visibly extending the new products literature.

### 3.10 Quality of Research Design

A good quality research design is mandatory for the credibility of theory building research. Unfortunately there are no standard guidelines for the evaluation of this kind of research (Eisenhardt, 1989). However, to ensure the good quality, construct validity, internal validity, external validity and reliability are the four design tests suggested for the case study method of qualitative inquiry (Yin, 2003). Similar suggestions are forwarded by Miles and Huberman (1994). In the current study appropriate steps (presented below) were taken for the three
pertinent tests (minus internal validity), as internal validity was not germane to this study. Internal validity is defined as the process of establishing a causal relationship between constants and variables and is relevant for causal or explanatory case studies and not for descriptive or exploratory case studies (Yin, 2003). The internal validity test was not felt to be applicable because this study was more or less an “exploratory case study.”

**Construct Validity**

It is the process of establishing correct operational measures (the standard operating procedures) for the concepts being studied. To fulfill the construct validity criteria, steps suggested include the use of multiple sources of data (data triangulation), the creation of a case study database and the maintenance of a chain of evidence (Yin, 2003, Miles and Huberman, 1994). Any finding or conclusion based on more than one source of information should be more convincing and accurate if a corroboratory approach (converging lines of investigation) is adopted (Yin, 2003).

In the current multiple sources of evidence were used for the triangulation purpose. In some cases, two respondents provided primary data. Primary data were supplemented with secondary data. A chain of evidence was established in the process starting with the interview(s) and through the data reduction and analysis process (see Figure 3.1). Before writing the final case descriptions I sent the draft version to respondent(s) to get their approval and suggested changes, if any. One more step taken at the beginning of the data collection also helps increase the construct validity — expert validation of the content of the interview guide. Managers with significant industrial experience validated the content of primary data collection instrument.

**External Validity**

External validity is the process of establishing the domain to which findings of a study can be generalized (beyond the case studies). In the current study, although the focus were on understanding the product newness and benefits concepts but the inclusion of seven case studies enable a reasonable generalization possible. The replication in following six cases was done to obtain evidence for emerging findings. Admittedly, these seven cases do not purport to represent global computer software population but only provide a glimpse.
Reliability
The reliability of a study pertains to the degree to which the procedures and steps established, if repeated, will yield similar findings. Although the interview guide was adapted for each case in order to capture the novel aspects of a product and firm in question but the case database was maintained for the reliability of findings (Yin, 2003). Procedures followed were documented, and presented briefly in foregoing sections, increasing the repeatability of the case study. It allows an observer to follow the derivation of a piece of evidence from initial research questions to final case study conclusions, moving from one part of the case study to the other (see Figure 3.1). Methodological procedures described above, hopefully, present “chain of evidence” and help reader cross-refer among the data collection, analysis and conclusion.
Chapter 4: Qualitative Data Analysis and Findings

Analysis and findings of empirical data are being presented in this chapter. First, a within-case analysis of the seven new software product cases is described. At this stage, data reduction and analysis was done at an individual, case-level to yield answers to the two research questions. The analysis is interspersed by emerging elements of newness and benefits (highlighted in underlined texts) identified in each case.

Then, the cross-case analysis of the seven cases, carried out jointly for all cases, is presented. This general-level analysis is organized under emerging elements found in the within-case analysis. Finally, findings are listed in the form of identified elements drawn from within- and cross-case analyses. From this empirical study, these elements come to represent the newness of a new software product and associated benefits to the firm.

4.1 Within-Case Analysis

The empirical database comprised of seven cases prepared on the basis of primary data, collected through open-ended, in-depth interviews of new product managers, supplemented by secondary data from archival sources. Three of the cases are from Sweden, two from the United States and one each from Finland and India. Table 3.2, page 59, provides a ready reference to the seven studied products, each forming one case.

Results of within-case analysis are presented below in a descriptive form, subdivided for each case in two sections to answer the two research questions: (i) What are the relevant elements of newness of a new product to the firms that develop and market computer software products? and (ii) What are the relevant elements of benefits of a new product to the firms that develop and market computer software products? At this stage, focus was to identify themes representing facets of newness and benefits to the firm in each case individually. To make it easy to read, identified themes are highlighted by underlined text.

Tables 4.2 and 4.3 present the findings of empirical analysis at a glance. These two tables should help the reader in following the ensuing analysis. First column lists elements of product’s newness and benefits in Table 4.1 and 4.3 respectively; each element is based on one or more than one closely related theme(s) listed in the second column.
<table>
<thead>
<tr>
<th>Elements</th>
<th>Underlying Themes</th>
<th>An example (from the case database)</th>
<th>Definition/Notes</th>
<th>Found in number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. New products make their firms acquire new development technologies.</td>
<td>1(a). New products made their firms acquire new design technology.</td>
<td>In order to update Swelog QVIQ decided to use object oriented design for next version of the product.</td>
<td>Design technology pertains to structure of the components of a software product, their interrelationships, and principles and guidelines governing their design and evolution over time (Garlan and Perry, 1995).</td>
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<td></td>
<td>1(b). New products made their firms acquire new programming technology.</td>
<td>C++, an object oriented programming language, was used in the Swelog’s next version (in the example cited above).</td>
<td>Programming technology involves implementing one or more interrelated abstract algorithms, using a particular programming language, to produce a concrete computer program.</td>
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<tr>
<td>2. New products make their firms acquire new distribution technology.</td>
<td>2. New products made their firms acquire new distribution technology.</td>
<td>L.Co had to go through a learning process to be able to use Internet for distribution of Lynx.</td>
<td>Being a digital product, software is suitable for distribution through high technology, unconventional distribution channels such as Internet through which a product can be distributed directly by the firm instantly and globally without carrying any inventory cost or obsolescence risk.</td>
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<tr>
<td><strong>3. New products lead their firms into new markets.</strong></td>
<td><strong>3(a). New products required their firms to sell to new customers.</strong></td>
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<td>Symantec had also to sell Q&amp;A to new customers who had not used any of Symantec’s products; needs and preferences of these new customers came as a surprise to Symantec.</td>
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<td></td>
<td>New customers are such customers to whom the firm has not sold before; none of the needs or preferences of such customers are known to the firm.</td>
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<tr>
<td><strong>3(b). New products made their firms to fulfill new, unfamiliar needs of existing customers.</strong></td>
<td>When I.Co began adding more features to IarP in later versions, the firm had to meet new needs of even the existing customers.</td>
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<td>New, unfamiliar needs of existing customers means such needs which the firm has not addressed before with its own product but the profile of customer is known to the firm.</td>
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<td><strong>3(c). New products compelled their firms to face new competitors.</strong></td>
<td>With Q&amp;A Symantec found itself competing against firms like Microsoft and Claris; these were new competitors Symantec had not faced them before and ultimately found them too strong competitors.</td>
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<td></td>
<td>New competitor is one which the software product firm has not faced before in that or any other product category. Such competitors pose challenge because their strategies are unknown to the firm.</td>
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<td><strong>4. New products necessitate their firms to increase and/or update development resources.</strong></td>
<td><strong>4(a). New products necessitated their firms to increase and/or update design resources.</strong></td>
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<td></td>
<td>QVIQ had to use new design for the first GUI-based version of Swelog; its existing design capability seemed insufficient and the firm had to outsource the function.</td>
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<td></td>
<td>Design resources of a firm include technical personnel—their skills, competence and experience, and hardware- and software-infrastructure for carrying out design function.</td>
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<tr>
<td><strong>4(b). New products necessitated their firms to increase and/or update programming resources.</strong></td>
<td>I.Co had to enhance its programming resources for later versions of IarP as complexity and sheer code-size of the product demanded more resources. The firm had to open an offshore development center in Asia.</td>
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<td></td>
<td>Programming resources of a firm include technical personnel—their skills, competence and experience, and hardware- and software-infrastructure for carrying out programming function.</td>
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<tr>
<td>5. New products require their firms to access complementary technological resources.</td>
<td>5. New products required their firms to access complementary technological resources.</td>
<td>L.Co used Linux volunteers extensively to test preliminary versions of Lynx, to report bugs and to write driver routines(^2) for peripherals.</td>
<td>Many software products meet on their own only a part of customer’s need and need to be compatible with a host of hardware and software and/or form a link in the chain of products needed to meet customers’ needs in totality. Through complementary technological resources firms enhance the product itself and/or ensure that with other firms’ products customer’s problem solving ability of the product is enhanced.</td>
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<tr>
<td>6. New products require their firms to increase and/or update marketing resources.</td>
<td>6(a). New products required their firms to increase and/or update the sales force.</td>
<td>L.Co had to hire new, professional and fulltime sales people to sell Lynx; earlier the firm had their project managers sell software services side which they carried out side by side of their main function of project management.</td>
<td>New sales people hired for the purpose of selling the new product.</td>
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<td></td>
<td>6(b). New products required their firms to increase and/or update their distribution channel(s).</td>
<td>L.Co increased and updated its distribution channel frequently by distributing Lynx through book shops, computer stores, and kiosks and later on through local computer systems re-sellers.</td>
<td>Distribution channels include commonly used for mass market software products such as computer stores, book stores and computer systems re-sellers and for corporate software products such as consulting firms and large computer systems suppliers.</td>
<td>5</td>
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</table>

\(^2\) A piece of software that enables an OS on a computer to communicate with a peripheral device (e.g. a printer).
<table>
<thead>
<tr>
<th></th>
<th>6(c). New products required their firms to increase and/or update their customer support.</th>
<th>Commerce One had to continually increase its customer support personnel and infrastructure to provide needed support to customers of COB’s and its later versions.</th>
<th>Technical personnel and hardware and software infrastructure need to provide technical support to customers of new products.</th>
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<tbody>
<tr>
<td></td>
<td>6(d). New products required their firms to increase and/or update their sales and marketing partners.</td>
<td>I.Co had entered into new partnerships regularly to sell and market new versions of IarP, particularly in new, distant markets. In some cases, the firm invested in the firm to bolster the partnership.</td>
<td>Sales and marketing partners are firms who bundle new products in their offerings or sell on behalf of the software product firm.</td>
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<td>6</td>
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</table>
Table 4.2: Relevant Elements of Benefits at a glance

<table>
<thead>
<tr>
<th>Elements</th>
<th>Themes</th>
<th>An example (from the case database)</th>
<th>Definition/Notes</th>
<th>Found in number of cases</th>
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</thead>
<tbody>
<tr>
<td>1. New products generate sales revenue.</td>
<td>1. New products generated or were expected to generate sales revenue.</td>
<td>Dataman sold 1,000 units of Vitrak in the first year which generated sales revenue for the firm.</td>
<td>Sales revenue denotes income for the firm from the sales of units or licenses of new products.</td>
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<tr>
<td>2. New products gain market share.</td>
<td>2. New products gained or were expected to gain market share.</td>
<td>COB gained the market share Commerce One had expected from the product.</td>
<td>Market share refers to a product’s share of the total sales of all products within the product category in which the product competes and is determined by dividing a product’s sales volume by the total category sales volume.</td>
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</tr>
<tr>
<td>3. New products earn profit.</td>
<td>3. New products earned or were expected to earn profit.</td>
<td>When introduced Q&amp;A was earning profit for the firm Symantec but gradually sales volume of the product went down and it became unprofitable. Later Symantec sold off the Q&amp;A.</td>
<td>Here, profit stands for sales revenue minus costs of selling, marketing and providing customer support in a given period of time; cost of product development is not included in the calculation.</td>
<td>7</td>
</tr>
<tr>
<td>4. New products contribute towards overall profitability of product portfolio of their firms.</td>
<td>4(a). New products enhanced profitability of other product(s) of their firms.</td>
<td>Vitrak shares cost of selling and customer-servicing with the firm’s other products and contributes to profitability of those other products of Dataman.</td>
<td>A new product’s synergy with other offerings of the firm may cut the cost of product development and marketing and/or share the cost of customer servicing enhancing, in the process, profitability of other products.</td>
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<tr>
<td>4(b). New products met new needs of existing customers of their firms.</td>
<td>New versions of IarP have met new needs of existing customers as ERP products have grown greatly in scope with time.</td>
<td>Meeting new needs of existing customers is particularly advantageous for the software product because it locks in(^2) the customer; such a customer will find increasingly costly to move over to a competitor due to switching costs.</td>
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<td>4(c). New products enhanced loyalty of existing customers of their firms.</td>
<td>Lynx increased loyalty of L.Co’s software services customers as these customers preferred to have one firm take responsibility of OS as well as application written to run over the OS.</td>
<td>Here loyalty of a customer means the customer buying the same product repeatedly in the future and/or buying other products or services of the firm due to the satisfaction caused by the new product.</td>
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<tr>
<td>5. New products create additional market opportunity, over and above for themselves, for their firms.</td>
<td>5(a). New products attracted new customers and created a potential customer base for their firms’ other present or future offerings.</td>
<td>TermMate brought the first customers to Nescit and created a customer base which the firm is targeting for it’s another new product, TermWeb.</td>
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<td>5(b). New products established platforms for future new products of their firms.</td>
<td>TermMate not only created a customer base but also created a technological platform for the firm’s future new product, TermWeb.</td>
<td>Here, a platform means a technological and/or human resource infrastructure—developed during development, marketing and distribution of a new product—which the firm may use for future new products including addition of</td>
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\(^2\) Lock in is a situation in which a customer is dependent on a particular supplier for products and services and cannot shift to another supplier with incurring substantial switching costs.
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<tr>
<td>6. New products improve their firms’ image and provide monetary as well as non-monetary benefits.</td>
<td>6(a). New products or promise thereof assisted their firms in attracting venture capital.</td>
<td>For L.Co, Lynx made possible needed finance in the form of venture capital for further development and marketing of the product.</td>
<td>Here, venture capital means equity or equity-linked investments by investors who often act as a director or advisor in young, privately held firms that have long term growth potential. It is an important source of capital for such firms as they do not have access to capital markets and carry high risk of new product but has a promise of handsome return.</td>
</tr>
<tr>
<td>6(b). New products helped their firms in repositioning themselves in the industry.</td>
<td>Through Lynx, L.Co repositioned itself from a software services firm to a software product firm.</td>
<td>Repositioning of a firm from a low profitable niche to a more profitable niche such as from a software services firm to a software product firm.</td>
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<tr>
<td>6(c). New products helped their firms in attracting new partners.</td>
<td>Great promise of COB attracted many established firms to become partners of Commerce One, only a startup firm.</td>
<td>New partners include both technological as well as marketing firms which contribute to the firm in making the new product a greater success and generate benefits cherished by the firm.</td>
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</tbody>
</table>
The third column gives an example to illustrate the theme; the fourth one contains definition and notes to clarify what the theme stands for. Last and the fifth column mentions in how many cases the particular theme was found.

4.1.1 Case of COB

Walnut Creek, California based Commerce One (Founded in 1994 as Distrivision) provided software products which linked buying and supplying organizations into real-time trading communities. It pioneered SRM\textsuperscript{24} solutions that aimed to automate, integrate and optimize, for large organizations, the entire buying and selling on the Internet. Commerce One BuySite (COB) was the first software product of Commerce One. It was based on new, patented technology of the firm.

Commerce One, like many other business e-commerce firms in the second half of 1990s, anticipated the spread of wide-scale electronic networks. These e-commerce electronic networks \textit{aka} marketplaces were expected to be the preferred platform for firms to transact business over the Internet. The underlying assumption was that the use of such electronic networks would help companies save money in buying or selling materials with business partners.

Along with Ariba COB tried to create an industry segment on its own. It offered many features hitherto unknown to its customers; the customers, who had known only ERP products earlier. Later, Commerce One added more products and created a SRM suite designed to lower total supply costs and to increase purchasing agility by delivering visibility and control across the entire source-to-pay process. The SRM suite comprised of COB, which included Procurement and MarketSite, and Commerce One Source, which included Auctions.

COB’s function was to take care of “buying” while Commerce One Source handled “selling” through the electronic network. As purchased products and services constitute a significant expense for many organizations, COB’s aim was to reduce the cost of goods purchased, cut the procurement cost and improve the cash flow for its customers. It aimed to cover the entire range of customer’s purchase process: from simple catalogue items to complex, custom made goods. COB supported transactions with worldwide trading partners in multiple languages, currencies and tax schemes.

\textsuperscript{24} Supplier Relationship Management
Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

Commerce One was one of the pioneering firms which introduced electronic procurement solutions. Ten themes represent the product’s newness to the firm. COB was Commerce One’s first product. By default the firm had to sell to new customers. New products required their firms to sell to new customers. But prior to product introduction the firm had to develop the required design (New products made their firms acquire new design technology) and programming technology (New products made their firms acquire new programming technology). In fact the firm registered over 39 patents during this process. While the product used own, patented technology, it had to rely on open standards and Internet protocol technologies for product deployment at remote customers’ sites and data interchange over public network (Internet).

As it later turned out, Commerce One, like its competitors, had underestimated the complexity of diverse hardware and software used in the customers’ and their suppliers’ networks. The product design was not able to overcome those inconsistencies. COB grew along an evolving trajectory in the electronic procurement solutions industry. During the entire process of product development of various versions of COB, Commerce One did all design and development tasks in-house by hiring the required personnel and building infrastructure to meet the changing needs design (New products necessitated their firms to increase and/or update design resources) and programming (New products necessitated their firms to increase and/or update programming resources) of new version of the product. Since Commerce One was a much talked about firm, it could easily attract talented software programmers and project managers; some of the industry’s best.

Commerce One partnered with firms producing software applications which enhanced value of COB for its customers. As the electronic procurement solution was very new, there were not existing, third party products which a COB customer could buy and meet its electronic procurement needs. In order to make COB work for customers Commerce One had to work with other firms for developing complimentary products or modules of existing products so that customers may get end-to-end solution of their electronic procurement using COB as mainstay in the process. New products required their firms to access complementary
technological resources. Sagent Technology is an example. Sagent provided Web analytic applications. In case of COB, Sagent captured COB’s generated data, such as organization’s spending pattern for specific commodities, sales activity with each supplier, on-contract vs. off-contract spending, etc. across all purchasing patterns of customer’s e-commerce activities. Sagent then delivered those data to key buyers via the Web enabling them to make better business decisions for global e-commerce trading.

Commerce One gradually developed its marketing team. It started with a small sales-team for COB but the size of sales force grew rapidly. New products required their firms to increase and/or update the sales force. In order to gain the market share quickly and efficiently, Commerce One took partnership path in a big way. New products required their firms to increase and/or update their sales and marketing partners. The firm used partnering extensively also to market COB. It worked with ERP companies like SAP and management consultants like Anderson Consulting to take the product to potential buyers. Commerce One’s technology and strategic partners augmented its sell efforts for COB, as the product formed a part of offering-bundle promoted by the partners. For example, Commerce One had a joint sales relationship with SAP (SAP owned 20% of Commerce One as well). By working in partnership with such firms who had extensive distribution network, Commerce One solved distribution problem for COB in an ingenious way. New products required their firms to increase and/or update their distribution channel(s). With very rapid expansion in market size and widely scattered potential customers, it could have been a great challenge for the firm to set up a conventional distribution channel.

Commerce One developed in-house customer support to take care of COB and enhanced the support set up as the product went into further release. New products required their firms to increase and/or update their customer support.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

Launched in 1994, COB had become market leader (New products gained or were expected to gain market share) and the flagship product of Commerce One by 2000. COB’s sales kept on increasing until 2001 (New products generated or were expected to generate sales revenue) but then it started to plummet. The promise and appeal of COB was vital in Commerce One
attracting talented people with industry experience such as Mark Hoffman (ex CEO of Sybase), and securing venture funding from leading institutions like Andersen Consulting, Canaan Partners, Foundation Capital, Morgan Stanley Dean Witter and The Entrepreneur Growth Fund. New products or promise thereof assisted their firms in attracting venture capital. COB also attracted partners like HP, SAP and Sun Microsystems to Commerce One. New products helped their firms in attracting new partners.

Despite the 1990s hype and potential the “vision” of e-commerce marketplaces was taking more time to evolve than expected by firms like Commerce One. Getting different firms’ computing systems to communicate and to exchange data proved ultimately to be a difficult challenge to meet. Many business-to-business marketplace firms such as Ventro and PurchasePro simply could not survive long enough and folded up.

Commerce One also gradually found itself in financial problem. Its revenue dipped from USD 409 Million in 2001 to USD 106 Million in 2002. In one year, in 2002, its head count reduced from 1 100 to 300 employees. In the same year Commerce One had to sell Online Marketplace, one of its products. Drying profit from COB (New products earned or were expected to earn profit) compelled Commerce One to overhaul its product line in March 2003. The firm decided to concentrate on Web services (a general term meaning programming techniques and protocols based on XML). It introduced Conductor, a business software product, aimed to help firms automate business e-commerce operations. Conductor was based on Web services technology, a marked departure from earlier focus on electronic procurement applications.

At this stage, Commerce One targeted the old customers of COB with Conductor. New products attracted new customers and created a potential customer base for their firms’ other present or future offerings. However, Web services pitted Commerce One against software heavyweights like IBM and Microsoft. By November 2004, Commerce One saw its experimentation coming to naught as it ran out of cash and key employees. In early December 2004, 39 patents held by bankrupt Commerce One were under the auction hammer. On December 13, 2004 a privately held company acquired Commerce One along with all its operating assets and products including COB.

25 Extensible Markup Language
Commerce One had identified the practice of indirect goods and services (those used by companies internally rather than for processing into goods and services) being procured locally, strangely, commonplace even in the large, global firms. Commerce One wanted to bring cost efficiency in such transactions for its customers through COB by making even local procurements taking place globally. British Telecom (BT) started to use COB in 1999 and saw the average cost of a purchasing transaction falling from £ 70 (USD 113) to £ 50 (USD 80) already during initial period of trial. BT had expected the cost to fall further in the future. BT’s experience with electronic procurement has been positive confirming COB’s positioning but due to uncertainty shrouding the Commerce One, BT shifted to Oracle’s similar solution in 2002. One of Commerce One’s major competitors, Ariba, pulled out from the general business to business exchange in 2001 and concentrated on procurement segment. It has been doing reasonably well against big ERP software players like SAP.

4.1.2 Case of IarP
I.Co makes IarP, a module-based ERP product for medium and large enterprises. The firm was set up in 1983 in Sweden. During initial years, it built competence in relational database technology using Oracle’s development tools. It started with software services assignment related to preventive maintenance in nuclear power industry. In 1986 it introduced IarP, its first software product which catered specifically to the maintenance function. By 1990 IarP had grown into a full-fledged ERP product incorporating solutions for all common business functions. Soon afterwards I.Co began expanding its market overseas. Over the period it consolidated its position in Scandinavia, USA and Asia by partnering and investing in local firms. It made crucial acquisitions to consolidate its position in important business sectors and countries.

Current version of IarP is based on Web and portal technology. It offers more than 60 enterprise application modules used in manufacturing, supply chain management (SCM), customer relationship management (CRM), financials, engineering, maintenance and human resource administration. Evidently, IarP provides comprehensive solution to enterprise by covering business functions relating to customers, suppliers and partners.

IarP was introduced initially as a DOS-based software product. 1993 version of the product had a graphical user interface (GUI), and 1997 version was based on object oriented
software technology. In 1999 I.Co launched a new version of IarP as a module based business applications system. After first recasting as an object oriented product, this module based configuration was its third major change in software design. IarP for NT, UNIX and Linux OS were also introduced by 1999. Minor versions have been introduced intermittently in 1998, 2000 and 2001.

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

There are eleven themes identifying IarP’s newness for I.Co. The firm had the requisite technological familiarity for the development of initial versions of IarP as it was carrying out software services in the same area. However, when the new technologies became standard of the industry, I.Co had to go for new ones which were not the firm’s forte. New versions of the product required unfamiliar design (New products made their firms acquire new design technology) and programming (New products made their firms acquire new programming technology). Its overseas product development centre in Asia was the result of such an effort. I.Co has been able to develop recent versions of IarP with familiar technologies with its overseas development center sharing a major load of writing and testing program codes.

First version of IarP was aimed at a known market as the firm had some exposure of the maintenance function of the nuclear power industry. But that familiarity was not going to last long as soon as IarP was enlarged in scope and targeted at a market beyond nuclear power industry. In any case, for an ERP product, I.Co had limited exposure. The firm had to target new customers with a feature-rich IarP (New products required their firms to sell to new customers) and had to serve new needs of old customers (New (version of) products make their firms to fulfill new, unfamiliar needs of existing customers). The firm entered continually into new geographical areas and into new industries with subsequent versions of IarP, which brought it to face to face with new competitors. New products compelled their firms to face new competitors. Now, the expansion of the product into numerous modules has assumed such a proportion that IarP seems like a product category rather than a product.

The firm had in-house resources for design and development for first few versions but soon those resources proved insufficient as new technologies became industry standard and the product’s scope widened. Existing design (New products necessitated their firms to
increase and/or update design resources) and development resources (New products necessitated their firms to increase and/or update programming resources) needed to be revamped and enhanced. Even though it wanted to hire needed technical personnel but they were not available locally in the home country. Feeling the pressure to modernize the product and expedite the development process, I.Co decided to open a development center far away in Asia, where it could hire needed people more easily. Savings on costs was not the prime aim for the firm to take that unusual decision, particularly when it was unusual for a Scandinavian firm to have a development center in Asia. Now that center supplements I.Co’s technological development resources seamlessly.

IarP was introduced first to meet the needs of a niche market in which I.Co was known. But with addition of new features, the product’s target market got enhanced in scope. Now the firm needed a different kind of sales and marketing expertise and more resources, which the firm did not have at that time. It had to expand its sales force to meet increased selling needs (New versions of products require their firms to increase the sales force) and add new distribution channels to make IarP accessible to new potential customers (New versions of products require their firms to increase their distribution channels). The firm had to enlarge its technical support resources to provide quick response to its customers. New products required their firms to increase and/or update their customer support. The firm built on its experience and increasingly partnered with new firms to complement its marketing resources in distant markets it entered during recent years. Now supplemented with a network of partners, I.Co is able to fulfill efficiently its sales and marketing needs for IarP. New products required their firms to increase and/or update their sales and marketing partners.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

I.Co admits many benefits IarP has brought to the firm. Seven themes symbolize these benefits. It has made the firm one of the major, global ERP players (New products gained or were expected to gain market share) and has sustained the growth of the firm now for more than eighteen years. Product’s sales (New products generated or were expected to generate sales revenue) and profit (New products earned or were expected to earn profit) has risen
almost continually barring few intermittent lean phases. IarP has built the firm’s image over
the period of time. The firm is now known in major parts of the world.

I.Co acknowledges the lessons the firm learnt during the long evolution of current
version of IarP. Addition of new functions in subsequent versions of IarP permitted I.Co to
sell to their existing customers who opted to update (New products enhanced loyalty of
existing customers of their firms) their older products with new versatile version. New
products met new needs of existing customers of their firms.

IarP has gradually become a product platform (New products established platforms for
future new products of their firms); modular form of this product makes it possible for the
firm to sell basic modules to new customers allowing the option (to the customer) of adding
more modules in the future. New products attracted new customers and created a potential
customer base for their firms’ other present or future offerings.

Recent trend of consolidation in ERP industry has made many customers wary. As an
ERP product is a huge investment (in terms of money and time taken for product deployment
and training on the part of customer), I.Co, like other similar firms, is facing a situation where
the firm finds potential customers being hesitant in making a buy decision based only on the
product quality. An example of Naivison has been frequently cited by prospective customers
I.Co is negotiating currently, where a Danish ERP firm (which developed and marketed
Naivison) has been taken over by Microsoft. Although Naivision is providing technical
support to its old customers and is even continuing with product development on new version,
customers are wary if they can obtain quality support in the future as well. I.Co believes this
mindset of potential customers is temporarily affecting IarP’s sales benefits.

4.1.3 Case of Lynx

Lynx (not the real name), a Linux OS, was a product of L.Co\textsuperscript{26} which was established in
Finland in early 1990s. For its first few years the firm specialized in software related
consulting services. During that period, it was engaged in developing software and turn-key
systems for private and public corporations as well as for state agencies. In 1995 it entered

\textsuperscript{26} As requested product and firm related information of first two cases are deliberately being written somewhat
vaguely to maintain their anonymity.
into the open source\textsuperscript{27} OS segment of the software industry. From its previous software related consulting services it had developed programming expertise across Windows, Mac, Linux and different flavors of UNIX platforms, it chose to focus on developing GNU/Linux and other open source software products. The firm devoted most of its resources on developing and marketing Lynx but after few years of trial it decided to pursue other software related business. Presently it offers consulting services related to software product development and ICT\textsuperscript{28}-infrastructure (e.g., VPN solutions) and has two offices in Finland, and one each in Estonia and Russia. In 2001, when it was heavily focused on Lynx, it had sales and support office in Sweden and representatives in the US and Australia but none of these remain active any more.

Lynx was introduced into Finnish market in 1998. It was aimed both at home and office users. The product claimed to be more stable (less subject to crashing); an important feature compared to the other popular OS at that time. It also had more and better functions, more security features and enhanced usability. In Feb 2000 at CeBIT trade fair, the firm showcased its enhanced Linux OS in English for the global market. It bundled office suite, multimedia applications, games, utilities, and Internet software with the Lynx. By 2001 it had become most popular Linux distribution in Finland. It had a sizeable number of users in other Nordic countries as well. Despite having made a presence felt in the market, Lynx could not generate the revenue the firm had expected. In 2002 LCo decided to give it one more try and re-launched Lynx under a different name.

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

Thirteen themes emerged while considering product newness of Lynx towards its firm. LCo was familiar only to a small extent with the programming technology involved in developing (designing and programming) Lynx. The firm realized that its past experience of managing smaller size software projects was not adequate for the purpose of the design of Lynx. New products made their firms acquire new design technology. The firm had of a couple of years’

\textsuperscript{27} Open Source refers to software source code that can be freely examined, changed, distributed, sold and used on the condition that source code must be made available, either delivered with the executables, or provided when requested.

\textsuperscript{28} Information and Communication Technology
experience of providing technical support to another Linux distribution in Finland but that did not suffice for the design purpose of Lynx; it had to use new design technology. New products made their firms acquire new programming technology.

L.Co had been using Internet to communicate to and to provide access to program codes to Linux volunteer developers. These developers downloaded program codes from the firm’s servers via Internet (and eventually uploaded their own and/or modified) program codes. But distributing (selling) software programs to end users at home or office via Internet, the preferred medium by Linux users, was new for the firm. New products made their firms acquire new distribution technology. While the firm was equipped for product delivery but it had to acquire adequate Web infrastructure for facilitating secure financial transaction.

L.Co had served only to a niche market comprising of local firms and few governmental organizations selling them software related services. The firm had anticipated that Lynx held a lot of promise for L.Co’s old customers (New products made their firms to fulfill new, unfamiliar needs of existing customers) but actual number of such customers turned out to be much smaller. From the beginning Lynx was aimed at a new market comprising both of home users as well as office users. This was a new market for L.Co. Not only customers were new to the L.Co (New products required their firms to sell to new customers) but also competitors in the product’s market were new to the firm. Providing technical support in native language worked in the favour of the firm in the home country but overseas market proved weak turf for the firm against seasoned competitors, because these new competitors had more experience and exposure of the market. New products compelled their firms to face new competitors.

Interestingly L.Co found itself in markets which were not formally intended by the firm. As many open source software products Lynx was downloaded by users from the Internet and tested, reviewed and compared with other Linux distributions in far flung countries. The firm saw this as an unanticipated market opportunity. This sudden expansion of target market size required additional resources to be pursued successfully.

L.Co did not originally have sufficient resources and skills to develop Lynx. New product required additional technological resources. It faced difficulty in hiring competent software developers in the home country. Establishing a development center at Tallinn, Estonia not only solved the scarcity of skills the firm lacked for programming (New products
necessitated their firms to increase and/or update programming resources) and design New products necessitated their firms to increase and/or update design resources. It also proved to be a lot more economical. (Later L.Co also made Tallinn office share major load of customer support.) New team at Tallinn was initially led by the CEO, who later moved base to Tallinn. This office concentrated on Lynx’s design, installation program development and manual documentation.

For testing and bug fixing of trial versions of Lynx, and for driver routine writing for supported hardware and software, Linux volunteers helped L.Co. These volunteers brought complementary knowledge and skills that L.Co needed for quick and economical development of Lynx and its later versions. New products required their firms to access complementary technological resources. Some of these volunteers had advanced skills needed to write specific drivers; L.Co could have found it expensive to get all such driver routine writing in-house. However, coordinating volunteers’ activities to meet quality standard and schedule proved to be a challenge for the firm.

L.Co had to build a sales team almost from scratch. New products required their firms to increase and/or update the sales force. It used to sell its services locally through its personal network. Selling a software packaged product to a great number of customers was new to the firm. Distributing through Internet, it attracted many users who tested the product but there was not much paid-sales through this channel. The firm’s effort to reach retail customers through book shops and computer shops also met with limited success. It had no prior experience of managing such channels. New products required their firms to increase and/or update their distribution channel(s).

For Lynx, the firm quickly developed a good customer support (New products required their firms to increase and/or update their customer support) which was vital for an evolving product like Lynx. To serve distant customers L.Co had to partner with resellers and other local service providers. New products required their firms to increase and/or update their sales and marketing partners. These partners bundled Lynx with their own offerings and were better placed to serve their local markets. Such partnering was also new to the firm but vital for wider market reach of Lynx.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?
There are nine themes symbolizing Lynx’s benefits for its firm. With the launch of Lynx L.Co had aimed for a major market share of OS. New products gained or were expected to gain market share. Its first target market was home and office users in Finland but it had dreams of becoming a global major OS producer. It had projected exponential rise in sales of Lynx in the forthcoming years from the year of launch. New products generated or were expected to generate sales revenue. It wished, like many other open source software firms, to see the end of the monopoly of Microsoft in OS. Having developed Lynx which, as mentioned earlier, had a very promising sales projection, the firm secured venture funding from an American firm (New products assist their firms in attracting venture capital) to market the product and consolidate its position in the OS market. Without this external funding it would have been very difficult for the firm to embark on the marketing drive and build infrastructure to provide sales and customer support.

The firm was able to sell Lynx to some of its existing customers (New products met new needs of existing customers of their firms) but such opportunities remained limited to new systems designed and developed around Lynx. Though increased dependency on Linux based solutions added to customers’ loyalty towards the firm (New products enhanced loyalty of existing customers of their firms) but such customers were limited in number. Majority of Lynx customers were new to the firm. New products attracted new customers and created a potential customer base for their firms’ other present or future offerings. The firm created a revenue stream by selling value added technical support and other services to those Lynx customers.

However, those sales projections never materialized; even increased sales- and marketing-efforts showed limited effect on the sales revenue. Both on revenue and profit (New products earned or were expected to earn profit) criteria Lynx was a big disappointment for the firm. Free bundling of more application software, introduction of improved versions and more technical support—all these increased the expenses but failed to improve the sales or profit of Lynx. Gradually L.Co realized it was unable to cater to the retail customers and began concentrating on corporate customers to whom it can sell value added software services profitably.
However, the firm believed that although Lynx did not bring much money directly, it brought other benefits. The firm was able to bundle its new office suite product with Lynx (New products established platforms for future new products of their firms). This facilitated new users to sample its other product in addition to the OS. Lynx enhanced the reputation and legitimacy of the firm not only in Finland but also in other Nordic countries and, to a certain extent, in the rest of Europe. But it was only in Finland that the firm managed to leverage that reputation to generate additional revenue channels in the form of value added services (such as server solutions, remote server monitoring and maintenance services, data replication, high availability clustering and disaster recovery solutions).

L.Co is now regarded as a reliable software systems and solutions provider in Finland. New products helped their firms in repositioning themselves in the industry. The firm gives credit to Lynx for its new found identity. Having Lynx in its portfolio, it became easier for the firm to sell its other services profitably. L.Co could not achieve economy of scale as sales of Lynx never took off, but the firm achieved economy of scope to a certain extent. It sold value added services profitably. It concentrated on serving its existing and prospective customers in Finland by bringing more offerings at a lesser cost. The firm enhanced its head count in Tallinn, its main development center and opened a new office in St. Petersburg in Feb 2003.

Lynx also brought respectability to the firm in the eyes of Linux volunteer developers. Attracting good quality developers were critical for the firm to test and fix the bugs in Linux kernel as well as in Lynx. Obviously it helped L.Co in keeping the cost of product development low and release new versions in time. Lynx also made possible L.Co to get into partnerships with reputed firms. These new partners were valuable to the firm for selling Lynx and Lynx based solutions to large customers. New products helped their firms in attracting new partners. For example, on its own L.Co might have found it difficult to sell to prestigious and large customers which it managed through Compaq.

Despite peripheral but significant benefits of Lynx, L.Co was consuming fast the venture funding it has secured for the marketing and consolidating its position in the OS market. It could not let the attraction of direct revenue go and decided to re-introduce Lynx under a different name in 2002. The firm values its association with Linux so much that it has joined LBA (Linux Business Alliance)—an industry consortium which promotes members’ interests.
4.1.4 Case of Q&A

Q&A for Windows was a product of Symantec. Founded in 1982 and headquartered at Cupertino, California, Symantec is a global leader in information security. It provides information security related software products and services from large enterprises to individual users. It has more than 120 million users, offices in 35 countries, and a turnover of USD 1,870 million (in fiscal year 2004). It employs approximately six thousand people.

Symantec has an extensive portfolio comprising of products aimed at providing, among others, integrated security, firewall/VPN\(^{29}\), intrusion detection, virus protection and anti-spam solutions. Moreover it provides consulting, educational services and security services. Since 1990 Symantec has made a number of acquisitions, mainly of companies/divisions dealing in information security.

Before narrowing down to security niche, Symantec was active in diverse segments of software industry. Database management software was one of them. By 1993 Q&A for DOS was one of the highly successful products of Symantec. In the same year Symantec introduced Q&A for Windows, a database management cum word processor program, to cater to growing number of Windows OS users. At that time Q&A for DOS was in fourth version of release and was very popular. Q&A for Windows (hereafter called Q&A) came with a GUI and additional features. The product was visualized by the firm as an easy-to-use database management product, complete with familiar spreadsheet view that allowed easy access to data. It was developed using natural query language\(^{30}\) technology and not SQL (Structured Query Language), the technology which ultimately became to dominate database management products times to come. Q&A did not offer many new significant features which were not offered by competing products (e.g., Claris FileMaker and Microsoft Access).

Having a strong sales and distribution network and given the Q&A’s brand equity, Symantec did not realize the need to market Q&A proactively. Counting on reputation of the product (Q&A for DOS) Q&A was going to replace, Symantec expected it to do well in the market but Q&A turn out to be a huge disappointment for the firm. Gradually Symantec stopped supporting the product; hence Q&A does not run under Windows NT, 2000 or XP.

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\(^{29}\) Virtual Private Network  
\(^{30}\) Use of English like language to query the database.
Given the large number of users-base third party, independent software firms now provide paid support for Q&A.

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

Five themes become apparent for the newness of Q&A for Symantec. The firm’s attempt of porting Q&A for DOS to Windows platform did not work the way it had wished. The GUI and Windows technology was not the domain of Symantec. New products made their firms acquire new programming technology. It was first Window’s product and the firm used a new product development methodology. New products made their firms acquire new design technology. To the product development team this new methodology proved too bureaucratic for a meaningful product development.

Q&A was not an altogether new product category for the firm, as Symantec was familiar with old market of Q&A for DOS. It planned to sell Q&A both to old familiar customers who were migrating from DOS OS to Windows OS (New products made their firms to fulfill new, unfamiliar needs of existing customers) and to altogether new customers (New products required their firms to sell to new customers), because with wider adoption of personal computers the market was expanding rapidly. Having more than 30 products (among them some were market leaders) in its portfolio, Symantec felt secure in its knowledge about the market.

However, upon launch, Symantec found new competitors like Microsoft (Access) and Claris (FileMaker). New products compelled their firms to face new competitors. New competitors were using new technology for their products and were meeting the new needs of customers very differently than what Symantec was trying to do through Q&A. Symantec later built backward compatibility in later versions of Q&A to retain the old customers. With new changes the firm finally managed to meet to a certain extent new needs (of Windows based database management) of old customers. But, as it turned out to be, Symantec could not meet new customers’ needs. Users of Q&A for DOS probably had a compatibility need of legacy data but new users of database management program were not limited in their choice of such software solutions. Windows OS based application market was new to Symantec.
which the firm did not recognize seriously enough to develop and market Q&A in a way which could meet its expectations.

Symantec did not have requisite skills and expertise for product development. It was primarily a sales and distribution house with a limited successful track record of new product development. Despite the odds, all activities of product development were performed in-house. However, development methodology of Q&A changed thrice in its three years of development life.

Symantec used its existing resources to distribute Q&A and used all regular channels (e.g., computer stores, book shops, service providers) to distribute boxed software products. However, Symantec did not allocate any significant marketing and advertising budget for Q&A. The firm expected the product was expected to sell on its own. Sales people were not adequately compensated for promoting Q&A, although Symantec was an old hand in the sales and distribution field. Distributor’s sales force did not prove effective in pushing the product. Symantec did not partner to supplement its marketing effort. Marketing department of Symantec turned out to be not skilled enough for Windows market. On the customer support front, Symantec was self sufficient in terms of people, skills and resources.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

Symantec evaluation Q&A’s benefits for the firm becomes apparent along five themes. Symantec had expected revenue of five million USD per quarter for Q&A. New products generated or were expected to generate sales revenue. The product was targeted at new database users as well as existing users of Symantec’s Q&A for DOS. As popularity of DOS was on decline due to users adopting GUI rapidly, Symantec expected most of its Q&A for DOS users to upgrade to Q&A for Windows (New products met new needs of existing customers of their firms). The firm could achieve revenue target only during first few quarters; soon gap between anticipated and realized sales revenue started to widen. Gradually Symantec realized Q&A was not getting the kind of market response the firm had expected. Competitors like Claris Filemaker and Microsoft Access were eating into the market share of Symantec. The idea of Symantec was to retain the market share of entry level database
management market which Symantec had in the form of Q&A for DOS. New products gained or were expected to gain market share.

Symantec continually compared Q&A with its similar product’s revenue stream. Q&A did not live up to the firm’s expectations. To the dismay of Symantec, Q&A could not attract new customers which the firm strived sincerely. In the long run Q&A could not attract and convert even majority of old users of Q&A for DOS version. The product did not enhance sale of any other Symantec product or service either. It did not provide any competitive edge to Symantec in any other form.

Symantec adjudged finally Q&A to be a market failure (New products earned or were expected to earn profit) and stopped supporting it by early 2001. There are, however, independent distributors who sell and consultants who support Q&A. Its erstwhile competitors are still around—Microsoft Access latest release was in 2003 and FileMaker is currently in seventh release.

4.1.5 Case of Swelog

QVIQ Systems, maker of Swelog, is a Swedish firm located at Linköping. It was known earlier as SWELOG Systems Pvt. Ltd. and traces its origin to MiniMax Data. MiniMax, established in 1978, was an ERP firm focused on retail, manufacturing and energy production segments of ERP market. MiniMax was also active in electronic point-of-sale systems and software consulting. QVIQ is a splinter of MiniMax, headed by one of the founders of MiniMax. The last few years have been a financially difficult phase for QVIQ, leading to changes in its ownership structure more than once. In addition to the product Swelog, QVIQ also has software services.

Swelog, a modular ERP system, is targeted at small to medium size firms. It is marketed as a complete business system containing solutions to purchase, manufacturing, sale, personnel management and accounting functions of the customer-firm. Additional modules such as CRM (Customer Relationship Management), and SCM (Supply Chain Management) are optional. QVIQ claims that the system is developed and tested in cooperation with customers. Compared to competitive products, the product is found to be simple and intuitive to use by the customers.
Swelog has an installed base of approximately 100 customers; about 40 of them rely on QVIQ for technical support. Current marketing efforts of QVIQ are not yielding satisfactory results. Presently QVIQ supports Swelog to the existing customers on a pay basis; otherwise the product is not being further developed for any future release.

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

Along eight themes Swelog seems new to QVIQ. At the time of development of the first version of Swelog, the (parent) firm was familiar with the design and programming technology used in the product. Being a firm specializing in software services, developing a compact program was easily within the gamut of familiar technology. But for later versions of Swelog, the firm had to do unfamiliar programming. New products made their firms acquire new programming technology. Rapid change in software design technology adopted by competing products forced the firm to adopt new design technology for later versions of Swelog. New products made their firms acquire new design technology.

Founders of the firm had long prior experience of working in the industry before establishing the parent firm. Later they continued to work in close cooperation with customers for their software services. They brought ample understanding of customers’ needs when the introduced first version of Swelog but selling a software product turned out to be very different than selling software services, the old forte of the firm. The firm faced new competitors (New products compelled their firms to face new competitors), still the firm was able to create a niche for the product. With subsequent release of new versions of Swelog, the firm targeted new customers (New products required their firms to sell to new customers). The demand of customers to integrate increasingly more business functions into single software solution was met by the firm in subsequent versions of Swelog. This was an opportunity (to sell more) as well as a challenge—to meet new, unfamiliar needs—for the firm. New products made their firms to fulfill new, unfamiliar needs of existing customers.

The firm had in-house resources to design and develop Swelog initially but for later visions, the firm had to resort to different solutions at different times. First need of GUI and then to adopt Object Oriented Programming technology made the firm to outsource the design and development function to a firm in India.
The exercise of outsourcing was not smooth; the firm got initially a product developed that did not meet its customers’ expectations. Finally, few key personnel from the outsourced firms in India were hired to move and work in Sweden. Few of them still work for QVIQ providing support functions to Swelog. New products necessitated their firms to increase and/or update design resources. New products necessitated their firms to increase and/or update programming resources.

Personal selling has been the forte of the firm. Close contacts with the industry has been of great value to the firm. Most of the sales were made by the firm on this basis. Swelog commanded a good reputation among the customers leading to good word of mouth publicity and referrals. The firm did some advertising time to time but never spent a big amount.

The firm partnered with hardware firms with an aim to get turn-key projects built around Swelog. It has attempted to augment Swelog’s sales by working through sales and marketing partners. New Product requires new sales and marketing partners. Unfortunately for the firm, such attempts have borne little fruit. After splitting of parent firm into few splinters, QVIQ is left with Swelog but with lesser resources than the firm feels needed for proper marketing of the product.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

Five themes are evident which represent Swelog’s benefits for QVIQ. Swelog was adjudged by the firm initially as a success because the product had gained a reasonable market share of the targeted niche. New products gained or were expected to gain market share. However, later versions of Swelog faced market hurdles which reduced the profitability of the product. New products earned or were expected to earn profit. QVIQ believes the initial advantage created in the market could not be sustained. The product managed to create a happy situation for the firm—customers had accepted the product very well, some of them felt delighted by the ease and functionality of Swelog.

Although Swelog never became a high selling product, it sold reasonably well in the beginning. New products generated or were expected to generate sales revenue. At that time, the firm had other revenue sources (various software services) as well and did not serious
attempts to market it more aggressively. Most of the sales were made in Sweden, few in other Scandinavian countries and only a handful in the rest of Europe.

Swelog helped the firm image to improve over the period of time. Swelog enhanced loyalty of the firm’s software services customers. The firm sold Swelog to many of its existing software services customers when their need of ERP solution arose. New products met new needs of existing customers of their firms. The product further enhanced loyalty of its customers many of them were its old customer from the time of parent firm. New products enhanced loyalty of existing customers of their firms. Swelog could not lead to setting up of a full-fledged new product category but it kept product update and support revenue trickling in. Lately, QVIQ is exploring Indian ERP market to launch Swelog as it sees a potential market for the product there.

4.1.6 Case of TermMate
TermMate was a product of Nescit Systems, a Linköping, Sweden-based software firm. Nescit was established in 1999 by two young, computer science graduates at the Mjärdevi Science Park, Linköping. The firm had focused on products and services related to terminology management for large organizations. Nescit endeavors to provide effective, flexible, easy to handle and user-friendly terminology-solutions to its customers. TermMate was the first product of Nescit. Nescit is in the process of replacing TermMate by TermWeb, a product which enables organizations to share distributing terminology database via the Internet. Nescit also provides associated software services to customize and implement its products at customer’s sites.

First, Nescit partnered with Interverbum, one of Scandinavia's leading knowledge company for translation, interpretation, language training, localization of software and websites, and terminology handling. Subsequently in 2003 Nescit became a subsidiary of Interverbum. Until Nescit partnered with Interverbum, it sold primarily in Sweden, but now its products are sold globally using Interverbum’s wide business network. Interverbum has offices in Stockholm, Göteborg, Malmö, Linköping, Copenhagen and Chicago.

TermMate was a software product, which helped an organization, operating in multilingual environment, in managing their terminology. The product facilitated the organization into creating a customized dictionary by defining, categorizing and sorting its commonly used
terms across more than one language and share the dictionary across the whole organization. Trados and TermStar, among others, were similar kind of competing products.

Nescit believed TermMate was an easy to learn program, which had a simple, user friendly interface. Online help function further increased user-friendliness. The product was function rich and easily customizable by users. It could run as a standalone application on work station as well as in a server-client configuration. Since it was programmed using Java technology, it could run on diverse operating system such as Windows, Solaris, Mac OS, and Linux. It could also run in a mixed environment where more than one operating system was used in the network.

TermMate was not an altogether new product to the market but it brought more flexibility and introduced few new features into the terminology management software. Graphical interface was a lot more intuitive than competing products. It made possible for individual users to customize their own list of words. Such features were new in comparison to similar products offered by competing companies.

TermMate was developed using the latest programming technology but owing to the rapid change in programming language and tools in software field, Nescit has decided to replace TermMate with TermWeb (TermWeb uses programming technology more suited for Web based applications). While designing and developing the product, Nescit had an all technical team; no one at Nescit had a background in sales, marketing or customer support. It was one of the founders who had to do marketing and sales until Nescit started to collaborate with Interverbum.

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

TermMate’s newness for Nescit emerged along eight themes. Nescit had required technological familiarity for the design and development of TermMate, as the two founders had recently worked on a study project which led to the development of TermMate. As far as distribution technology was concerned, the firm had no such prior experience. New products made their firms acquire new distribution technology.

As a new firm with two fresh computer science graduates, the firm had no familiarity with market. Nescit had to sell and find customers for the first time. New products required
their firms to sell to new customers. In the process, the firm had to market the product amidst competing products. Nescit initially sold directly to the customers but had to access new distribution channels through its partner. The market familiarity gained by virtue of TermMate helped the firm later in the course for development and marketing of TermWeb, Nescit’s second product.

The two founders were able to develop the product in-house; all the development activities were carried out at first by only two of them. At a later stage, they were able to hire few programmers to expedite the development of the product. New products necessitate their firms to increase programming resources.

Nescit’s sales resources were minimal. Initially, one of the founders took selling responsibility and later hired some temporary extra help. New products require their firms to increase the sales force. The firm was short of resources and had to find partner to do the advertising and marketing. New products require their firms to increase update their sales and marketing partners. Nescit pointed out lack of money, time and know-how as reasons for resorting to partner.

To distribute the product, Nescit had to get hold of partners. New products require their firms to increase their distribution channels. Again lack of resources was the reason for Nescit to access distribution channels through its partner.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

Seven themes stand out for the TermMate’s benefits from the Nescit’s point of view. Both the founders of Nescit conceived the idea of developing terminology management software while doing their master’s thesis project at a large Swedish corporation. Even before formally completing their computer science courses, they founded the firm. As a start-up, Nescit aimed to create a reputation and credibility in the Swedish software market through its first product i.e. TermMate. The firm did not want to become a software consulting company as was the trend at the software science park in which it was located. It wanted to distinguish itself as a software product development company. Nescit had expected TermMate to make an overall impact in the market but also to get a market share (New products gained or were expected to
gain market share), meet its sales (New products generated or were expected to generate sales revenue) and profit target (New products earned or were expected to earn profit).

Unfortunately Nescit could not attract a lot many customers which the firm had expected (New products attracted new customers and created a potential customer base for their firms’ other present or future offerings), neither had it turned out initially to be financially successful. But Nescit treats it as a marketing success, because it provided a breakthrough, a toehold for the firm in the software products industry. TermMate was successful in creating awareness among prospective customers about the terminology management solution it contained and about the firm behind the product. TermMate helped Nescit build a favourable image. During the initial phase, when there were hardly any significant sales or marketing effort carried out by Nescit (or on its behalf), prospective customers made inquiries about TermMate. This was an encouraging sign for the firm.

Interest shown by potential customers in TermMate helped Nescit to convince Interverbum to become a partner to sell and distribute the TermMate. New products helped their firms in attracting new partners. Wide network of Interverbum made TermMate available to customers in the Scandinavian, American and UK market. Pre-sales activities carried out to prospective customers and feedback provided by early users helped Nescit improve TermMate significantly. Nescit values greatly the know-how gained in the process. They credit the enhanced quality of TermMate to that learning experience.

Taking into account the gaining popularity of Web-based applications, Nescit complemented TermMate with TermWeb, a product is proving more financially successful than TermMate. TermWeb provides similar terminology management solution albeit through World Wide Web. New products established platforms for future new products of their firms. Customers of TermMate have been loyal to Nescit; most of them have opted for TermWeb. TermMate customers have also referred the product to their companies in their network.

Nescit realizes the credibility and status TermMate brought to it. It credits financial success of TermWeb to TermMate’s contribution of providing recognition in the market place and enhancing firm’s knowledge base.
4.1.7 Case of Vitrak

Established in 1989 at Kanpur, India, Dataman has been involved primarily in software turnkey projects and process automation projects for clients in India. From time to time it has also provided onsite software programming services for the firms in the US and Europe. The firm has graduated only recently into the software products segment. It offers industry specific software solutions, such as Aatithya for hotels, Petrocare for gas-stations, Vastralaya for garment retailers, and Vitrak for FMCG distributors. All of Dataman’s products are developed keeping Indian firms’ needs into account and are marketed currently only in India.

Dataman’s Vitrak (meaning distributor in Sanskrit) is a software product aimed to provide inventory, sales and accounting solutions to FMCG distributors. Developed using Visual Basic and Microsoft Access software development tools, this is a compact program which, the firm believes, complements its other software products in supply chain management product portfolio.

Compared to competitors’ products Vitrak offers new features for its customers. The firm has designed the product keeping in mind the limited computer literacy of majority of targeted customers, who are self-employed, less educated traders carrying out family trading business. For users, the firm has emphasized ease of use and intuitive GUI as key features of the product. While data is entered by the user through GUI which is in English, invoice can be generated also in supported local Indian languages. Dataman believes this feature is very meaningful as many customers’ customers, mostly living in Indian countryside, are not proficient in English. Current pricing strategy adopted by the firm is aggressive in order to penetrate the market and gain a sizeable market share.

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

Four themes are identified for the newness of Vitrak for Dataman. In fact, the firm was well versed with the software technology used to design and develop Vitrak, because the firm had been using underlying technologies to carry out their software services for years. Moreover, it had developed other software products using those technologies. Since most other competing

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products were also low on technology, Dataman’s Vitrak was marketed as a modern product although it was designed and programmed with in-house, familiar software expertise.

However, the target market for Vitrak was partly new for the Dataman as it had not developed or sold any software product to distributors before. The firm faced new competitors, mostly local firms who peddled software package (earlier made to order for some client) to new buyers in the local (city- or state-level) market. New products compelled their firms to face new competitors. The product was marketed in geographical areas where Dataman already operated but it was targeted at a customer segment which was partially new to the firm (New products required their firms to sell to new customers), and partially known as some of the potential customers were already users of Dataman’s other products and services. New products met new needs of existing customers of their firms. For distribution of Vitrak Dataman used old channels it had been using for its other software products.

For design and programming of Vitrak, Dataman used the in-house resources (people and skills). The firm did not feel the need of partnering to complement its developmental resources for Vitrak. It used its existing sales force and distribution channel to sell and distribute Vitrak. The firm felt existing set up was sufficient enough for the purpose. Its advertising and promotional resources were also thought to be adequate by the firm. Dataman believed that its customer support was sufficient to serve the needs of Vitrak.

In hindsight, the firm concedes the importance of partnering in order to increase the sales of Vitrak. New products required their firms to increase and/or update their sales and marketing partners. Feedback from the customers has helped Dataman in enhancing the product by means of incorporating multilingual support in later versions of the product.

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

Seven themes are found identifying the benefits of Vitrak for Dataman. The firm expected to sell 50,000 units of Vitrak in the very first year and altogether 100,000 over a three to five years period. Although it has managed to sell only 1,000 units in the first year, it is optimistic about the future of the product. Vitrak has only covered the cost of development and whatever limited marketing the firm did for the product not surprising that Dataman do not treat it yet as a very successful product. Being historically a software services firm, Dataman appreciates
the revenue from 1,000 licenses of Vitrak (New products generated or were expected to generate sales revenue), a mass market product, but expects the product to be more profitable (New products earned or were expected to earn profit) than its services offerings. Dataman’s other mass market products are more profitable than Vitrak.

Vitrak has managed to achieve expected market share only in certain parts of the market. New products gained or were expected to gain market share. Dataman don’t perceive any significant image enhancement contributed by Vitrak to the firm’s image. Majority of Vitrak-buyers are new customers to Dataman, as the firm has not sold to them earlier. New products attracted new customers and created a potential customer base for their firms’ other present or future offerings. Dataman hopes to be able to sell its other products to these newly acquired customers.

The firm visualizes increased density of customers in certain geographical area as an opportunity to sell its other products and services more aggressively and that too at a lower cost. New products enhanced profitability of other product(s) of their firms. Vitrak complemented Dataman’s other products in supply chain management segment. Now Dataman offers complete supply chain solution to its customers. New products met new needs of existing customers of their firms. The firm feels confident that its customers are now more tied to the firm because it can meet more of their software related needs with in-house offerings. New products enhanced loyalty of existing customers of their firms.

4.2 Cross-Case Analysis
This section presents the general-level analysis of the empirical data. Now the focus shifts from the individual case to the individual theme, identified in the foregoing section. Under each theme pieces of evidence from relevant case(s) are analyzed simultaneously. Wherever relevant comments are made also about cases where evidence was not found. Emergent themes, drawn collectively form all the seven cases, are presented below in the context of the two main research questions. Some of the themes address individually a distinct aspect of newness or benefits, while some of the themes seem to belong together and address a distinct aspect of newness or benefits collectively. Such themes are presented as a series of themes belonging to a group and are serial numbered accordingly.
4.2.1 Emergence of Product newness to the Firm Themes

The first research question: “What are the relevant elements of newness of a new product to the firms that develop and market computer software products?” addresses the product newness to the firm in this study. In all thirteen themes emerged during within-case analysis of the seven-cases. Some of the themes were present in most of the cases while some only in few cases. Each theme is analyzed below drawing reference from the seven-case database.

Theme 1(a): New products made their firms acquire new design technology.

In five of these cases their firms needed to use unfamiliar design technology for their new (or new version of) products. L.Co had only some exposure of design technology that went into Lynx but it required design expertise of a much higher order.

For Lynx: “…we had never done (a mass market) product development before. I mean of such a magnitude and with so many features and options. We knew about developing custom applications which had limited options. For Lynx everything was very extensive, at a very different level we were used to…” (Respondent, L.Co)

Linux kernel was at the core of Lynx, like any other Linux-based OS. With the regular release of new, more stable, kernels for Linux OS, L.Co had to re-design Lynx to make use upgraded kernel. I.Co had to update IarP’s design technology to introduce new, contemporary versions of Lynx. As noted earlier, IarP has undergone three major changes in design technology. Commerce One had developed state of the art design technology for COB. A trade analyst was of the opinion that the design competency was so great that one of its partners “sucked” the technology and then abandoned the firm. Despite having such a cutting edge design technology, Commerce One had to undertake extensive research (resulting in many patents) for later versions of COB.

For Symantec, Q&A posed a challenge in the form of “…First Windows product, new development methodology, too bureaucratic… (Product Development Manager, Symantec). For later versions of Swelog QVIQ stumbled with the design technology. For an object oriented version of Swelog having GUI, the firm had to outsource design and programming work to an Indian firm. The firm found it difficult to attract competent software professionals at an affordable cost.
Nescit was familiar with the design technology used in TermMate. It is understandable because the two founders of Nescit had been working on a similar project as part of their master’s project at a local firm and TermMate, the product, was the outcome of that project. However, it may be noted that Nescit has to update design technology to TermWeb, the product which is in the process of replacing TermMate. The reason for design upgrade was felt due to change in underlying systems architecture necessary to make use of WWW technology and to suit server-work station configuration. Had Nescit decided to call TermWeb as next version of TermMate, this case also would have been a case of design technology update needed by the firm for the product’s new version. Dataman has used, for Vitrak, familiar design technology which it has earlier used for few software services projects.

Theme 1(b): New products made their firms acquire new programming technology.

In five of the seven cases new (or new version of) products required unfamiliar programming for the firm. L.Co had been active in software services segment—developing software programs as per order and maintaining legacy systems. Lynx was a Linux OS involving open source software programming. Being a Finnish firm it was familiar with the hype developing around the concept, which had originated in the country. Some of the key personnel had taken part in the process in their personal capacity. Moreover, Lynx was a Linux OS, which involves somewhat UNIX like programming, with which L.Co was familiar. This very limited familiarity with programming involved in Lynx did not serve the purpose. The firm had to hire new personnel having proficiency in Linux and UNIX.

For IarP, I.Co has needed new programming technology commensurate changing product design and evolving systems architecture used by customers. In case of COB, Commerce One was one of the pioneers in electronic procurement products category and had patented design technology to develop the product, but it had to acquire programming technology, time and again for new versions, to do the actual product development. Symantec was also not familiar with the programming technology used in Q&A.

For Q&A: “…unrealistic technology choices… the product had to be based on Symantec developed Croos platform bedrock class library technology, as it made the product too slow for current hardware...” (Product Development Manager, Symantec)
QVIQ was familiar with the programming technology at the initial phase of development, but it lacked the needed technology when GUI, and later, object oriented programming had to be incorporated in forthcoming versions of the product.

As mentioned earlier, Nescit’s two founders had worked on a course project where they became proficient with the programming technology they later used in development of TermMate. Dataman is an old hand in developing software programs for clients as per order. The programming technology used in Vitrak is quite familiar to the firm.

Theme 2. New products made their firms acquire new distribution technology.

This theme was found in only two cases but in both cases it proved to be vital for their firms. L.Co distributed Lynx through a combination of distribution channels—computer retail stores, book stores, kiosks, and Internet. The technology involved in making Internet work as a distribution channel turned out to be a challenging task for the firm. It also distributed free samples packaged with computer magazines. For L.Co, product distribution was new. It had sold software services on a personal selling basis and had used Internet only for exchanging program codes with volunteer Linux developers.

For Lynx: “…Internet was preferred medium for sharing software codes and communicating among geeks. But normal users were not in the loop. We distributed Lynx through Internet (among other channels)… it was difficult to work with that…” (Respondent, L.Co).

Reach of Internet was appealing but L.Co had yet to master how to use Internet as a medium for selling Lynx. The firm developed a software program for the purpose but it did not work smoothly for a while. It turned out to be cumbersome and not very intuitive for many users for placing and tracking their order. In due course of time, the firm managed to have a functioning Internet distribution system complete with software and associated physical distribution logistics in place.

Nescit was a startup firm with no prior distribution experience. The firm realized Internet can be an efficient medium to reach potential customers who can sample the product with minimum fuss. It used Internet as a distribution channel which permitted interested firms to do a preliminary evaluation of TermMate without ordering and installing the product on
their own systems. Although Nescit did not sell TermMate through Internet but it made possible for potential customers to access limited version of the product. For this limited purpose Nescit managed to learn the technology involved in distribution with little problem.

Theme 3(a): New products required their firms to sell to new customers.

In all of the seven cases firms had to sell their new products solely or partly to customers who were new to their firm. For the start-up firms, they had to sell, by default, to new customers. For the firms graduating from software services category into product-maker category or for the firms already into product-maker category, majority of their target customers were new to their firms.

L.Co had mainly targeted home and office users with Lynx. These customers were very different in profile and number than the medium and large organizations the firm had had as customers.

For Lynx: “…our existing customer base was small, though consisting of big customers, but we have never sold to individual users before…” (Respondent, L.Co).

New customers turned out to be tricky for the firm. Majority of new customers got the product free of cost—either downloaded from Internet or as a sample packaged with a computer magazine. The firm struggled to generate any revenue stream from these freeloaders. As the firm found out at a later stage,

For Lynx: “…Individual users were not willing to pay for the open source software, but they wanted a lot of free support…” (Respondent, L.Co).

Not understanding the new customer’s needs and preferences proved dear to the firm. It not only had revenue-less sales but also had to provide free of cost technical support. Gradually, the firm changed the marketing focus onto large corporate customers.

IarP brought first customers, from a niche market, to I.Co. As noted earlier the firm had prior experience of serving the customers in nuclear power industry and first version of IarP was aimed at this known customer segment. Later versions of IarP were far more developed and contained solutions for more business functions and were suited to customers
in additional industries. I.Co had to target continually new customers for new versions of IarP. Following the trend in the ERP industry, the firm had begun to customize industry specific versions of IarP.

COB and TermMate were the first products of Commerce One and Nescit respectively. These firms had no customer base before introducing these products; naturally they had to sell to new customers. While Nescit quickly moved on to replacement product of TermMate, Commerce One continued to target new customers with new and improved versions of COB. It is worth mentioning that Commerce One regularly made use of new partners who were familiar with the new customer segments.

Swelog off and on tried to sell Swelog to new customer segments (though with little success). It also developed product modules keeping specific needs of different customer groups in mind but could not make significant inroad in the market (It has currently little over one hundred installations). Dataman had planned Vitrak to be the missing link in its supply chain solution product portfolio which had already two other software products. Interestingly two thirds of approximately 1 000 users of Vitrak are new to the firm.

Theme 3(b): New products made their firms to fulfill new, unfamiliar needs of existing customers.

Four of the new products required their firms to serve new needs of existing customers of their firms. Although majority of Lynx customers were new to the firm some of the Lynx customers were L.Co’s old customers. The firm had known their various programming needs (depending upon software services they had bought from L.Co) but had to understand OS related needs which varied greatly from customer to customer. While it was comparatively easy for L.Co to profile individual home and office customers, the same was not true for old organizational customers as each one of them were very different from each other.

I.Co with IarP and QVIQ with Swelog also had to serve new needs of old customers. Customers have come to expect more from each new version of their ERP products. Naturally more business functions have been continually added to the ERP products covering new needs of customers. As an ERP deployment is a major decision for any customer firm, they naturally like to upgrade to the new version of same product making firms like IarP and QVIQ to serve new needs of their existing customers. I.Co has been more successful in this;
while QVIQ has had little success. Dataman has fulfilled new needs of their old customers through Vitrak. Approximately one third of Vitrak customers were already Dataman’s customer.

Theme 3(c): New products compelled their firms to face new competitors.

In all seven cases new products brought new customers to the firms. Startup firms faced competition for the first time but all other firms had to face a new competition which is evident in all such five cases, namely L.Co, I.Co, Symantec, QVIQ and Vitrak. Software is said to be a global industry, it turned out to be very true in the case of Lynx. It caused L.Co to face new competitors far and wide:

For Lynx: “…Before we were a service company, competing locally. With Lynx we started to compete nationally and even globally. At once people were downloading Lynx at faraway places like Germany and Switzerland. People were comparing us with Linux distro made all over the world. Yes, we were competing at once with big guys (RedHat, Suse, etc.)…” (Respondent, L.Co).

As it turned out, competing against established competitors was not easy for L.Co. ERP firms like I.Co are also finding themselves pitted against global competitors. In the initial stage, IarP was sold in local national market where there were only few competitors. All these firms had their products developed to suit national needs and regulations. Gradually consulting revenue associated with ERP products have grown considerably with a result of that large ERP players like Oracle and SAP now eye markets which used to be dominated by local firms like I.Co. On the other hand I.Co has also entered new markets abroad and has encountered new competitors32.

For Q&A Symantec had to face new competitors like Microsoft (Access) and Claris (FileMaker) which it found too hot to handle. Both the competitors were more up to date with the product technology and marketed their products more aggressively than Symantec. Vitrak has taken Dataman to a niche market where competitors are small, local firms. Dataman has no serious concern about the new competitors it has not faced before.

32 Changing nature of competition in ERP market has led to the consolidation in the industry.
Theme 4(a): New products necessitated their firms to increase and/or update design resources.

In five cases it was evident that for new (or new version of) products their firm’s had to enhance or upgrade their design resources. For Lynx, L.Co’s motive behind opening the Estonia office was, among others, to supplement firm’s design capability. Although the firm had basic experience of design involved in software program but it had to reinforce those programming resources which it did by opening Estonia office. It further upgraded and enhanced its design resources when Lynx’s later versions were being developed. Lynx got some excellent reviews by Linux users and analysts reflecting the design proficiency L.Co managed to achieve within a short span of time.

I.Co had to increase and update its design resources to make the transformation of IarP as a niche ERP product to a multi-module ERP product. While design function is still housed at the firm’s head quarter, programming function is largely carried out at its Asian development center. Commerce One kept on hiring regularly new technical personnel, who had needed expertise, to supplement research work it was doing for design of COB. Given the pioneering nature of product, the design requirement for the same unfolded over a period of time and the firm increased its design resources for later versions of COB until ominous sign of electronic procurement industry heading towards bad times began to emerge.

The major reason of Q&A’s failure in meeting customers’ expectations was Symantec’s inability to design the product right. The firm came to realize, albeit too late, that product needed to be designed keeping the latest technological developments; whereas the firm kept clinging to the design technology it had used in the legacy product Q&A was expected to replace. QVIQ’s compulsion of outsourcing Swelog’s development emanated from the firm’s shortage of design skills. The firm had to outsource the development (design and programming) work of Swelog to an Indian firm. After some teething problems of outsourcing, QVIQ managed to get the product’s design working.

Theme 4(b): New products necessitated their firms to increase and/or update programming resources.

In five cases new product, or new version, of the product required new or additional programming resources which the firm had to acquire. L.Co had to hire new programmers for the development of initial version of Lynx; later it added more to its programming team for
new versions of the product. Finding availability and cost on the unattractive side in the home country, the firm opened a development center in Estonia. The new office was manned with programmers who had skills for developing (and supporting) the product. Further, the firm made use of Linux and other open source volunteers to supplement its programming resources as these professional programmers tested the trial versions of the product and reported the bugs. Some of them helped even in writing routines and drivers.

I.Co also found shortage of appropriate programmers in its home country for developing later versions of IarP. This constraint led the firm to open a development office in an Asian country. With the rapid growth happening in IT-industry during early years of 1990s there were not enough programmers available for I.Co to hire; even though I.Co was conveniently located at a Science Park, adjacent to one of the leading technical university of Sweden which produces computer science engineers.

Commerce One kept on assembling requisite programming resources and skills for COB. It hired new skilled programmers as the need was felt time to time by the firm for new versions of the product. Being a frontline firm of the time in the electronic procurement industry and having enough financial resources, Commerce One had no problem in attracting right kind of manpower at the Silicon Valley.

For COB: “…Commerce One kept on hiring all along. Hiring skilled people was a constant process…” (Business Development Manager, Commerce One).

Symantec, being a large software firm, had adequate resources for the development of Q&A. Its choice of programming technology, however, later turned out to be questionable. “…Unrealistic technology choices dictated by CEO…” (Product Development Manager, Symantec). In retrospect, the firm realizes that it better had used programming more compatible with Windows OS on which Q&A was to run.

QVIQ developed initial versions of Swelog in house but later faced the road block. As pointed out earlier, it had to outsource the development (design and programming) to an Indian firm. The product developed initially by the Indian firm turned out to be a poor one for the Swedish market. QVIQ believes communication between QVIQ and the Indian firm was to blame. Later, QVIQ hired key programmers from the Indian firm who had worked on the
Swelog project and flew them to Sweden. Some of them are still with QVIQ, providing technical support to Swelog customers.

Nescit hired few programmers on project basis to supplement its development effort. Dataman had developed Vitrak with available programming resources.

Theme 5: New products required their firms to access complementary technological resources.

This theme was identified in Lynx’s and COB’s cases. L.Co needed to develop Lynx and its later versions quickly so as to be able to release the products in time. All Linux OS products had to wait for the release of latest version Linux kernel to be able to incorporate that in their product. After the kernel release, L.Co had to incorporate the kernel, and test and fix the bugs in Lynx as quickly as possible. Volunteers helped the firm in expediting this process. Moreover, volunteers assisted by writing or sharing driver routines needed for making various hardware and software compatible with Lynx. The firm, like many other Linux OS firms, could not have been able to release their products in time if they had decided to test and fix all bugs themselves. Sheer diversity in skills needed to write all driver routines in-house makes it a highly expensive proposition.

In COB’s case, the product alone was not able the serve the customers’ purpose of meeting their electronic procurement needs. The firm was one of the pioneers of this industry. Product like COB needed to be supported by complementary products so that customer can carry out the complete operation of procurement. Commerce One made available such complimentary products for COB’s customers by sharing its patented technology and developing new products or modules in collaboration with other technology leaders. By accessing these development resources through partnering Commerce One made end-to-end electronic procurement solution feasible and viable for COB’s customers in a reasonable time period without incurring too high costs or taking too much risk.

There is some difference in role complementary technological resources played in case of Lynx and COB. While these complementary resources contributed largely in product development of Lynx itself, they enhanced COB’s scope of use—in both cases firms had to rely on exterior technological resources to make their products solve customers’ needs where their product alone might not have sufficed for the purpose.
Theme 6(a): New products required their firms to increase and/or update the sales force.

This theme got support in four cases. These firms either had to hire additional sales people or had to restructure the sales team and hire new, suitable sales people for selling the new (or new version) of the products. In L.Co, Project managers used to do the majority of selling for its software services before Lynx was introduced. CEO used to pitch in the selling process, if and when required. But Lynx required full time sales personnel which L.Co had to hire. First a few new hires did not deliver desired sales results when firm targeted markets far and wide (from Australia to India to the US). The firm kept restructuring its sales team but could not develop one which could serve the purpose it had envisioned for Lynx. Lynx sales team is disbanded now: the firm is now again concentrating on selling software services.

I.Co has built a strong sales team over the period of time. With the growth of the product (IarP) firm has kept increasing the sales team. In addition to its own sales team, the firm relies heavily on ERP consulting firms that use IarP in their solutions. In this way, a sizeable outside sales team also contributes towards the sales of IarP, particularly in new markets where I.Co has entered lately.

Commerce One had assembled an impressive sales team to sell COB globally. Being a pioneer product Commerce One had to continually hire sales people who were abreast with latest technological developments in electronic procurement industry. The firm kept updating its sales team to meet the requirements of new versions of COB.

Nescit founders, two young computer science graduates, tried personally to sell TermMate. Most of the initial sales pitch was made by one of the two directors; other director used to join him when the firm needed to show a bigger team to the potential buyer or to discuss complicated technical matter. However, this style of salesmanship did not help Nescit achieve desired results. Financial resources did not allow hiring of full time sales personnel. The firm ultimately resorted to partnering with Interverbum to sell and distribute the product.

Symantec used their existing sales team to sell Q&A. As the firm relied heavily for Q&A’s sales on its past reputation in beginners’ database management product market, it did not compensated salesmen adequately. These salesmen preferred concentrating on selling products which carried bonuses, since Q&A did not carry any such bonus. Limited overall marketing support did not help Q&A either.
Dataman uses the firm’s existing sales team for selling Vitrak. In fact, the firm believes now it is utilizing its sales team (hired prior to Vitrak’s introduction) more efficiently adding overall profitability to the firm. Despite a large shortfall in the projected sales of Vitrak in the first year, the firm has no immediate plan to increase the sales team size. The firm seems to have a very cautious approach; it does not want to add to the sales-related expenses before it is convinced that additional selling effort will lead to proportional increase in Vitrak’s sales. Dataman’s Managing Director believes “…it (the firm) wants to test the water…” before getting aggressive in selling.

Theme 6(b): New products required their firms to increase and/or update their distribution channel(s).

In five of the seven cases new (or new version of) products made the use of new or additional distribution channel necessary for the firm. L.Co distributed Lynx through multiple channels. L.Co began with distributing through conventional channels as computer software stores and book stores. As Linux had created a lot interest in media, retail stores agreed to carry the product. But these stores either lacked expertise and/or motivation to push a Linux OS like Lynx. For new versions, the firm attempted to distribute it through some very unconventional channels such as kiosks. The Respondent at the firm expressed, “…we struggled to get access to efficient distribution.” As noted earlier, mastering Internet as a distribution channel involved a technological learning process for the firm.

I.Co has also been distributing later versions of IarP through new channels. Working through ERP consulting partners has proved to be an efficient medium for the firm to distribute the product in remote markets where the product has yet to achieve a critical mass to justify setting up own distribution channel. Similarly Commerce One used partners’ distribution channel to distribute COB as the product had to be made available globally in a short period of time. Rapid introduction of new versions of COB gave little time to the firm to set up own distribution set up in ever increasing new markets.

QVIQ’s attempt to distribute Swelog through formal distribution channel has not yielded much result. The firm has lately been distributing Swelog on its own. Nescit realized the need of formal distribution channel soon after the introduction of TermMate. The firm chose to get access to meaningful distribution channels through strategic partnership with
Interverbum, its erstwhile investor. Symantec and Dataman did not feel the need to increase or update their distribution channels for Q&A and Vitrak respectively.

Theme 6(c): New products required their firms to increase and/or update their customer support.

This theme emerged in three of the studied cases. These firms realized the importance of extending appropriate customer support and decided to supplement or update their technical manpower and infrastructure. Lynx made necessary for L.Co to acquire additional resources for providing customer support. The firm had to add to its hardware and software infrastructure, and hire more technical staff. As the product was being used in several countries in Europe, L.Co had to hire support staff proficient in those languages.

For Lynx: “…we built gradually a support team which was unique for a Linux distro. We provided support in local language in many Nordic and Baltic countries…” (Respondent, L.Co)

I.Co has built up its customer support resources gradually with the growth of IarP. With each new version IarP has grown in scope and consequently has become technically complicated, like any other ERP product. An enlarged and technically complex product naturally calls for more technical support. I.Co has continually enhanced and updated its support function. Commerce One also kept pace with the development of COB and supplemented customer support resources to meet the expectations of customers. Unfortunately for COB, Commerce One’s customer support was able to solve COB related problems but the product faced serious problems in communicating across various diverse networks having inconsistent standards, which Commerce One’s customer support could not resolve. This limitation damaged COB’s prospect greatly.

QVIQ and Nescit had required customer support skills and manpower when Swelog and TermMate respectively were introduced. Nescit continues to provide customer support with similar resources and finds them sufficient. For Q&A, Symantec felt no need to expand on its existing technical support resources. Commerce One had disbanded the team as the firm came close to bankruptcy; QVIQ has curtailed its customer support team keeping in view that it has only about 40 Swelog customers who buy support. Dataman is also using existing customer support resources to support Vitrak.
Theme 6(d): New products required their firms to increase and/or update their sales and marketing partners.

This theme got support from in six cases—new (or new version of) products required new or additional partners for sales and marketing. All these firms came to realize that they could not do it without partners. In respect of technological resources most of these firms were reasonable endowed but when it came to marketing most felt the need to get hold of partners who had the resources to do it quickly and efficiently.

L.Co joined an industry alliance to create awareness and promote open-source products like Lynx. Later, the firm started working with other hardware and software partners to market the product and solutions built around the product. Symantec had an established partner network in place. Q&A got the benefit of partner-network in place but the firm did not make any new partner especially for this product.

For ERP firms partnering is commonplace as found in the cases of I.Co and QVIQ. Whereas I.Co has established an extensive partner network for IarP, QVIQ has had difficulty. The firm has not been able to garner resources on its own or form a partner network for proper marketing of Swelog.

Nescit had to go along Interverbum for sales and marketing of TermMate. As the product fits snugly in Interverbum’s product portfolio, TermMate is being actively marketed through Interverbum’s wide network. Dataman concedes the importance of partnering but has not formed any specifically for Vittrak. It is only the Dataman which promotes the product, Vittrak on its own— this may explain slow entry of Vittrak in the market. Commerce One used the partnering to its hilt. Leveraging the promise of the product and ensuing opportunities, the firm was able to assemble a global network of partners so that buyer can get the business transaction from end-to-end handled together by Commerce One and its partners.
### Table 4.3: Product’s Newness to the Firm Themes

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<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>3(a). New products required their firms to sell to new customers.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>3(b). New products made their firms to fulfill new, unfamiliar needs of existing customers.</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>5</td>
</tr>
<tr>
<td>3(c). New products compelled their firms to face new competitors.</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>5</td>
</tr>
<tr>
<td>4(a). New products necessitated their firms to increase and/or update design resources.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>4(b). New products necessitated their firms to increase and/or update programming resources.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>5. New products required their firms to access complementary technological resources.</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>6(a). New products require their firms to increase and/or update their sales force.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>6(b). New products required their firms to increase and/or update their distribution channel(s).</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>6(c). New products required their firms to increase and/or update their customer support.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>6(d). New products required their firms to increase and/or update their sales and marketing partners.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: C=COB; I=IarP; L=Lynx; Q=Q&A; S=Symantec; T=TermMate; V=Vitrak
4.2.2 Emergence of Benefits Themes

Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

Theme 1: New products generated or were expected to generate sales revenue.

It was not surprising to find a robust support for this theme. All of the studied seven products were introduced with an expectation to generate sales revenue. Even if the product failed to do so, such a wish was clearly perceptible. For example, the respondent for Lynx replied, almost with a sigh, “…it didn’t bring money….” Lynx, an open source software product, had been downloaded widely through the Internet by the users. That explained the great number of units in use but few (paid) sales. The actual paid units of Lynx constituted a fraction of total units of Lynx downloaded by users. Hence actual sales revenue was a miniscule of the anticipated one. It is evident from the Lynx case that sales benefit of a product could be so compelling that the firm would not let it go very easily. Despite the dismal sales benefits of Lynx, L.Co did not give up. It still wanted to capture the sales revenue benefits of the product and re-introduced it in 2002 under a new name.

IarP’s growth as a product from a niche ERP product to a product with over 60 modules explains its sales benefits. I.Co has built upon the benefits sales of IarP have brought to it over the period of time. In another case, COB—the first product of Commerce One—was the flagship product in 2001, when firm’s sales revenue was an all time high. Afterwards sales started to decline, the reason proffered by the respondent at Commerce One was that potential customers started to cut down their IT budgets in the aftermath of bursting of IT bubble. Despite falling sales the firm continued to use the quarterly sales as the parameter to evaluate COB’s benefits. This continued use of sales revenue figure symbolizes prime importance accorded to sales revenue benefit Commerce One’s expected from COB.

Symantec had introduced Q&A with an expectation of “… USD 5 million a quarter sales…” (Product Development Manager, Symantec) but the sales target remained a distant dream; the product was ultimately taken off the market. Expected sales never materialized. Swelog has lived up to QVIQ’s sales expectations only from time to time, but the firm accepts sales benefits over its whole life span.
As a startup firm, Nescit obviously wanted TermMate, their first product, to generate sales revenue. The wish of Dataman’s Managing Director “…it could sell only one thousand Vitrak licenses in its first year against an expected fifty thousand…” signifies the benefit the firm expects from its new product. Dataman believed sales revenue would go up in subsequent years. Achieved or expected, sales benefits of new products seem to be of prime importance to these firms.

Theme 2: New products gained or were expected to gain market share.

Like sales revenue theme, this one was also evident in all the seven cases. It is only natural since sales and market share go hand in hand. L.Co expressed that market share projections (of OS market) for Lynx were missed by a great margin, adding further “… even big guys like RedHat and Suse didn’t (meet market share projections)…” (Respondent, L.Co). For I.Co, IarP gained sizeable market share in niche markets and, in the process, allowed the firm to graduate into the big league of ERP global firms.

Introduced in 1994, COB’s market share gradually picked up and it became market leader in 1999 and remained so until 2000. Being market leader brought many associated benefits to the firm, such as COB was setting standards for technologies used in electronic procurement market; third party products were being introduced specially written for COB’s users; the firm was able to attract key personnel. However, COB’s own market share as well as the electronic procurement market as a whole started to shrink, probably because the online electronic procurement market could not live up to the expectations of customers.

In another case, with the introduction of Q&A (for Windows) Symantec had planned not only to retain the market share of entry level database management program but also to enhance it. The firm continued Q&A for DOS side by side of Q&A (for Windows). Actually it had launched version four of the former simultaneously when it introduced Q&A (for Windows). But Q&A (for Windows) faced many handicaps including misplaced product specifications and insufficient marketing budget. Symantec achieved a reasonable market share in the initial phase when many users while shifting to Windows from the DOS OS bought Q&A (for Windows). However, as soon as advantages of the competing products’ became known to potential customers Symantec saw market share of Q&A decreasing
rapidly. Continually depleting market share forced Symantec to get rid of the product emphasizing how much importance market share of a product entails to its firm.

TermMate never gained the market share Nescit had aimed for the product. In fact, Nescit is about to terminate further product development of TermMate. The firm plans to promote TermWeb, a replacement product for TermMate which is poised to gain larger market share than TermMate had achieved.

Vitrak’s current market share is minor but “…it has a huge potential market…” (Managing Director, Dataman). The firm expects sales to pick up in coming years and is confident of Vitrak gaining larger market share.

Theme 3: New products earned or were expected to earn profit.

Profit expectation by all the seven firms was easily discernible in all seven cases. Ironically many of the products could not fulfill those expectations. L.Co has no qualms in accepting that Lynx was not profitable and that is why the firm re-introduced it under a new name. Obviously the firm was not satisfied with profit benefits of the product.

IarP has lived largely up to I.Co’s profit expectations, though there have been isolated periods when profitability dipped. Taking a long term view the firm maintains that IarP has been overall profitable. COB was making profits for Commerce One already by 1999. In fact, it remained the firm’s most profitable product until 2001, when electronic procurement market began to shrink. Unfortunately for the firm this period was too short. Diminishing profits from its flagship product caused great trouble (for the firm) leading ultimately to closure of the firm.

Symantec had a huge product portfolio. Q&A (for Windows) was introduced by the firm to retain the market leadership which it had in the form of Q&A for DOS. But Q&A (for Windows) never came close to achieving Symantec’s other products profitability. There was a will, as it was pointed out: “…the corporation wanted to own the novice database market in Windows, like it did for DOS… (Product Development Manager, Symantec),” but the support was lacking, “…no market launch money (budget went to Norton Division) when product was shipped…” (Product Development Manager, Symantec). Drying profit caused Symantec to dispose of the product.
QVIQ had much higher profit expectations from Swelog. The firm found itself in a vicious cycle—since Swelog did not generate sufficient profits, the firm felt constrained in further developing or marketing the product properly which meant fewer sales in time to follow. Now the firm provides only paid technical support to the existing users with virtually no further product development activities being carried out by QVIQ. Profit benefit seems to be paramount for this firm.

TermMate did not bring profit benefits to Nescit. Its success is described by the firm as “…not a financial one” (Managing Director, Nescit). Vitrak has not met Dataman’s profitability outlook for the product either. However, the firm is positive about the future sales of Vitrak and expects it to be ultimately profitable in three to five years time.

Theme 4(a): New products enhanced profitability of other product(s) of their firms.
This theme found support in only two cases. L.Co had a customer base for its software services. The firm found selling and servicing those existing customers with an enhanced basket of offerings, in the form of Lynx and services built around Lynx, cost effective and convenient. “… (older services) brought now more money. Selling and servicing them (older customers) became cheaper…” (Respondent, L.Co).

IarP has grown from a product into almost a product category. Since the firm treats even the current version of IarP as one extended-product, IarP’s initial and later versions contribution in increasing the profitability of extended product or newly added modules go unnoticed—such effects are subsumed in the new version of product itself. Dataman is finding synergy in selling and providing support to Vitrak customers and the firm’s other customers. Since the firm is selling Vitrak in geographical areas where it sells its other products too, it is helping the firm in sharing selling and onsite support costs as well as more productive use of sale- and technical support-personnel’s time.

COB was Commerce One’s first product. It created a user base for the firm but the market for electronic procurement did not last long enough for the firm to see profitability increase in any of its other products. Q&A did not contribute towards profitability increase of any of Symantec’s other products. Swelog’s parent firm had a customer base of software services but the firm does not recognize any profitability effect on other erstwhile products.
TermMate was also the first software products of Nescit. Now this product is giving way to its replacement product, TermMate.

Theme 4(b): New products met new needs of existing customers of their firms.

In the five of seven cases, this theme came to fore. L.Co had now more to offer to its software services customers when it launched Lynx. The new product was not only an OS but also contained many free open-source programs free of cost. Customers were not needed to buy additional licenses to use the bundled programs which included, among others, an office suite, a Web-server, and other utility programs. The firm sold value added services built around Lynx to its existing customers as well.

With new features in later versions of IarP, I.Co met continually new needs of its old customers. First version of IarP took care only of maintenance function; later versions were more comprehensive and met other business function needs of old customers. With Q&A Symantec had aimed to meet also the new needs of its old users who wanted to migrate from DOS to Microsoft Windows OS. The case of Q&A was slightly different in the sense that for users graduating to Windows OS old need was being replaced with the new need—new Q&A was supposed to replace older, DOS version of Q&A.

Later versions of Swelog have addressed new requirements of its existing customers. Modular configuration of Swelog has made integration of new modules easy and economical even at a later stage. This flexibility feature is appealing to old customers. Vitrak has complemented Dataman’s two other products for SCM. Now the firm is able to meet more of supply chain related needs of its old customers.

Evidently in some cases new needs were evolved needs replacing the older needs, whereas in other cases new needs were additional needs of customers. It meant, in earlier situation, new product cannibalized the older product (e.g. Q&A); in other situation, new product was adopted by the customer along with older offering (e.g. Lynx).

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33 Symantec also targeted Q&A (for Windows) at first time buyers of database management program.
Theme 4(c): New products enhanced loyalty of existing customers of their firms.

This theme was supported in three of the cases. Prior to introduction of Lynx, L.Co was known to its customers as a software services firm. Introduction of Lynx consolidated the firm’s software related expertise in the eyes of its existing customers. Post Lynx, L.Co saw many of its old customers buying more of its value added services (e.g., remote server monitoring service, virus scanning of emails).

New versions of Swelog have been adopted by many loyal customers. The firm had worked closely with early customers. Many such customers shared their experiences with the product and gave useful suggestions for further improvement of the product. QVIQ admits it had a very good healthy relationship with many key customers which helped in development of new versions of Swelog. The problem with QVIQ has been that it could not attract sufficient number of new customers leading to stagnation in further product development due to resource crunch. QVIQ has seen gradual erosion in its loyal customer base.

Dataman has been primarily a software services firm; it is a newcomer in the software products segment. It has built up a product line meeting supply chain management needs of small Indian firms. Vitrak has supplemented its other SCM products and now Dataman is promoting itself as one-stop solution provider for SCM needs to its potential customers. Some of Dataman’s old customers bought Vitrak and then sought the firm’s services for integration with their other existing software applications.

Since COB and TermMate were the first products of Commerce One and Nescit respectively, there were no existing customers of these firms. Q&A failed to live up to the expectations of existing customers. “… it (Q&A) lost the old customer base who did not like the responsiveness of the program, bulk, etc. When the OS changed, they just picked a different supplier (of database product)…” (Product Development Manager, Symantec).

Theme 5(a): New products attracted new customers and created a potential customer base for their firms’ other present or future offerings.

In five of the seven cases this theme got support. In some cases the number of new customers met firms’ expectations but in some cases the number was too low for firms’ liking. Lynx was downloaded by many new “customers,” albeit most of them did not pay for the product as Lynx was available for free download on Internet. L.Co tried to market paid technical support
for Lynx to this customer base and create a revenue stream but it found too little takers. The reason could be that many users downloaded more than one Linux OS, tested them and ultimately used the one which they liked best. So, number of downloads probably far exceeded the actual number of potential customers. Moreover many Linux users were too technically proficient to need a (paid) technical support.

Starting with first release, larp has attracted more new customers with each new version. I.C has capitalized upon its customer base to generate product update revenue as well as new license revenue with new modules. COB, the first product of Commerce One, managed to create a customer base as hype created around the product was great. Commerce One brought new complementary products for electronic procurement market and managed to sell those new products to COB customers. The firm was successful in its pursuit of enlarging the customer base for few years before the electronic procurement market started to shrink.

Q&A failed to attract new customers which were badly needed by Symantec to hold the market share it had in beginner’s database management product market. DOS as an OS was giving way to GUI-based Microsoft Windows OS and users were fast migrating to GUI-based database products like Microsoft Access. Q&A (for Windows) did not meet the customers’ expectations as competing products had an edge over Symantec’s product. “… why would anyone not buy Microsoft Access? It (Q&A) needed to be better than (Microsoft) Access…” (Product Development Manager, Symantec). Although Q&A could not attract customers but the firm certainly aspired the product to sustain the customer base it had for legacy product Q&A for DOS. Failure in holding on to the customer base has resulted in Symantec’s exit from the market segment.

Swelog’s customer base never became too big. At first the product attracted new customers easily and the firm got involved heavily in product deployment. QVIQ never actually tried to leverage this customer base for any other offering.

TermMate appealed to potential customers. “… the (potential) customers heard about it and were led to our company (Managing Director, Nescit).” Nescit recognized the shift in technology well in time and developed TermMate’s replacement product TermWeb according to new technological standards. The firm is leveraging the customer base of TermMate to sell TermWeb in addition to other new customers.
In its first year Vitrak has attracted little over one thousand customers, about two third of them are new to Dataman. As the general profile of Vitrak customer is one using a stand-alone PC for managing his distribution business, Dataman plans to target this customer base to sell its other products.

**Theme 5(b): New products established platforms for future new products of their firms.**

This theme was evident in four cases. L.Co developed its office suite product using similar technology used in Lynx and marketed generally to all Linux OS users but aggressively to Lynx users. Later the firm bundled the office suite product with Lynx so as to achieve a sizeable installed base and included feature facilitating import and export of documents from its office suite to other major office suits. Prior to introduction of L.Co’s office suite, Lynx customers used other open source office suites. With L.Co’s office suite, buyers were assured that the product would work problem free, as it would be supported by hardware and software already functioning under Lynx. Later L.Co also introduced Lynx platform-based remote server monitoring and maintenance services.

IarP has evolved through many technological changes since its introduction. I.Co has treated this product as a platform for development of subsequent version. Adding more features and supplementary modules the firm has grown latest product consisting of more than 60 modules. Commerce One introduced COB platform-based supplementary products as part of comprehensive electronic procurement solution. The firm called them derivative products— built on the COB platform to meet the needs and specifications of evolving e-procurement industry.

Q&A did not turn out to be a platform for Symantec’s future products. In fact, Symantec sold the product to CAB GmbH, a German firm, and is not active in the product category at all.

TermMate has proved to be a successful platform for Nescit for the introduction of its new product. The firm developed TermWeb, a product based on TermMate’s technological platform but enhanced with Web-technologies. TermWeb is proving to be more profitable than TermMate for Nescit.
Theme 6(a): New products or promise thereof assisted their firms in attracting venture capital.

In two cases new product or its promise was instrumental in attracting venture capital to their firms. With Lynx in pipeline L.Co was poised to graduate from being a software service firm to a software product firm. L.Co had anticipated a huge market for Lynx. In lieu of 25% ownership, the firm received the venture funding to further product development and marketing. Lynx could not live up to the firm’s sales projections but venture funding helped the firm to survive the IT meltdown at the turn of the century.

The market potential of COB and promise of anticipated electronic procurement market were vital for Commerce One getting venture funding from prestigious institutions. Moreover the reputation of venture funds helped the firm in attracting strategic partners and key personnel with industry experience. The venture capital covered COB’s development and marketing costs for more than four years. Unfortunately for Commerce One, electronic-procurement network industry never took off leading many firms including Commerce One’s bankruptcy.

Theme 6(b): New products helped their firms in repositioning themselves in the industry.

This theme found evidence in only one case. Prior to coming up with Lynx, L.Co was a niche software services firm. Lynx elevated the firm’s status and positioned it as a software product firm. The new found respectability made possible partnering with reputed firms of the industry like Compaq, SteelEye and NCR (National Cash Register) and attracting key personnel such as CEO from Australia.

As the first product of a startup firm, there was no repositioning role for COB towards Commerce One, for TermMate towards Nescit, or for IarP towards I.Co. QVIQ, a part of parent firm MiniMax, is a young firm which is striving to establish itself with Swelog as its mainstay.

Symantec is a large firm with a large product portfolio. Q&A’s (poor) benefits were not significant enough to affect the firm’s position. Dataman’s Vitrak has been in the market only for a year. It is too early for the firm to evaluate product’s effect on firm positioning.
### Table 4.4: Product’s Benefits to the Firm Themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>C</th>
<th>I</th>
<th>L</th>
<th>Q</th>
<th>S</th>
<th>T</th>
<th>V</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. New products generated or were expected to generate sales revenue.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>2. New products gained or were expected to gain market share.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>3. New products earned or were expected to earn profit.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>4(a). New products enhanced profitability of other product(s) of their firms.</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>2</td>
</tr>
<tr>
<td>4(b). New products met new needs of existing customers of their firms.</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>5</td>
</tr>
<tr>
<td>4(c). New products enhanced loyalty of existing customers of their firms.</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>3</td>
</tr>
<tr>
<td>5(a). New products attracted new customers and created a potential customer base for their firms’ other present or future offerings.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>5</td>
</tr>
<tr>
<td>5(b). New products established platforms for future new products of their firms.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>6(a). New products or promise thereof assisted their firms in attracting venture capital.</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>6(b). New products helped their firms in repositioning themselves in the industry.</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>6(c). New products helped their firms in attracting new partners</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: C=COB; I=IarP; L=Lynx; Q=Q&A; S=Symantec; T=TermMate; V=Vitrak;
Theme 6(c): New products helped their firms in attracting new partners.

The theme was evident in three cases. L.Co was able to establish partnership with reputed firms such as Compaq, SteelEye and NCR due to the new found legitimacy by virtue of Lynx. Post Lynx it was a product firm and not merely a software services; this undoubtedly brought more respectability to the firm.

Commerce One was able to build an impressive network of partners. This network of partners made possible a functioning electronic procurement network. These partners included some of the leading names of IT industry. The promise of COB was instrumental in attracting such reputed firms to a new start-up firm like Commerce One.

For Nescit, the partnership with Interverbum holds immense value for sales and marketing of the firm products. This partnership was made possible due to TermMate.

For TermMate: “…it (Interverbum) made it (TermMate) available to a broader market much faster than if we (could have) done it ourselves. It also gave it (TermMate) higher status as our partners are respected company in the field…” (Managing Director, Nescit).

4.3 Empirical Findings

Results of within-case analysis and cross-case analysis yielded the themes in context of the two research questions: (i) What are the relevant elements of newness of a new product to the firms that develop and market computer software products? and (ii) What are the relevant elements of benefits of a new product to the firms that develop and market computer software products? Table 4.3 and Table 4.4 listed the themes found in each of the seven cases. Some of the themes were found in majority of cases while some were found only in few cases; their frequency of occurrence is mentioned in the extreme right columns of both the tables. Since this study is aimed to describe newness and benefits of new software products, no attempt has been made to classify the themes in major and minor groups.

Based on identified themes elements of newness and benefits to the firm are put together. Attempt is made create a succinct list of clearly distinguishable elements. Hence, several themes constitute some of the elements. While themes were mentioned in past tense, findings as elements of newness and benefits are being
4.3.1 Elements of New Software Product newness to the Firm

Based on thirteen themes found in the analysis of the empirical database, six elements of newness emerge. These six elements address the first research question.

Element 1: New products make their firms acquire new development technologies.
This element points towards newness of software products requiring their firms to get hold of new design and programming technology and to internalize them for a meaningful product development. Following two themes constitute this element:

Theme 1(a): New products made their firms acquire new design technology conveyed that firms were compelled to adopt new design technologies for the development of new software products or, in some cases, new versions of the product. Barring for startups’ initial version(s) of new products, evolving design architecture made old design competency redundant as expressed in this theme.

Theme 1(b): New products made their firms acquire new programming technology highlighted the need of new programming technology required by the software firms to develop the new product. In some instances, new versions of the product could not be developed with familiar programming technologies the firms had; instead, latest technologies were needed which the firms were not familiar with.

Element 2: New products make their firms acquire new distribution technology.
Being a digital product, software is suitable for distribution through high technology, unconventional distribution channels such as Internet. While mastering this distribution technology makes firms gain a wide, instant and global reach to potential customers but it involves firm to invest in technology infrastructure (hardware and software) and to deal with evolving technology and competing standards.

Theme 2: New products made their firms acquire new distribution technology recognized the phenomenon of new software products being amenable to be distributed using novel, involving technology heavy distribution channels. In two
cases, firms had to use unfamiliar distribution technologies in order to distribute their full version product or limited function sample product.

**Element 3: New products lead their firms into new markets.**

Three themes point to the finding that new products lead their firms into new markets. In this theme new market is characterized either by a set of completely new customers or by a set of existing customers whose needs and preferences firms are fulfilling for the first time. In some cases, firms have to new competition in the process entering into these new markets. For some new products such as Lynx and COB new customers were spread far and wide, across many countries; for some such as Vitrak new customers were concentrated in a limited area of one country. For Vitrak, Managing Director of Dataman expressed it succinctly, “Geographically same area but different profile (of new market)…..”

Theme 3(a): New products required their firms to sell to new customers highlighted the fact that new products made software firms serve new customers. Peculiarities of new customer segments were unfamiliar to the existing firms: startup firms had never served any customers before. In either case, firms faced a challenging task to meet requirements of new customers.

Theme 3(b): New products made their firms to fulfill new, unfamiliar needs of existing customers pointed out that new products involved fulfilling new needs of customers whom the software firms were already serving but for a different purpose. While the customers were known to the firms but their new, unfamiliar needs presented additional risks.

Theme 3(c): New products compelled their firms to face new competitors conveyed the difficulties firms faced when new products or their new versions took their firms into a new competitive field. New competitors’ strategies were not known to the firms and their behavior could not be anticipated either. Unfamiliar competitors threw unfamiliar challenges.

**Element 4: New products necessitate their firms to increase and/or update development resources.**

Existing design resources and programming resources are either not sufficient and/or are redundant and in both cases firms have to fulfill the gap in resources to develop
new (or new versions of) products. Two themes together make this element of newness.

Theme 4(a): New products necessitated their firms to increase and/or update design resources pointed towards rapidly evolving or changing design technologies which caused firms’ to lack appropriate design resources needed for new (or new versions of) products. In some cases, when firms’ tried to meet the design needs competent technical people were simply not available for hiring and firms had to go abroad to meet their design needs by opening development centers or outsourcing the design activity.

Theme 4(b): New products necessitated their firms to increase and/or update programming resources represented new products or new versions programming requirements which could not be fulfilled by firms existing resources. Rapid change in programming technology is to blame which made available resources either obsolete or not sufficient.

Element 5: New products require their firms to access complementary technological resources.
Many software products meet only partially customer’s need in solving their problems as these products provide solution to part of the customers’ problem. Those software products need to be compatible with a host of hardware and software and/or form a link in the chain of products need to meet customers’ needs in totality. Thus, newness of products require firms to reach out and access technological resources necessary either to enhance the product itself or to ensure that with others’ products customers’ problem solving ability of the product is enhanced.

Theme 5: New products required their firms to access complementary technological resources captured this aspect of product newness for their firms. In Lynx’s and COB’s case this theme came to fore.

Element 6: New products require their firms to increase and/or update marketing resources.
It is understandable that many software firms have technological resources in plenty and marketing resources in shortage. For successful product development how appropriate or sufficient those technological resources usually are is however subject to debate. Notwithstanding technological resources sufficiency, marketing resources
are usually lacking for products’ sales and marketing. In this element, marketing resources include sales personnel, distribution channels, technical support for customers, and sales and marketing partners. Four themes from database analysis collectively make up this element.

Theme 6(a): New products required their firms to increase and/or update the sales force pointed out firms’ need of new or different kind of sales team for their new products. New products had features which were so different that existing sales team could not sell or these were the first products of their firm, in both cases firms had to grapple to build or enhance a sales team appropriate enough for the new products’ selling.

Theme 6(b): New products required their firms to increase and/or update their distribution channel(s). This theme highlighted the inadequacy of distribution channels firms had—firms either had no access to distribution channels or those were not suitable. Firms had to set up new or additional channels to match the needs of new products.

Theme 6(c): New products required their firms to increase and/or update their customer support. In three cases new products made firms to acquire new or additional customer support resources, because the products were new or different than what firms were used to have.

Theme 6(d): New products required their firms to increase and/or update their sales and marketing partners. Firms needed new or additional partners to sell and market the new or new versions of products. These sales and marketing partners made selling and marketing not only cost effective but also saved time in reaching potential customers.

4.3.2 Elements of New Product’s Benefits to the Firm

During the analysis of empirical data eleven benefits themes were identified. Based on these twelve themes six elements addressing second research question can be recognized. These elements represent new products’ benefits—achieved or expected—by their firms. Some elements of benefits were achieved by many firms but some elements, though desired earnestly, remained elusive for many firms. As the aim of the study is to understand the firm’s perspective, listed elements of benefits contain all such elements which software firms achieve or desire from its new (or new versions of) products.
Element 1: New products generate sales revenue.
This element represents most commonly desired but often elusive benefit of new products.
Theme 1: New products generated or were expected to generate sales revenue was identified as expected benefits in all seven cases, although only a handful actually achieved significant sales.

Element 2: New products gain market share.
Market share benefit is significant for software firms not only because it is necessary for products to generate sales revenue and become profitable but also for pre-emptying the competitor from gaining a dominant role in the market and set the standards. Theme 2. New products gained or were expected to gain market share, emerged as a major benefit expected by the firms. New products to gain a sizeable market share became apparent as one of the most prominent wish of studied firms.

Element 3: New products earn profit.
Merely revenue and market share achievements do not suffice if new products do not eventually earn profits. For initial versions of new products, software firms may emphasize on achieving market share and making their products most commonly used in targeted niche but ultimately these firms, like firms in any other industry, yearn for profits.

Theme 3. New products earned or were expected to earn profit highlighted profit benefits desired or achieved by all seven firms. Measures like return on investment, and overall long term profitability were invariably used for judging success of new (or new versions of) software products.

Element 4: New products contribute towards overall profitability of product portfolio of their firms.
Three themes make up this element of benefits firms expect from their new products. By enhancing profit of other products, meeting new needs of existing customers, and/or by increasing the loyalty of existing customers new products contribute towards overall profitability of their firms’ product portfolio.

Theme 4(a). New products enhanced profitability of other product(s) of their firms conveyed the benefit firms gained due to synergy of new products with other
products. Having similar offerings of the same class not only cut the cost of product development and marketing but also share the cost of customer-servicing. This benefit came more as a fringe benefit of new products but the firms took solace in, even if, indirect new products’ profit contribution.

Theme 4(b). New products met new needs of existing customers of their firms. With new products or new versions the firms were able to meet new needs of old customers. Although these firms had to overcome associated uncertainty of meeting unknown needs, this opportunity of selling and servicing the old customers was more cost effective than selling to absolutely new customers. In addition to selling cost savings, meeting new needs of existing customers preempted the chance of competitors replacing the firm even for its earlier products customers were using.

Theme 4(c). New products enhanced loyalty of existing customers of their firms. By meeting more of customer needs with new products, many of studied firms helped their customers in reducing buying cost and in having one firm solely responsible for a group of products. As software products are highly technological in nature, customers may prefer an old supplier to take the responsibility for the new product’s compatibility (with existing hardware and software), deployment and training; while this arrangement reduces customers’ risk but also lock in if firm uses patented or non-standard technology which is a great benefit for the firms behind new products.

Element 5: New products create additional market opportunity, over and above for themselves, for their firms.

In this element market opportunity stands for an opportunity (i) to market additional offerings to the customer base created by the new product in question, or (ii) to leverage technological base of new product to introduce extended or additional product or service to be marketed to existing as well as new customers.

Theme 5(a). New products attracted new customers and created a potential customer base for their firms’ other present or future offerings. For startup firms new products brought first customers and for other firms new products or new versions brought additional customers. In both instances, customer base proved to be beneficial to the firms for marketing their other offerings.

Theme 5(b). New products established platforms for future new products of their firms pointed out that firms valued the possibility of introducing future new
products made possible by the new products. New modules of the product, new services built around the product, or next generation of new products—all were worthy opportunity created by the new product acting as a platform.

*Element 6: New products improve their firms’ image and provide monetary as well as non-monetary benefits.*

Many software firms are either new startups or services oriented firms, while former ones have yet to create an image, later ones do not have, in most cases, an image which enables them easy access to finance, to attract key personnel, or to create trust among potential customers—all arguably valuable for software product firms. An improved image due to new product helps software firms to gain monetary as well as non-monetary benefits as expressed in following three themes. Interestingly, in some instances, even the promise and market potential of a new product in offing works for software firms.

**Theme 6(a). New products or promise thereof assisted their firms in attracting venture capital.** New products convinced the market potential to investors and attracted venture funding, critical for idea-rich but resource-poor new firms or in one case for the firm which wanted to reposition itself as a software product firm.

**Theme 6(b). New products helped their firms in repositioning themselves in the industry.** One of the firms found new product helping it into repositioning itself from a software services firm to a product firm. This new found positioning in the market increased profitability of other products of the firm as well.

**Theme 6(c). New products helped their firms in attracting new partners.** The market potential of new products was found valuable by few firms. The future promise conveyed by the new products convinced many established firms and attracted them to get into partnerships with few of startups or fledgling firms covered in this study, as these firms were highly specialized and could develop their products but needed partners to meet customers’ needs in totality (so that customers can solve their problems) as well as to market the product quickly and effectively.
Chapter 5: Discussion and Conclusions of Qualitative Study

This qualitative study (the first part of this dissertation) attempts to describe new software products’ newness and benefits from the perspective of firms developing and marketing them. There has been increased interest in products’ newness and benefits research but new software products have remained largely outside the purview of the researchers. In order to further fill the gap in products’ newness (also called product newness) and benefits (also called product benefits) literature, this study investigated what made new products new to their firms and what benefits firms expected and/or received from those products. The focus lied particularly on identifying elements of newness and benefits considered relevant by the software firms. There are two salient features of the study, first, it offers descriptive information about new software products’ newness and benefits to their firms, and second, it also identifies some novel features of the same.

In order to fulfill the research aim of this first part of the research, this qualitative study sought to answer the two research questions: (i) What are the relevant elements of newness of a new product to the firms that develop and market computer software products? and (ii) What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

This chapter reviews and discusses empirical findings of the study. The findings are presented and discussed in relation to the two research questions. First a summary of empirical findings comprising of elements from the case-database is presented. Then these elements are classified into categories representing the two conceptualizations of product newness and two dimensions of product benefits, as described in Chapter 2. Emerged elements of newness and benefits are discussed in the respect of extant product newness-benefits literature pertinent to software. Further, an interpretation of empirical findings is presented followed by a description of limitations of this study. Suggestions for future research and implications of this study for researchers and practitioners are discussed before this chapter winds up with conclusions of the study.
5.1 Summary of Empirical Findings

The following six elements of new products newness and six of new products benefits to the firm emerged from the analysis of seven case studies carried out for this study:

Elements of Newness
1. New products make their firms acquire new development technologies;
2. New products make their firms acquire new distribution technology;
3. New products lead their firms into new markets;
4. New products necessitate their firms to increase and/or update development resources;
5. New products require their firms to access complementary technological resources;
6. New products require their firms to increase and/or update marketing resources.

Elements of Benefits
1. New products generate sales revenue;
2. New products gain market share;
3. New products earn profit;
4. New products contribute towards overall profitability of product portfolio of their firms;
5. New products create additional market opportunity, over and above for themselves, for their firms;
6. New products improve their firms’ image and provide monetary as well as non-monetary benefits.

5.2 Categorization of Elements

As evident in the previous chapter, the elements (of product newness and benefits) are based on the themes identified from the content analysis of the case-database. Based on the key issue contained in each element, all six elements of newness and benefits each are categorized under dimensions of newness and benefits respectively. This classification is shown in Tables 5.1 and 5.2.

During the categorization process, first key issues related to product newness dimension were identified in each of the six newness elements. And then, based on related issues, elements were grouped together and placed under one of dimensions of product newness of the conceptual framework (see Chapter 2). For example, in
element “New products make their firms acquire new development technologies” acquire and development technologies were identified as key issues. In another element “New products make their firms acquire new distribution technology” acquire and distribution technology was found as key issues. Since acquire signified “procurement of something new to the firm” and development technologies and distribution technology address technological aspect of new products, these two elements were grouped together and placed under Technological Familiarity dimension of newness. Table 5.1 exhibits dimensions of software product newness to the firm and various elements constituting each dimension. The reason for using an a priori dimension-scheme is to build upon and extend the existing newness-benefits literature using the existing or slightly modified terminology. Because the newness-benefits literature is a part of the new product literature and there are already too many terms used by researchers which adds to the confusion in the new product literature (Craig and Hart, 1992, Garcia and Calantone, 2002, Griffin and Page, 1993).

Table 5.1: Dimensions and Corresponding Elements of Software Product newness

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Familiarity</td>
<td>1. New products make their firms acquire new development technologies;</td>
</tr>
<tr>
<td></td>
<td>2. New products make their firms acquire new distribution technology;</td>
</tr>
<tr>
<td>Market Familiarity</td>
<td>3. New products lead their firms into new markets;</td>
</tr>
<tr>
<td>Technological Fit</td>
<td>4. New products necessitate their firms to increase and/or update development resources;</td>
</tr>
<tr>
<td></td>
<td>5. New products require their firms to access complementary technological resources;</td>
</tr>
<tr>
<td>Marketing Fit</td>
<td>6. New products require their firms to increase and/or update marketing resources.</td>
</tr>
</tbody>
</table>

A similar process was followed for identifying key issues in each element, grouping together and placing under one of the benefits dimensions. Table 5.2 exhibits the dimensions of software product benefits to the firm and various elements constituting each dimension.
Table 5.2: Dimensions and Corresponding Elements of Software Product Benefits

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product-level Benefits</td>
<td>1. New products generate sales revenue;</td>
</tr>
<tr>
<td></td>
<td>2. New products gain market share;</td>
</tr>
<tr>
<td></td>
<td>3. New products earn profit;</td>
</tr>
<tr>
<td>Firm-level Benefits</td>
<td>4. New products contribute towards overall profitability of product portfolio of their firms;</td>
</tr>
<tr>
<td></td>
<td>5. New products create additional market opportunity, over and above for themselves, for their firms;</td>
</tr>
<tr>
<td></td>
<td>6. New products improve their firms’ image and provide monetary as well as non-monetary benefits.</td>
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</table>

5.3 Emerged Elements and Prior Newness-Benefits Literature

In this section, each element is analyzed and discussed in the context of newness-benefits literature particularly suitable for software products and presented in Chapter 2. First, the elements addressing the first research question are taken up (in subsections 5.3.1-5.3.4), followed by the elements addressing the second research question (in subsections 5.3.5 - 5.3.6).

5.3.1 Technological Familiarity

**Element 1:** New products make their firms acquire new development technologies. This element represents two closely-related themes about technological familiarity.

**Theme 1(a):** New products make their firms acquire new design technology. In five studied cases, firms had to acquire new design technology. Rapid changes prevalent in software industry (Hoch *et al.*, 1999) makes it difficult for software firms to keep abreast with all the design technologies needed for a new product or for a new version of an existing product. For example, QVIQ had to scamper to an overseas firm (in India) to access design technology when it needed to change the design of Swelog to the one based on object-oriented design. The task of acquiring new technology proved problematic as the Indian firm did not understand what QVIQ wanted for its customers. The problem associated with communication and coordination among different teams involved in software project is documented (Cusumano and Selby, 1997). To overcome the communication and coordination problem, QVIQ hired key personnel from the Indian firm and brought them to their headquarters in Sweden.
In another case, Symantec chose to use the familiar design technology for Q&A, when the new version of the product was being developed for GUI-based OS. Even though, during the development process of Q&A (for Windows), Symantec changed the design but failed to choose the one which majority of entry level database users came to adopt. For a firm of Symantec’s size, it should have been possible to catch the market signals and interpret them. What Symantec actually did was to count on its marketing and distribution strength and under-estimated the importance of design that went into to the product. This oversight cost dearly to Symantec in the form of exit from the market from that product category paving way for new comers like Microsoft Access and Claris FileMaker, an illustration of new technology proving an enigma to an established firm (Christensen, 1997).

The two firms which did not require were Nescit and Dataman. The two founders of Nescit have just prior to setting up Nescit had worked on a similar project and were familiar with the design technology needed for TermMate. For Vitrak, Dataman used the design technology it has been using for other projects in-house. Moreover, Vitrak is comparatively small and compact software that does not need much sophistication.

Theme 1(b): *New products make their firms acquire new programming technology.* Similar to design technology, programming technology also proved unfamiliar to five of the studied cases. I.Co had to use object-oriented programming for one of the major version of IarP. When the firm realized it has to adopt object-oriented programming there were not many at the firm who could do such programming. I.Co built the design expertise at its headquarters in Sweden but opened an overseas development center. For the development of COB, Commerce One had to keep hiring, all along the development process, new personnel who had needed programming expertise: by hiring more with new expertise Commerce One overcome the unfamiliarity barrier of technology.

L.Co had to adopt unfamiliar software development process needed for Lynx. The firm had prior experience of software projects done on contract. Such projects were smaller in scope and easy to coordinate but for Lynx, it had to use a new language (UNIX), coordinate with an overseas development center where majority of programmers were stationed. As part of Linux kernel development program and to
test Lynx preliminary (Alfa and beta versions), L.Co had to communicate and coordinate with Linux volunteers which was new to the firm.

Use of appropriate programming language(s) (Baetjer, 1998) and development process (Chroust, 1996, Boehm, 1988) are vital in software projects. Familiarity with programming technology (programming languages, tools and processes) seem very pertinent for new software products.

**Element 2: New products make their firms acquire new distribution technology.**

**Theme 2: New products make their firms acquire new distribution technology.** This theme was found in the cases of Lynx and TermMate. In a stuffy of software firm, Banerjee (2003) has suggested that for new software products’ success distribution holds an important key. Both Lynx and TermMate were distributed through a combination of channels, but Internet as a distribution channel played an important part in both cases. L.Co had prior experience of using Internet as a communication channel with Linux volunteers who were involved in Linux kernel (core of Lynx, like any other Linux OS) development and beta testing of Lynx. In fact, the firm and Linux volunteers had used Internet for exchanging software program codes as well. But, distributing Lynx to customers through Internet proved to be difficult, at least, initially. The firm used a software developed in-house to facilitate customers to place order through it website and make payment. This software did not prove very intuitive, both customers as well as the firm’s employees had difficulty in using and tracking the order place. Later, L.Co combined this online order placement with physical delivery organized through a third-party logistics firm. It cannot be said for certain if this move of physical distribution was caused by difficulties faced in distribution through Internet, or by the firm’s strategy to package printed product manual, third party software applications and utilities as an added incentive to “push” Lynx. It was clear that this distribution technology bypassed the middlemen in distribution, reduced transaction cost and helped cross entry-barrier to the market (Smith et al., 2000), but the firm’s unfamiliarity in using the Internet as a distribution channel proved to be a handicap.

Nescit used Internet to make TermMate available for interested potential customers to test the product. Since TermMate was the first product of the firm, it had to set up required infrastructure to facilitate hosting of TermMate on servers so that it can be accessed through Internet for sampling. Since the product was aimed at large
organizations which made pre-sales support necessary for final sale, the firm did not expect direct sales through Internet and neither did it happen. But, as the product had generated some good word-of-mouth publicity, many curious potential customers visited the firm’s website to test the product. Later, the firm (through its subsidiary) used the familiarity gained and the infrastructure set up for TermMate to host websites professionally.

5.3.2 Market Familiarity

Element 3: New products lead their firms into new markets. Three themes constitute this element of market familiarity.

Theme 3(a): New products require their firms to sell to new customers. This theme was found, as expected, in all the seven cases. In an industry which characterized by frequent technology changes and new product introductions (Abernathy and Utterback, 1988) selling to new customers was inevitable for these firms. I.Co has continually introduced IarP (major new versions in 1998, 2000 and 2001) aimed to meet needs of firms in new industries. IarP was aimed initially at nuclear power industry and now, with 60 modules, it meets needs of enterprise resources planning needs in all major industries. The firm started with Sweden and now sells IarP in over 41 countries. Selling to new, unfamiliar customers was part of the growth. When L.Co introduced Lynx, the firm attempted to sell a product and that too to individuals in comparison to its earlier organizational clients of software services. Lynx could not overcome the handicap of network effects the product posed to its potential customers. As far as a standalone product was concerned, Lynx fetched good customers’ feedback and experts review. But the applications such as office suite available as complementary products had serious compatibility limitations with the technological format used in other popular office suite products. Unfamiliarity with market proved much more difficult for L.Co to overcome than unfamiliarity with technology.

L.Co was not alone. COB faced similar problems: lack of established standards did not encourage many complementary products and services to enter the newly evolving electronic procurement solutions market. Commerce One tried to
form alliances with firms in the industry to encourage introduction of such complementary products. Limited customers of COB did not prove worth for such complementary products and services providers to enter the electronic procurement solutions market; limited complementary offerings did not meet potential customers’ needs causing them to delay their purchase of COB. Nescit struggled to sell TermMate. Dataman has achieved a fraction of its projection of unit sales of Vitrak. A majority of Vitrak customers are new to Dataman.

**Theme 3(b): New products make their firms to fulfill new, unfamiliar needs of existing customers.** In five of the seven cases this theme was found. In two cases, firms had been active in providing software services. With new products, they entered software product segment of the industry and sold their new software products to the existing customers. In case of I.Co, the software product was a natural progression as the firm developed a product aimed at the customers it has been doing consulting services for. But, Lynx was target primarily at new customers. However, with limited sales of Lynx, L.Co started to promote its software services built around Lynx. In this exercise, the firm was leveraging its earlier core competency of software services; Lynx was commercially a small part of the package, but technologically it was the core of the offering. But, familiarity with customers’ helped the firm to address their needs where Lynx formed a part of the package deal.

Commerce One’s case presents an interesting situation. Symantec is a large, established firm having the sales and marketing as its strength. Its product, Q&A was introduced to replace Q&A for DOS, because GUI based OS was fast replacing the text-based OS such as DOS. Q&A for DOS was the market leader in the entry stage database management product. It was only natural for Symantec to expect a continued market leadership in the new OS-environment. However, the firm misread the customers’ needs in the context of GUI-based OS giving competitors’ products (e.g., Microsoft Access, Claris FileMaker) a head-start which ultimately proved so detrimental for Q&A that the product was ultimately shelved by Symantec. Familiarity with customers’ older needs did not automatically got transferred in the new technological context.

New products do fulfill new needs of firms’ existing customers (among others, Danneels and Kleinschmidt, 2001). While the future needs of customers can be, at least to a certain degree, reasonably forecasted in many other industries, the situation
is very different in the software industry. This industry is unpredictable due to rapid technological changes and advances. Hardware and software standards and specifications change rapidly. Evolving connectivity needs (use of Internet, intranet, and wireless), distributed computing (Server-client, application on demand, etc.) trends, interoperability among different standards, etc. have direct and immediate effect on needs and preferences of customers which are very difficult to anticipate for software firms. For example, in case of TermMate, Nescit found many customers shifting from PC to server-client architecture. This change happened within two years of life of TermMate, causing the firm to develop new version of TermMate. QVIQ faced similar challenge for Swelog when customers insisted on GUI for new versions.

IarP is a typical example of an ERP firm evolving its product along new versions with changing needs of its customers. A new version of a software product, introduced within a year or two, can be so different from the older version is probably unique to software products.

**Theme 3(c):** *New products compel their firms to face new competitors.* In five cases, new products created new competitors for their firms. New products do often create new competitors for their firms in knowledge-based industries (Chandy and Tellis, 2000). In case of Q&A, new version of the product brought Symantec to compete against new competitors like Microsoft and Claris. Unfamiliarity with these firms and their strategies proved dear to Symantec. Symantec continued to focus on selling and marketing of the product (Q&A), whereas Microsoft and Claris focused on the technological aspect of the product and took advantage of new, evolving technology and incorporated features in their products which proved cherished to entry-level database product customers. In a study of incumbency, size and radical product innovation, Chandy and Tellis (2000) termed the inability of leading firms to compete against new competitors as “the incumbent’s curse”. Symantec failed to overcome its “incumbent’s” curse to meet the challenge posed to Q&A by Microsoft and Claris, even though it was not exactly a case of radical innovation.

I.Co has continually faced new competitors during the long life of IarP. In new markets, the firm has often partnered with local firms to reinforce its ability to meet the competition. But, the nature of competition has gradually changed. Initially ERP providers were small, local firms comparable to I.Co’s size and resources, now large, more resource-rich firms are entering the ERP market. This latest development has
caused takeovers and acquisitions leading to uncertainty in the minds of potential buyers, when it comes to placing order for new products from “smaller” firms like I.Co. The fear of potential customers is based on their apprehension of these smaller firms’ ability to remain in the market to support the product over a long period of time as an ERP deployment is a huge investment of time and money for a customer. The changed nature of competition is telling on the future of firms like I.Co. In new product literature it is well recognized that new competitors mean a new competitive situation (Cooper, 1999) and lead to increased competitive intensity (Song and Parry, 1997).

5.3.3 Technological Fit

**Element 4:** New products necessitate their firms to increase and/or update development resources. There are two themes which are represented by this element of technological fit.

**Theme 4(a):** New products necessitate their firms to increase and/or update design resources. This theme was found in five cases. During the development of their new products these firms not only had to use unfamiliar design technologies but also had to increase and, in some cases, update such resources. By “updating” design resource is meant that existing resources were no longer suitable for the new product development and had to be discarded and new ones, the right kind, acquired. For example, QVIQ realized that its existing design capability was not sufficient for new version of Swelog. After an unsuccessful attempt to outsource the design (and programming) function, it updated its design personnel and infrastructure, replacing the old one. I.Co has continually increased and updated its design resources for all major releases of IarP. Lynx caused its firm, L.Co, to increase its design resources, which the firm did by opening a new office and hiring more programmers.

The two firms which did not feel the need to make any changes in tier design resources were either recently been involved with similar function (Nescit and Dataman both) and the product was not that sophisticated (Dataman’s Vitrak).

To Make newly acquired resources to work in a product innovation context a firm needs “absorptive capacity” (Cohen and Levinthal, 1990). But once they
overcome the challenge of internalizing such new assets, these may bring benefits to
the firm. In many studies firms ability to leverage their technological resources and
skills of new product development has been found important for their success (among
others, Zirger and Maidique, 1990, de Brentani, 2000, Montoya-Weiss and Calantone,
1994).

**Theme 4(b): New products necessitate their firms to increase and/or update
programming resources.** In six cases, existing programming resources proved
insufficient for the development of new products (or new versions). In this exercise,
while none of the seven studied firms attempted to place design function to a place
where costs were low, but three of them did (or tried to do) that for programming
function. All three faced problem of communication and coordination (Cusumano and
Selby, 1997). L.Co solved this problem by moving its Managing Director (who was
also the technology head) to the “programming” office overseas. QVIQ hired the
people who were working on the Swelog project in India, and brought them over to its
headquarter in Sweden. I.Co is the only one which is still working with design and
programming centers separated with product managers from design center regularly
visiting overseas programming center.

Although Nescit did not have to increase its design resources, it had to
increase programming resources for ongoing development of TermMate. Dataman
with a large programming resource (mainly for contract software services) had no
difficulty in design or programming of Vitrak.

The advantage of synergy between existing resources and needed for a new
product development is well documented in new product literature (among others,
Easingwood and Storey (1991) came to the conclusion that synergy with existing
product lines augmented new product benefits. After all, technical proficiency has an
direct effect on the product quality which ultimately leads to a product’s success or
failure (Song et al., 1997).

**Theme 5: New products require their firms to access complementary technological
resources.**

To fill technology gap (Hoch et al., 1999, Sorensen and Stuart, 2000) and to bring
complementary products and services (Sivadas and Dwyer, 2000) for customers,
software firms need complementary resources. While the former is needed for the development of the product, the latter is mandatory for market acceptance of the product. In two studied cases, this theme was clearly obvious.

In case of COB, CommerceOne had to work together with other software firms to complement its technological resources so as to market a comprehensive solution to the customer built around COB instead of marketing COB as a standalone product. Hoch et al. (1999, p. 181) point out the practice of “web” of firms pooling their technological resources. Such a symbiotic relationship helps these firms in solving customers’ problem through a “complete” product. For example, COB provided a complete solution to the buying function, but it included a data-mining module from a partner-firm. This partner firm had expertise in data-mining which COB did not have but needed such a capability so as the COB customer may identify the priority items needing immediate attention.

Not only for kernel development but also for driver routine writing and testing of Lynx, L.Co complemented its technological resources with that of Linux volunteers. Some of these Linux volunteers had high level of expertise in their chosen areas and provided inputs which would have been very difficult for a firm of L.Co’s size and resources. To make Lynx compatible with an array of software and software, these volunteers wrote driver routines (shared also among other open source, Linux OS); some other translated user-manuals and installation program into other languages.

A plausible explanation for this compulsion of accessing complementary technological resources is argued to be that firms in knowledge-intensive industries are generally highly specialized in their core areas (Sorensen and Stuart, 2000) and consequently do not have resources to nurture all the capabilities in house and in time (Abernathy and Utterback, 1988).

**5.3.4 Marketing Fit**

**Element 6:** New products require their firms to increase and/or update marketing resources.

Four themes are represented by this element.

**Theme 6(a):** New products require their firms to increase and/or update the sales force. This theme emerged in four of the seven cases. COB was Commerce One’s
flagship product. With the release of each new, feature-rich version of COB, the firm inducted more personnel in its sales force. The firm despite being a new start-up attracted (due to its pioneer image, respected industry partners and investors) sales people with long industry experience. The product (COB) Commerce One was selling was one of the first of its kind based on the patented technology. The firm firmly believed in technological solution it was offering in the form of COB to customers in procuring supply based on a global bidding. But the product could not solve the customers’ problem (due to reasons such as incompatibility of diverse hardware, software and communication protocol used in buyer and seller networks) making selling very difficult for even experienced sales personnel the firm had hired, a common phenomenon among high-technology firms as pointed out by Mohr (2001). Commerce One made many changes in its sales force for new versions of COB but could not sell sufficient enough to make it a successful product leading to the bankruptcy of the firm.

L.Co has been using project managers to sell software services before it entered the software product segment with Lynx. For Lynx, the firm hired sales personnel first to sell within the home country and later to sell in overseas market. With the introduction of new version of Lynx, it gradually increased its own selling network encompassing Australia, part of Eastern Europe, Scandinavia, and the US. New sales personnel were more adept in selling software products than some of its earlier hires for the purpose. L.Co has increased its sales force over the period for selling IarP, even though the firm relies on partners for major sales.

Nescit tried to sell TermMate through two founders acting as direct sales force but achieved very limited success. But due to limited financial resource the firm was not in a position to hire full time sales people. So, it partnered with a firm to compensate for shortage of sales and marketing resources. This partner firm had extensive sales and marketing network. Over the period of time this partner firm first became minority shareholder and later acquired a majority stake. Now, TermMate and other products of Nescit are sold through this partner’s sales force, a common feature for small software firms (Hoch et al., 1999).

**Theme 6(b): New products require their firms to increase and/or update their distribution channel(s).** In five cases this theme was found except in Q&A and Vittrak cases. Symantec had a large product portfolio and a wide sales and distribution
network, and distributed Q&A through existing distribution channels. Dataman sales and distributes its products mainly through own sales force and few value added resellers (VARs). It has continued the same practice also for Vitrak. In fact, there are not many alternative channels available to firms like Dataman to distribute their products viably and reliably. The unit selling price of Vitrak does not permit hiring third party agents. Many small time VARs and system integrators are not reliable as they install, on customers demand, unauthorized copies of software products on systems they had to sell. This lack of distribution network has caused slow entry into the market.

Swelog did not gain the kind of market success as the QVIQ would have preferred. QVIQ had a good product (most of customers are very satisfied) but could not market and distribute well due to resource constraints.\(^{34}\) IarP has grown to a 60 plus module product and is being distributed in over 41 countries. The product has grown with the technological changes (Nambisan, 2002) and new market opportunities; I.Co has correspondingly enhanced its distribution network by partnering VARs, management consultants and large dealers. The firm went to the extent of investing in such firms who had good sales and distribution networks in new markets IarP was introduced. This was a long journey from the initial versions of IarP when I.Co’s own (direct) sales force did all the selling and distribution.

L.Co began distributing Lynx through various dealers—computer hardware and software stores, and later included computer games and book stores. It included Internet and, even, kiosks to distribute a light version (stripped, without manual and many third party software) to gain market penetration. Despite the firm’s many /short) attempts to distribute the product through many new channels result was far from satisfactory for the firm. It is plausible that firm had little knowledge and resources to cultivate and establish the required distribution channel, the product (Lynx) had become market leader in the (home) market but soon it was displaced by a competing product. An effective and large distribution channel is found to be vital for the success of a new software product (Banarjee, 2003). Lynx received good reviews from customers as well as product reviewers of Linux magazines but failed to set the network effects in motion (Shapiro and Varian, 1999). L.Co introduced complementary software and support services so that Lynx (and other Linux OS)

\(^{34}\) In Feb 2005, QVIQ had become bankrupt; Swelog has been bought over by a group of Swelog-customers who have hired QVIQ employees for continued support of the product.
users can utilize their products fully but the firm achieved limited success. It can be speculated if an effective channel would have helped Lynx to gain the critical market share it needed to set the network effects for customers in motion.

**Theme 6(c): New products require their firms to increase and/or update their customer support.** This theme was evident in three cases. The size and complexity of code in a software is continually on rise. It is estimated the amount of code in most (software) consumer products and systems is doubling every two to three years (Gibbs, 1994). The rapid change in technology in the software industry (Hoch et al., 1999, Abernathy and Utterback, 1988) aids to the complexity of most software products. In such a situation, increased customer support for new software products is natural. The diversity of new features demanded by customers is adding to the challenge to the software firms. Some examples of such features are increased connectivity (through Internet, intranet and wireless networks), inclusion of multimedia and ICT-related tools, compatibility with more software applications, etc.

Commerce One had to educate COB customers and provide extensive technical support to make COB work across diverse systems being used at different locations of customers’ offices. Lynx customers faced installation and compatibility related problems; L.Co had to substantially increase support function of the firm by investing in hardware and hiring new technical employees. Like for many other themes, not only when introduced for the first time but also a new version (of software product) also created substantial discontinuity for the firm; the firm had to enhance resources to meet new needs of customer support. For example, I.Co had to include more business functions in later versions of IarP which meant increased features and compatibility with e.g., CRM and HRM applications which IarP customers had been using earlier.

Past studies in new product have noted that firms need to increase support function for their new products. (Danneels and Kleinschmidt, 2001, Atuahene-Gima, 1995). The reason is customer satisfaction is vital for the success of any new products and services (e.g., Edgett and Snow, 1996, Avlonitis et al., 2001, Cooper et al., 1994). For example, the customer service was found important in Cooper et al.’s (1994) study of financial services. It may be noted that there are several references in this dissertation to the financial services industry. The reason is it is one of the non-manufacturing industry (whose “products” are intangible and similar to software in
some sense) where researchers, particularly of strategy, have shown interest (Sveiby, 1992). Although the concept of customer service for financial products is different (in terms of content and delivery) from for software products, but it, nevertheless, highlights the importance customer support for the success of the new product. As (Elliott, 2000) has pointed out in the context of software products that the customer satisfaction has a bearing on the perceived quality of the product. For the widespread acceptance of its new product, a software firm cannot do without providing bundled with the product as well as after sales customer support so that the customer may put the product fully to use. Software firms usually concentrate on product’s technological aspects and underestimate the value of proper customer support (Leffingwell, 2002). Such a practice does not augur well for the success of a new software product.

**Theme 6(d): New products require their firms to increase and/or update their sales and marketing partners.** New product requires new or additional sales and marketing partners theme emerged in six cases. L.Co signed up value-added resellers (VARs) and system integrators (SIs) to include and sell Lynx to their customers, as these VARs and SIs had a good local market with established sales and marketing infrastructure. Through them Lynx could reach many more potential customers than L.Co could have achieved on its own. Nescit realized the limited reach it could create on the basis of selling and marketing TermMate on its own due to its limited marketing resources, and soon stuck a partnership with a large firm who had extensive sales and marketing resources and network. As far as product development was concerned Nescit managed on its own but sales and marketing proved to be the handicap for the firm, as competing products were sold in large European and North American markets but Nescit could hardly reach to Swedish market.

Commerce One created a large partner network for COB. Some of the software industry’s largest firms became Commerce One’s partner and promoted COB. The firm was highly involved in R&D and was one of the pioneers of the electronic procurement industry, it concentrated on the development of technology and resorted to partners for selling and marketing. Anyhow, the nature of the product was that of a capital goods which required extensive selling efforts and a closer understanding of the customers’ needs. Partners like SAP were more suited for this function. Moreover, early product introductions were necessary for the firm to maintain its pioneering status. Using the extensive reach of its partners, Commerce
One was able to launch COB and its later versions simultaneously in all major markets (Europe, North America and Japan). Such kind of partnership has been common in other industries as well. In a health care products study, partnership was found helpful in cutting down time-to-market and reducing risk of new products (Sivadas and Dwyer, 2000).

I.Co extended its sales and marketing reach through introductions of new partners in its network. Passing through various versions IarP matured into a full-fledged ERP product competing globally with other major ERP products. While I.Co concentrated on the product development, partners largely did the sales and marketing in major markets. However, the firm did not work with its many major partners at “an arm’s distance” for a long time. It invested in many sales and distribution partner firms to make the relationship stronger and long-term and even acquired some of them ultimately. With each new version of IarP, I.Co’s sales and marketing network has grown as it has helped the firm in increasing reach and market-share, and simultaneous product introductions, as suggested by Hoch et al. (1999), in a large market of over 41 countries.

5.3.5 Product-level Benefits

Element 1: New products generate sales revenue.

Theme 1: New products generate (or are expected to generate) sales revenue. No surprise that this theme emerged in all the seven cases. Commerce One received sales revenue for COB what it had expected but only for first few years. IarP has met sales revenue targets for I.Co for almost always over its long life. Lynx did not meet the sales revenue targets L.Co had set for the product leading the firm to withdraw it from the market. It can be argued that, among other reasons, limited resources of L.Co did not permit it to market the initial versions of the product sufficiently well and to continue to develop the product which could meet customers’ needs comprehensively. L.Co seems to have many similarities with the characteristics of typical small software product firms Nambisan (2002) has described and which hindered the firm in realizing full sales potential of Lynx.

Q&A initially generated sales revenue for Symantec as it was expected but could not sustain it for long. Swelog generated modest sales revenue but never achieved the potential QVIQ had anticipated. Vitrak is also far short of sales target
Dataman has expected from it. Nescits’ TermMate could not achieve much sales during initial period of market launch but the replacement product for it is performing sales-wise much better. It is clear that although sales revenue is a vital benefit for software firms but it proves to be illusory in many cases.

**Element 2: New products gain market share.**

**Theme 2: New products gain (or are expected to) gain market share.** All seven firms expected their new products or their new versions to achieve anticipated market share but only few were able to do it; some of those gained the market share for a short period and then saw it diminish. IarP is the sole case where it has reasonably managed to meet the firm’s anticipated market share projections. Another ERP product, Swelog has struggled with the market share and is almost languishing in the market. Q&A managed the market leadership position in terms of market share when GUI-based entry-level database market was in infancy stage but soon competitors reduced Q&A to a minority in the market.

Nescit’s TermMate managed only to make a dent in the terminology management market and never came close to becoming a significant player in the market. Lynx (and other Linux OS) created a lot of curiosity among potential customers but could not achieve a sustainable market share for any significant period of time. Since most potential customers were already locked-in with other OS-products, switching-costs would have made adoption of Lynx-like products more difficult. Vitrak has also achieved only a fraction of market share Dataman has expected but the firm is optimistic about the product’s future because the product is aimed at a niche where Dataman believes it is well equipped to lead the market in the medium to long run. Six out of seven studied products struggled or are struggling to achieve the market share their firms had expected. Varian’s (2001) argued that industries with proprietary standards and high switching-costs for customers are generally devoid of many firms with smaller market share and are concentrated by few firms with large market share. His argument fits studied software firms where their products have struggled to gain and/or maintain a significant market share.
Element 3: New products earn profit.

Theme 3: New products earn (or are expected to) profit. All seven firms considered profit a very important benefit. Some of them achieved this product profitability for a short period of time and very few for a long period of time. High product development and marketing cost borne by the firm for a new product can only be recovered by selling a high number of products as stiff competition in most segments of software products pre-empts premium pricing. Many factors, such as technological uncertainty, lack of network effects, act as a hindrance in a large scale purchase of new software products by customers.

COB was profitable for Commerce One for a while. IarP has been highly profitable for L.Co, but Lynx never turned out to be profitable for L.Co. Q&A earned anticipated profit for Symantec for first few quarters of launch but slowly lost its way. TermMate could not achieve profitable status for Nescit. Due to low cost structure, Dataman is expecting Vitrak to turn profitable soon in the second year of market launch. Although few studied products remained profitable over a period of time but all the seven firms understandably expected the profit benefit from their new products.

5.3.6 Firm-level Benefits

Element 4: New products contribute towards overall profitability of product portfolio of their firms. This element represents three themes of firm-level benefits of new products.

Theme 4(a): New products enhance profitability of other product(s) of their firms. In cases of Lynx and Vitrak this theme was applicable. L.Co has been selling software services. With the introduction of Lynx, the firm began to offer Lynx and related services (e.g., servers for managing email, network and Website) as a packaged deal. Having both product and related services from the same supplier lessened the technical uncertainty for the customers as the responsibility of compatibility and accountability for the combined system lied with one firm. For L.Co, this was a more profitable deal as sale value in money terms was high and selling cost was shared. By selling Linux based products and services, L.Co was gradually locking-in customers in Linux environment, which gave potential to L.Co to sell Linux based products in
future (Which actually happened when L.Co sold Linux based SteelEye’s high-availability services.

Vitrak complemented Dataman’s portfolio of SRM products. The firm shares selling cost of Vitrak with other products of the firm. About one-third of Vitrak customers have bought other offerings from Dataman. As on-site customer support is common among Dataman’s customers, the firm shares cost and optimizes time of support employees providing on-site technical support. In both cases, credibility of the firm increased with new products in the eyes of potential customers lessening technological uncertainty, and compatibility of products was firm’s responsibility, which made cross-selling not only possible but also profitable, as Li et al (2005) have hypothesized. In new products studies this theme has been widely suggested (Alam, 2003, Song et al., 1999, Avlonitis et al., 2001, Cooper et al., 1994). Moreover, accumulated information about customers and their needs and preferences reduces search cost of new customers leading to a cost advantage for firm’s other new products (Song et al., 1999).

Theme 4(b): New products meet new needs of existing customers of their firms. In five of seven cases this theme was identified. IarP has grown with the evolution of ERP products. As customers gradually wanted to add more new business functions, L.Co enlarged the scope of IarP meeting new needs of customers with new versions. Symantec decided to introduce Q&A for Windows as customers were shifting to GUI based OS to meet their new needs. Through Lynx L.Co met not only met desktop OS-related needs but also network related needs (network management, file server, etc.) of many of its existing customers.

Similar to IarP, new versions of Swelog also met new needs of existing customers. The modular design of Swelog made easy for the customers to deploy additional modules seamlessly with existing modules. QVIQ has had a close relationship with Swelog’s customers; understanding their needs and preferences, in fact, helped in the development of later versions of the product. Through Vitrak, Dataman has met needs of sales and inventory management of some of its existing customers. As pointed out earlier, one third of Vitrak’s customers were existing customers of other offerings of Dataman.
Theme 4(c): New products enhance loyalty of existing customers of their firms. This theme was evident in IarP, Lynx and Vitrak cases. Switching costs could be very high if an ERP customer wishes to shift to a new ERP product. I.Co’s IarP has created a loyal customer base. But QVIQ’s Swelog failed to achieve the same advantage. It was not that product feature did not appeal to the initial customers (Swelog received very good customers’ ratings), in fact, the firm could not develop the product to meet many new evolving needs of its customers. Customer satisfaction and compatibility assurance helped Lynx enhance loyalty of L.Co’s customers. Customers were satisfied because Lynx as an OS, and network management applications (e.g., Web server) contained in Lynx were more stable and secure than many competing products. Abernathy and Utterback (1988) have argued that benefits play a major role in customers’ evaluating a new product which is new to the market and is based on evolving technology.

Vitrak’s role in increasing loyalty can be seen as a case of convenience, and brand equity (Aaker and Jacobson, 2001). The ongoing relationship of the firm with its existing customers for software services and other products was further reinforced as Dataman’s technical support employee could service on-site Vitrak in addition to other products of Dataman. This facility is critical for Dataman’s customer to minimize downtime of their computer systems.

Element 5: New products create additional market opportunity, over and above for themselves, for their firms. Two themes are represented by this element.

Theme 5(a): New products attract new customers and created a potential customer base for their firms’ other present or future offerings. Except for Q&A and Swelog, new products attracted new customers and created a customer base which their firms could use to sell other offerings. I.Co has sold new versions and additional modules of IarP to its existing customers. As the switching costs in case of an ERP product is too high, an I.Co’s customer is locked-in with IarP and would continue to but next versions of the product or related services until a I.Co’s competitor offers significant higher value, as argued by Shapiro and Varian (1999). In a similar situation to I.Co, QVIQ was in a position to leverage the initial customer base Swelog had created, but the firm due to limited resources could not develop and introduce other products to leverage the customer base.
L.Co was successful in selling Linux-related other products and services to Lynx users. Due to the similarity in technology between Lynx and other new offerings, customers accepted those new offerings (VPN solutions, remote email scanning service, etc.) readily because the learning and using new offerings would have been easier. Due to Lynx, the legitimacy of L.Co was enhanced as a firm who can develop and support new products. This legitimacy must also have made selling new products easier for the firm.

Vitrak has been in the market only a little over one year, so it is too early to comment Dataman is successful in leveraging the customer base for selling other products. As the firm believes in reducing the cost of selling and providing support by selling more products to existing customers to enhance profitability, Dataman is trying to sell its other products to Vitrak customers. It may be noted that one third of Vitrak customers are existing customers of Dataman, so the firm has pursued a strategy of creating and leveraging the new customers’ base to sell other products as argued by Selnes (1993).

Theme 5(b): *New products establish platforms for future new products of their firms.*

The theme new software product introduces platform for future new products is evident in past studies (e.g., Cooper et al., 1994, Dvir and Shenhar, 1990). Microsoft Windows is a living example. For four of the studied firms, their new products turned out to be a launching pad for future products. These firms developed a technological competence in the core area and an understanding of the market, which they leveraged in their future offerings. The technological and human resource infrastructure proved vital for these firms to get “prepared for the future” (Dvir and Shenhar, 1990). For example, in Lynx’s case the firm leveraged its recently acquired technological know-how (for Lynx) to develop an open source office suit. In TermMate’s case, Nescit improved the original product and introduced TermWeb (substituting TermMate, its earlier product) using the technological and market knowledge they had gained through the TermMate. IarP provided a hugely successful platform to its firm. Now, the firm has over 60 modules under the umbrella product IarP.

The association created with other firms to develop, market and/or distribute a product is invaluable for software firms because sharing of resources and information—intellectual ones: such as customer requirements, technology information, and cross-functional communication; physical ones: such as linked
information systems, technology and shared hardware and software; and human ones: such as supplier participation on the project team and co-location of personnel are such partnership—is commonplace in software industry (Hoch et al., 1999). Barriers once overcome for one product may prove a great benefit for the firm for its next new product in same category (Ragatz et al., 1997).

**Element 6:** *New products improve their firms’ image and provide monetary as well as non-monetary benefits.* There are three themes represented by this element of firm-level benefit.

**Theme 6(a):** *New products or promise thereof assisted their firms in attracting venture capital.* New software product attracts venture funding theme surfaced in two cases. These firms greatly value this contribution of their new products. Uncertainty and informational asymmetries make arranging financing particularly difficult for young, high-technology firms because their assets are largely intangible and their potential benefits difficult to assess (Gompers and Lerner, 2001). Specialized financial intermediaries like venture capital funds are the only ones who overcome the information gap and provide critical financing to such fledgling startup firms (Ibid). In an extensive study of twenty industries over three decades in the US, Kortum and Lerner (2000) have found venture funding enhancing innovative benefits of firms. Hellmann and Puri (2000) have found the empirical evidence of venture funding helping Silicon Valley firms to reduce time-to-market of their products. Venture funding allows firms to pursue long term market strategies for new products without compromising only for short term revenues (Ibid.). There are ample studies justifying benefits of venture capital for knowledge intensive firms like software, but empirical evidence for this theme is hard to find in the extant newness-benefits literature.

Characteristics of software start-up firms (and their reliance on venture funding as one to bid their time) are described as:

“…those [firms] are primarily involved in the design and/or coding of minor software packages. They tend to be small units with limited financial resources or product vision to develop and market their own products. Nor do they have significant experience in large software development projects, and hence, do not attract contract jobs from larger software firms. Instead, they focus on managing their human resources judiciously and gaining valuable experience in product coding and testing.” (Nambisan, 2002, p. 149)
This description fits the case of Lynx very well but differs very much from COB’s case. It seems, not only small start-ups but also large software start-ups may need venture funding and can be a significant benefit of a new product for the firm.

**Theme 6(b): New products help their firms in repositioning themselves in the industry.** This theme was found only in the case of Lynx but this benefit of Lynx is very significant for the firm. L.Co managed to transform itself from a local (national) software services firm to an open source products and services firm having offices and representatives in Australia, Eastern Europe, Scandinavia and the US. The improvement in image caused by Lynx made the firm a legitimate supplier of credible services based on open source software as the capability to develop an open source OS was proved in the case of Lynx. The improved image of L.Co helped in marketing of new services like VPN solutions, remote email scanning and server maintenance. Banarjee (2003) has also pointed out that a firm’s image is important for a software product. Potential for growth of a software services firm is limited, at least in the short term, compared to software products firm, because scope to scale up a “service” is less due to time needed to enhance infrastructure, and hire and train personnel. Moreover, increasing returns of scale is much more remarkable in case of software products than in software services, if at all. Taking these aspects into account, an image improvement and consequent repositioning in the industry can be treated as a major benefit for appropriate software firms.

**Theme 6(c): New products helped their firms in attracting new partners.** This theme demands attention. Value of partners for the supply as well as for the marketing and distribution are recognized in the literature but studied firms recognizing this as a clear cut benefit was something new, not widely recognized in the newness-benefits literature.

Case study findings showed that software firms not only needed to cut down the time but also lacked resources to offer comprehensive solution. Hoch et al. (1999) have found reasons of partnerships as to fill up technology gap, to quicken time to market, and to gain higher market penetration. Extensive partnering solved many of these problems. For Nescit, TermMate attracted leading Scandinavian terminology firm as a partner which eventually took the product to overseas market.
In case of Commerce One, COB made it possible for the firm to partner with leading firms of the industry and bring the complete solution for COB customers. It was an achievement for a new firm like Commerce One to form a partnership with established firms like SAP. Athey (1998) have listed the formation of such partnerships as a major manager challenge of software firms. Doz and Hamel (1998) argue that such strategic partners can fill the skill and capabilities gap quickly, a vital requirement in an industry where rapid technological change makes time a scarce commodity. As COB was one of the pioneering product to establish electronic procurement solutions market, the firm was in a hurry so that it can set the industry standards. Stalk’s (1988) coined term “time based competition” highlights the importance of quick time-to-market for technology driven firms like Commerce One.

In an investigation of factors affecting new product success, Sivadas and Dwyer (2000) suggest that business alliances quicken the pace of and reduce risks associated with innovation. In case of COB, partner-alliance certainly helped in quick introduction of COB and other complementary product so that customers like British Telecom could make the full use of COB. However, the product could not survive long enough and hence the effect of partnership in case of COB cannot be commented.

5.4 Interpretations of Empirical Findings

The research in product newness and benefits has attracted significant interest since 1970s. However, most of the studies have been confined to tangible products of traditional industries, or to services. Even though the software industry has assumed a global proportion, the software product has largely remained outside the purview of researchers as the research literature on newness and benefits of software products is sparse. The growing importance of software makes it imperative to develop a theory of product newness and benefits that accurately applies to new software products. This study provides important information, about new software products’ newness and benefits to the firms which develop and market software products, and is expected to help in further investigations leading to an appropriate theory of software product newness and benefits to their firms.

The current study provided an empirically-grounded description of what a software product means to the firm in terms of its newness and benefits. Elements of software product newness and benefits were, further, compared with the relevant
literature to interpret newness and benefits as applicable to software products and software developing and marketing firms. The findings of this study are to a large extent similar to those found in the existing literature about “other” new products but few findings, as observed below, stand apart and seem significant for software products, and deserve attention in future studies.

5.4.1 Software Product newness
In respect to the technological familiarity, these software firms found their new products requiring unfamiliar technologies—for design and programming. For new products, firms require new design technology has been commonly found in previous studies but programming technology being peculiar to software was naturally not found. However, the programming can be considered close to the production (post-R&D and design activities, in order to actualize the design into a product) in traditional industries and, in that case, programming technology requirement of a new product can be treated as similar to production technology requirement found in the previous newness-benefits studies.

In respect to market familiarity, studied new products took their firms to new markets. These products had to serve new customers and meet new needs of old customers. Firms already having other products had to meet new needs of old customers, whereas start up firms, naturally, with their first offerings aimed for their first customers. In the extant literature, these elements of product newness are well recognized. New or new versions of the software products led their firms to face new competitors. Whereas new products leading to a new competition is well documented in past studies, new versions of a product capable of doing the same is hardly mentioned in the newness-benefits literature. Keeping in mind the introduction of new versions of software products every one to two years, the changing competitive scenario assumes serious proportion for the software firm. Studied new software products and their new versions necessitated new distribution channels. While many new products need to be distributed by a new channels (new to the firm) is commonplace and recognized in new products literature but the same change caused by new versions and that too so often seem unique to software products.

Pertaining to the technological fit dimension, findings are largely in agreement with the past literature. If programming resources are treated as production resource in case of software products, the newness literature recognizes that new products require
new/additional programming resources. However, new software products require new/additional complementary resources found little support in the newness literature. Even those firms who were self-sufficient to develop the initial versions of their product found themselves in need of the complementary technological resources, which they managed by partnering. New firms pursuing a more uncertain technology, no matter small (such as L.Co) or large (such as Commerce One), invariably entered into partnerships for complementary technological resources.

Marketing fit dimension findings got largely wide support in the newness literature. New products requiring new/additional sales force and distribution channel(s) were evident in many previous studies. The theme new product requires new/additional customer support is typical of knowledge-intensive products where customers need help in order to use the product fully. New products require new/additional sales and marketing partners is amply supported in the newness literature but the significance of sales and marketing partners for software products seems to be great.

The capacity of a new version of a software product to create noteworthy discontinuity in a firm’s resources and familiarity with environment stands apart. This phenomenon seems unique to software products. The role of complementary technological resources in the development of new (or new versions) of software products is very important but this element is not very obvious in the literature.

5.4.2 Software Product Benefits
Product benefits realized, or expected, but considered relevant varied from the firm to firm in the study. Different elements represented different kind of benefits envisaged by the software firms. These ranged from high financial benefits of the product (as in case of IarP) to benefits to the firm as a whole (as in case of COB attracting the venture funding or TermMate establishing a platform for future products). This finding of benefits being multi-dimensional is similar to many other previous findings in the new product literature.

Product-level benefits comprising of revenue, market share and profitability themes emerged as the most common product success criteria used by software firms. This observation did not come as a surprise. The extant literature on new product benefit is unanimous in the use of financial benefits by firms to evaluate their new products success (e.g., Craig and Hart, 1993). However, given the nature of software
industry—for example, rapid technological change (Symantec had to port Q&A from DOS-based to GUI-based), competing standards (COB had to be compatible with diverse software standards and communication protocols), short product life (Lynx had to be released in a new version every time a new Linux Kernel was released)—financial benefits painted only partial picture of product benefits. Though all studied firms wanted their product to be financially successful but took heart even if their products did not live up to the expectation financially but delivered on non-financial counts benefiting the firm in other ways.

While quite many empirical findings related to the firm-level benefits of software products tallied with the extant literature, few stood apart. The new product literature recognizes new product benefits such as the introduction of a platform for future new products, the enhancement of other products’ profitability, the opening of new market, the attracting of new customers, the meeting of new needs of old customers, the enhancement of old customers’ loyalty and the repositioning of firms. Of course, the finding new product brings non-monetary benefits to the firm is suggested in the literature but the importance some of the firms in study accorded to it seemed special. In their cases, non-monetary benefits seemed to more than compensate for product-level benefits (of their software product), whereas it (non-monetary benefits) is recognized largely as a secondary benefit-measure (financial measure as primary one) in the literature.

Another finding new software product attracts venture funding is unique to firms in knowledge-intensive industries and only rarely evident in the new product literature. Similar is the case of the finding new software product attracts new partners. Both findings seem very important for software firms but lack the commensurate support in previous studies. Studied firms accord so much importance to these two elements of product benefits, that these could be the one of the most important benefit in some cases in the larger interest of the firm.

Overall, the findings of the current study about software product benefit were largely similar to that described in the extant new product literature. However, the relevance of a particular benefit varied with the firm to firm and firms had their own priority about benefits. The results also suggest that some of the elements of benefits of new product, particularly attraction of venture funding and new partners, may be more important for software firms than the extant literature suggests. Even, the benefit
of a new software product in terms of repositioning of firms can be an important element of the firm-level benefits.

Obviously, complex issues like new software product newness and benefits can often be better understood when viewed through multiple perspectives. This study has described and interpreted both concepts from the firm’s perspective. As far as I know, there are not many similar qualitative studies of software product newness and benefits based on empirical data collected from the firms. Findings of this study add to the initial, exploratory information about software product newness and benefits and offer future research suggestions. However, it is important to keep limitation of this study in mind while considering its applications. As the study relied on qualitative methodology and did not use random sampling process, the results should not be generalized without any reservations. The findings are primarily useful in understanding the software product newness and benefits concepts and should be valuable for new product researchers and others interested in learning more about new products and their benefits to the firm. These findings can also act as a useful starting point for future research into new software product’s newness and benefits.

5.5 Limitations of the Study Findings
Following points should be taken into account while interpreting the results of this study. First, since the study described and interpreted software product newness and benefits only from the firms’ perspective the findings may be different from customers’ perspective or software industry perspective.

Second, the study did not intend to differentiate between major and minor benefits new software products for their firms. When the initial contact was made with the studied firms, it was mentioned clearly to them that the selection of product for study was their choice, irrespective of whether the firm thought the product to be a success or failure, or highly or lowly beneficial. So, although efforts were made not to discriminate among high/low benefit-products, it is possible that respondent(s) chose their favourite (or most disliked) products, hence, a possibility of biasness in their response.

Third, single informants in four cases and two informants in three cases were sources of primary information. Although the use of single informant is prevalent in the primary research design in new product studies, multiple informants may further enhance the validity of research findings. A manager in-charge can be expected to
have a great deal of knowledge about the product under study but multiple respondents naturally can provide more comprehensive and less-biased information. Hence, this study suffers partially from the single informant limitation.

*Fourth,* the possibility of cultural and structural differences among the seven firms covered in this study. Such differences might have affected cross case analysis and, hence, might have an effect on conclusions. However, Hoch *et al.* (1999) in their global study of software firms did not find any marked effect of national cultural differences on the practice or success of software firms in different countries.

*Fifth,* the small size of the sample and the method of sampling limit findings’ generalizability. However, it should be noted that the current study’s design was not to provide a generalized view but a detailed, rich description of software product newness and benefits from the firm’s perspective. Three firms from Sweden, two from the US and one each from Finland and India constitute the sample; number of employees range from six to 3,500 from the smallest to the largest firm. The effort was made to capture finer nuances of newness and benefits by selecting a sample as diverse as practically possible. Since firms for the study were selected purposefully (rather than randomly) this selection process may restrict the generalizability of the results.

The *sixth* limitation is typical of much of the research in new products—the use of retrospective methodology. This methodology is subject to threats to internal validity, hindsight bias, new product selection bias, and recall errors.

The *seventh* limitation is given the exploratory nature of the study it presents only such findings which seemed to be significant. Insignificant findings (See dropped themes in Tables 2.1 and 2.2) and their reasons are not being reported which may inhibit theory building (Brown and Eisenhardt, 1995).

### 5.6 Suggestions for Future Research

This study empirically explored the questions of what product newness and benefits are from the software firm’s perspective and attempted to describe and interpret the two concepts. As a preliminary study, it provided important information about what are the important aspects to be taken into account when software product newness and benefits are to be conceptualized (represented through elements) and operationalized (represented through respective themes of elements) in future research. Further studies
are needed to develop a better understanding of new software product in terms of newness and benefits.

5.6.1 Qualitative Investigation of Software Product newness and benefits
Cases for this study were selected to identify as many relevant elements of product newness and benefits as possible. The reason for adopting this criterion (of identifying and not filtering on the basis of significance) in the study was that so little was known about new software products. Moving beyond understanding software product newness and benefits, further studies could be undertaken to explore the relationship between product newness and benefits.

This study focused only on software products. The software-services is another significant segment of the software industry (Campbell-Kelly, 2003). A replication of this study in the context of software services firm should point out similarities and differences between the two types of software offerings (products and services). Findings of such a study would allow researchers to define key variables common to all software offerings. Additional qualitative investigations of software firms should throw more light on newness and benefits elements identified in this study; different samples may yield element(s) this study might have missed.

The present study covered firms that are solely in the software business but there are many firms who undertake software development alongside their other business. What (software) product newness and benefits mean to them? Additional studies can be recommended to better understand software newness and benefits.

5.6.2 Quantitative Investigation of Software Product newness and benefits
This study assists with an understanding of key elements (and corresponding themes) of software product newness and benefits, but a quantitative research can be useful in determining the validity and the generalizability of findings of this study for software products in general. Admittedly more qualitative studies should be conducted before beginning quantitative analyses of software product newness and benefits. However, results of the present study do suggest elements (and themes of product newness and benefits) that lend themselves to quantitative research.

Based on the suggested elements and themes, in this study, which help to conceptualize and operationalize a software product’s newness and benefits from the
firm’s perspective, a survey could be generated. Such a survey could include all of these elements and ask respondents to choose and rank these elements. This survey could be sent to a large number of software product firms and the results could sift major and minor elements of software product newness and benefits from the firm’s perspective. Results of such a study may enable researchers to develop a more comprehensive understanding of software products and may lend credibility to qualitative findings.

Alternatively, a survey could be designed combining (software product newness and benefits) elements identified in this study and NPD process variables from the extant literature. Results of such a survey may throw light on the relationship among software product newness, NPD process, and benefits. Findings of such a study should be useful both to researchers as well as practitioners. Researchers can learn more about causal relationship among the three; managers can use the findings in the better management of software NPD.

5.7 Implications of the Study
The research in product newness and benefits has grown in volume (Henard and Szymanski, 2001), but it is doubted if it has enhanced our knowledge of new product success/failure or has helped firms in improving the success rate of new products (Craig and Hart, 1992). One of the reasons of the limited use of such findings is inclusion of more than one industry in majority of studies. Finding large enough samples within one industry is often difficult, hence researchers tend to include a variety of industries in a single study (Story, Smith and Saker, 2001). Inclusion of many industries in single study results in “average” results due to the generalization made across diverse industries (Cooper and Kleinschmidt, 1993b). Such generalized results add only limited understanding to the newness-benefits research field.

Practitioners do not benefit sufficiently from such generalized findings as they cannot relate these to their particular product development context (Story et al., 2001). Craig and Hart observed: “they are unable to relate them directly to their own situation” (1992, p. 38) and suggested adoption of a contingent approach by researchers in studying success/failure factors so that results could be more useful. Being limited to only one industry this study tried to limit inter-industry effects that have plagued many previous new product studies (Cooper and Kleinschmidt, 1993b,
Lilien and Yoon, 1989) with a hope that findings will be found useful both by new product researchers as well as managers.

5.7.1 Implications for New Product Researchers
Previous studies have identified fit and familiarity as dimensions of newness consisting of technological and marketing aspects (Garcia and Calantone, 2002, Danneels and Kleinschmidt, 2001). The present study identified elements that constitute product newness and benefits from the firm perspective for new software products. These findings are presented Tables 4.1 (p. 77) and 4.2 (p. 81). The distribution technology emerged as a unique element of the technological familiarity; the complementary technology resources were identified as a vital element of the technological fit. The customer support as well as the new sales and marketing partners were found to be important elements of the marketing fit.

Although there has been little consensus on how to measure new product benefits (also called success or benefits in new product literature) (Hart, 1993), the use of financial measures is most common (Cooper and Kleinschmidt, 1987a, Storey and Easingwood, 1999). Lately, researchers have begun to include non-financial measures in study of new product benefits to include wider benefits of new products to the firm (Storey and Easingwood, 1999). The present study validates this practice as product-level benefits (consisting of financial themes) along with firm-level benefits (wider benefits of new products) were treated as important by studied firms. Wider benefits such as attracting venture funding, repositioning the firm, and attracting critical partners emerged as important benefits of new products for software firms. These relevant and somewhat uncommon elements and their associated themes of newness and benefits should help in the appropriate operationalization of these concepts in future studies; vague and inappropriate operationalizations have been one of the major shortcoming of new product research (Garcia and Calantone, 2002, Henard and Szymanski, 2001, Montoya-Weiss and Calantone, 1994).

In some cases of this study new versions of a product were found to disrupt fit and familiarity of firms in a significant manner. This feature of a new version deserves attention in future studies of software or other industries where technological change is rapid and significant; new version of products radically different from their earlier products. An implication of this finding is that new versions could be treated more as a new product than as a minor variation of older product.
5.7.2 Implications for New Product Managers

Findings of this study are of interest to new product managers also. Understanding a new product’s newness better, and especially what a new product means to their firm in terms of fit with resources and familiarity with market and technology is of much importance. Managers can select appropriate new product projects and product portfolio strategies for their firm with an improved understanding of products’ newness. To start with, they can choose market(s) that their firm wishes to be in and customers their firm wishes to serve. Accordingly, they can select technologies and products that the firm needs to develop and market. Moreover, managers can decide the basis of competition for their firm, such as value-proposition, unique features, reliability, etc. The proper understanding of product newness vis-à-vis the firm can not only guide in selecting a viable new product project but also help in clearing (approving, making changes or abandoning) on-going new product projects. This may help in maximizing the kind of benefits the firm expects from the new product and reducing risk of failure of a new product project.

The findings of this study suggest that (new software) product benefits are of different types. Product-level (financial) benefits are obviously primary aims of software firms like any other firms, but some other wider, firm-level benefits deserve managers’ attention. For start-up software firms, raising the initial capital from public sources is usually troublesome. A new product in pipe-line having a sizeable revenue potential by sale or service of the product makes venture funding for the firm possible. A new software product also opens a window of opportunity or proves to be a platform for future products. In certain cases, a new product raises the legitimacy among customers and potential partners which the firm makes use of in times to come. Depending upon the type of benefit desired by the firm, managers can set realistic evaluation criteria for measuring the success of a new product. These criteria may include even strategic-ones like enhancing the firm’s image, repositioning of the firm, creating a product platform, attracting prestigious partners, etc. Managers need to be certain about expected benefit(s) of the new software product to give a go/no go signal to the software product project or to evaluate the products’ benefits after introduction in order to decide about further development of the product. Use of inappropriate or limited benefit-criteria may lead to the killing of a deserving project/product or the wastage of resources and opportunity loss by continuing with the “wrong” project/product.
5.8 Conclusions
Even though software products are ubiquitous now, the topic of software product has largely skipped the attention of new product researchers. Findings of this study offer valuable insights into software product newness and benefits, namely what these mean to a software product firm. For what software product newness means to the firm, the study identified elements and corresponding themes of technological and market familiarity as well as technological fit and market fit. From the seven-case database themes and, eventually, elements emerged which described software product newness. In this study, it was found that new software product required new/additional design and programming and distribution technologies, took the firm to a new market and created new competitors. The firm had to serve new customers with the new product and meet new needs of old customers and in the process firm had to resort to, among others, unfamiliar distribution channel.

In respect of technological fit, new software products required new design and programming resources (including skills and capabilities). Another noteworthy finding in this context was the need of complementary technological resources. In respect of marketing fit these firms found new product necessitating new/additional sales force, distribution channel, customer support and partners. Importance given by these firms to partners for the development and marketing of their software products deserve special attention.

Several conclusions with respect to product newness can be elicited. First, the distribution technology seems to be very relevant for software firms. As a digital product it is suitable for distribution over Internet, reaching to a much wider market and that too instantaneously. As an intangible product, it lends to be tested by prospective customers, who can access the product through Internet with little cost to the software firm. Second, the role of complementary technological and marketing resources—for design, development, marketing and adding value to the product—for these software firms prove to be vital. These firms found themselves short of resources, skills, capabilities and time to do everything themselves. Given the rapid technological change, competing standards, short product life cycle and intense competition, the reasons for partnering by software firms to complement resources and cut down on time-to-market and reduce risk can be easily understood.

The third conclusion highlights the capacity of a new version of a software product to create discontinuity in firm’s familiarity with business environment and fit with resources. Even though some of the studied firms had developed a product on its
own and had marketed it successfully, new version of the same product proved more like a new product (development and marketing) for the firm; existing resources and market and technological familiarity ceased to be sufficient. Given a very short life of most software releases, a software firm finds in a new situation every so often with new versions is probably unique to the software product firms.

Pertaining to the product benefits to the firm, this study underscores some of the findings not generally evident in the new product literature but critical to software firms. One is non-monetary benefits of new products accruing to the software firm. Studied firms, of course, expected financial benefits but also gave great importance to other wider benefits of new products. It was found that one firm wanted to reposition itself, another wanted to create a serious impression in the market, a third firm appreciated partnership with the leading industry firms made possible by the product. This phenomenon might not be unique to software firms but it means a lot to these firms; sometimes more than financial benefits of the product in question.

Another new product benefit that proved to be very relevant was the ability of a new software product to attract the venture funding. As the ability of traditional financing institutions to evaluate the potential of new software product is limited and such institutions lack mechanism to exercise control over spending by such firm, they usually hesitate to finance new start-up firms in an industry like software. Given the limited financing option available to software firms in formative stage, it becomes a vital benefit of the new (or proposed) product.

Next conclusion is about the effect on firm’s image created by the new software product; repositioning of the firm can be treated as special case of it. A product is the most plausible, and in many cases only possible, means to create a brand equity for the firm. The value of a brand can be readily appreciated, because a brand image can, to a certain extent, make or mar a software firm which is operating in a mass market. Hence, the importance accorded on this count to the new software product.

The last conclusion is about the ability of a new software product to attract partners. Since many of the resources of software firms are in intangible forms, it is the potential of the product that can entice meaningful partners for the firms for their first products. Once a firm has built a market presence and a positive firm image, it can leverage its position to enter into such partnership to further consolidate its position.
PART II: The Quantitative Study

An Introduction

The purpose of this research was “to explore effect of newness of new software products on the benefits to the firms”. As discussed in Chapter 1 and Appendix II, research findings in this field has not been coherent--one reason being flawed conceptualization and operationalization. To overcome this shortcoming, Part I was conducted so as to measure newness and benefits of new software products as applicable to software product industry.

Part II is dedicated to testing quantitatively the connections between newness and benefits in the context of new software products. Moderating role of environmental factors, namely, switching costs of customers, prevailing aggressive marketing practices, and prevalence of computer mediated transactions, were considered while studying the effects of product newness on benefits. Data from 321 Swedish computer software products were collected and analyzed.

This quantitative study part is organized under four chapters: Chapter 6 presents the conceptual framework and hypotheses to be tested in this study, Chapter 7 describes the research method, Chapter 8 covers the data analysis, hypotheses testing and results, Chapter 9 presents discussion and conclusions of this quantitative part.
Chapter 6: Conceptual Framework and Hypotheses

The conceptual framework of quantitative part of this dissertation is presented in this chapter. This framework covers the linkage between new product newness and new product benefits acknowledging the moderating role of Environmental Factors, namely switching costs, aggressive marketing practices, and prevalence of computer mediated transactions. Corresponding hypotheses are interspersed in the discussion.

6.1 Conceptual Framework

New product newness and new product benefits appear (mostly separately and seldom together) in marketing-, strategy-, and other related research-fields. Despite their presence, the discourse on the role of NP newness plays in the NP benefits is ambiguous. The conceptual linkage between NP newness and NP benefits is far from being conclusive; the empirical linkage in the context of software firms difficult to find. Understanding the linkage between NP newness and NP benefits is crucial in order to understand the NP’s success or failure from the firm’s perspective; it is also vital for software firms for the improvement in their new product benefits. The disaggregation of benefits into product-level and firm-level benefits and incorporation of industry-specific environmental factors in the framework is expected to result in some concrete, novel findings pertaining to NP newness and benefits relationship and to fill some gaps in the NP literature.

The focus, therefore, is on understanding how NP newness is related to NP benefits and how the software industry-specific environmental factors moderate this relationship. Figure 6.1 presents the conceptual framework of this study. The oval on the left side named New Product Newness consists of technological familiarity, market familiarity, technological fit and marketing fit. This oval is linked to New Product Benefits on the right side, where New Product Benefits comprises of product-level benefits and firm-level benefits. This link between NP newness and NP benefits is affected by the switching-costs, prevalence of aggressive marketing practices, and prevalence of computer mediated transactions, jointly labeled environmental factors at the bottom of the framework.

Rest of this chapter is organized as follows: next section discusses the various dimensions of NP newness and the role they play in affecting NP benefits. The section
thereafter presents the moderating role of NP newness on the relationship between NP newness and NP benefits.

**Figure 6.1:** The conceptual framework of the impact of NP newness on NP benefits and the moderating effect of industry-specific Environmental Factors.

### 6.2 Impact of Various Dimensions of NP Newness on NP Benefits

Marketing fit, technological fit, market familiarity and technological familiarity are the four dimensions of New Product Newness. Likewise, product-level benefits and firm-level benefits are the two dimensions of New Product Benefits (see Chapter 2 and Appendix II). In this section the impact of various dimensions of New Product
Newness on New Product Benefits in the context of new software products is hypothesized.

6.2.1 Marketing Fit
The effect of firm resources on new product benefits has long been studied by the new product researchers. It has been commonly termed as “product-firm synergy” to denote the fit of new product projects with firm resources. From the seven case studies conducted in the first phase of this research, it was found that marketing fit in terms of sales force, distribution channel, product launch approach, sales and marketing approach, aggressive marketing, and sales and marketing partner are the six relevant measures for new software products.

The past research has found an overall, positive impact of marketing and technological fit on new product benefits. As per Cooper (1979) marketing proficiency, and marketing synergy are associated with a high new product success rate. Similarly, Zirger and Maidique (1990) also concluded that successful new products had higher synergy with existing marketing competencies of the firm. Song and Parry (1997a) found that marketing synergy has a positive impact on financial benefits of new Japanese products. Marketing synergy increases new product benefits through its impact on the quality of implementation of marketing tasks.

As the findings of the first phase of this research suggests, new product benefits should be studied under the two dimensions of product-level benefits and firm-level benefits. Accordingly, it is expected that when a firm draws on its existing marketing resources, i.e., when it pursues a new product project with high marketing fit, it is more likely to be successful.

**Hypothesis 1A (H1A):** The higher the marketing fit of the firm needed for the new product, the higher product-level benefits will it generate.

**Hypothesis 1B (H1B):** The higher the marketing fit of the firm needed for the new product, the higher firm-level benefits will it generate.

6.2.2 Technological Fit
Similar to marketing fit technological fit has also been found by new product researchers to positively affect new product benefits. Technical and production synergy were among the several factors which were associated with a higher success
rate of new products in the study by Cooper (1979). Synergy with existing technologies of the firm were associated with successful new products in Zirger and Maidique’s (1990) study. Song and Parry (1997a) concluded that technical synergy positively affects new product benefits as the quality of implementation of technical tasks during the new product development process is much better when there is a synergy.

As new product benefits is composed of product-level benefits and firm-level benefits, it is expected that the level of technological fit of a new product to the firm will lead to higher benefits on both counts.

**Hypothesis 2A (H2A):** The higher the technological fit of the firm needed for the development, distribution and support of the new product, the higher product-level benefits will it generate.

**Hypothesis 2B (H2B):** The higher the technological fit of the firm needed for the development, distribution and support of the new product, the higher firm-level benefits will it generate.

### 6.2.3 Market Familiarity

New products targeted at familiar markets tend to have a higher success rate. Not only the fit in terms of synergy but also the familiarity contributes to the new product benefits. Previous studies findings are, however, a little ambiguous. Whereas fit or synergy is conceptualized and measured distinctly, familiarity is sometimes either left out or covered poorly (Danneels and Kleinschmidt, 2001). For example, in a study of large chemical firms it was found that familiarity might not be particularly effective in success or failure prediction of new products (Cooper and Kleinschmidt, 1993a).

Normann (1971) argued that the familiarity of the firm’s domain makes it possible the perception and interpretation of signals from the domain. The easier perception and interpretation of environmental signals coupled with established the firm’s established communication channels with the domain facilitate a better new product benefits. As the new product benefits is found to comprise of product level benefits and firms level benefits, it can be expected that:

**Hypothesis 3A (H3A):** The higher the marketing familiarity of the firm needed for the new product, the higher product-level benefits will it generate.

**Hypothesis 3B (H3B):** The higher the marketing familiarity of the firm needed for the new product, the higher firm-level benefits will it generate.
6.2.4 Technological Familiarity
Similar to market familiarity technological familiarity too has been found in previous studies to positively affect new product benefits. The rationale remains the same that the easier interpretation and perception of signals from the familiar technological environment and established communication channels within the domain enhance the new product benefits. Hence, technological familiarity can be expected to aid to benefits of new software products through enhancing both product level benefits and firm level benefits.

**Hypothesis 4A (H4A):** The higher the technological familiarity of the firm needed for the development, distribution and support of the new product, the higher product-level benefits will it generate.

**Hypothesis 4B (H4B):** The higher the technological familiarity of the firm needed for the development, distribution and support of the new product, the higher firm-level benefits will it generate.

6.3 Moderating Role of Environmental Factors
As gleaned from the conceptual paper of Varian (2001), the pertinent moderating environmental factors for software product industry can be categorized under three major factors: switching costs of customers, prevailing aggressive marketing practices, and prevalence of computer mediated transactions. Each of these three are discussed below.

6.3.1 Switching Costs
Durable investments made by customers in complementary assets act as a disincentive to switch to another product (based on another technology) when the time comes to replace the original product, or to buy a next generation of the product if the product has a multi-phase life-cycle. In such a situation, the customer is “locked-in” a certain system. If such a customer decides to switch over to a new product based on another technology he/she has to incur switching costs in terms of purchase of new complementary assets and learning new skills. The phenomenon of lock-in is very relevant to an information product like software, because information is handled—stored, manipulated, and communicated—not alone in isolation but in a system.
comprising of multiple pieces of hardware and software, and a specialized training is needed to use a specific system.

With the purchase of a product a customer is initiated in a long process. With the passage of time the customer usually gets more proficient with the system which results in increased productivity and the customer gets increasingly more value out of the investment over a period of time. A selling firm would prefer such a locked-in situation for its customers as that will enable the firm to charge a premium for its products in future. However, even if the lock-in of the customers to the firm’s proprietary technology increases profit margin of future unit sales, it limits the possibility for other firms to offer complementary products and join the market. In such a situation, the market (size) based on the firm’s proprietary technology may stagnate which could be a risky proposition, particularly if there are other technologies competing to become the industry standard.

There is a risk not only of diminishing market size but also of increasing unit cost to serve the locked-in customers. In such cases a lock-in may result in a disadvantage also for the firm, at least in the long run. Even if the firm wants to shift to a new technology, the obligation to provide backward compatibility may turn out to be a liability. Lock-in may occur at system-level or vendor-level: system-level lock-in pertains to a particular technology and vendor-level lock-in is applicable to one or more firms providing solutions based on that particular technology. A firm aiming for an absolute lock-in of customers exclusively to itself will opt both for system-level and vendor-level monopoly. But such a situation would not be very promising for potential customers as a choice of vendors symbolizes a competitive market and an assurance of continuation of the system even if one of the vendors ceases to operate. A vendor-level lock-in is not as strong as a system-level lock-in, for both customers as well as the firm.

In markets where many small firms are vying intensely for the market share, a situation similar to “perfect competition,” there is a strong likelihood of price to be driven close to the cost, squeezing the profit in the process. If there is not much friction, a customer can easily switch to a competitor or, still worse, make several switches taking advantages of invitation offers of several firms in a series, and finally settles for the lowest price supplier. However, this scenario is not applicable where

35 Example of frictions could be anything which adds to the switching cost, such as longer time-period to cancel a contract, need to learn user-interface of the new product, buy new set of equipments, etc.
there is a friction in the form of high switching costs. But in order to build an installed customer base, a supplier has to bear the cost of attracting new customers who are locked-in with competing technologies or suppliers unless the product is very innovative, new to the world kind. This is more applicable to such suppliers who are introducing a product which is directed mainly at new customers to the firm. The investment made to create the installed customer base can become profitable only after a period of time depending upon the profit margin of the product. To augment the profit from this customer base a supplier may offer own complementary products or those in association with partners (actually earning by providing access to its customer base to partners). There is an opportunity for the supplier to use proprietary technology in the original or complementary products to increase the lock-in of customers and make the switching costs still higher – a preferred situation for the supplier.

However, when switching cost is significant both fit with resources and familiarity with environment will be expected to have a greater impact on new product benefits. In other words, in the presence of customers’ switching costs marketing fit and technological fit will be expected to result in higher product-level benefits and firm-level benefits.

**Hypothesis 5A (H5A):** The higher the switching costs of customers, the higher will be the impact of marketing fit on the product-level benefits.

**Hypothesis 5B (H5B):** The higher the switching costs of customers, the higher will be the impact of marketing fit on the firm-level benefits.

**Hypothesis 5C (H5C):** The higher the switching costs of customers, the higher will be the impact of technological fit on the product-level benefits.

**Hypothesis 5D (H5D):** The higher the switching costs of customers, the higher will be the impact of technological fit on the firm-level benefits.

In a similar way as marketing familiarity and technological familiarity will be expected to yield higher product-level benefits as well as firm-level benefits.

**Hypothesis 5E (H5E):** The higher the switching costs of customers, the higher will be the impact of market familiarity on the product-level benefits.

**Hypothesis 5F (H5F):** The higher the switching costs of customers, the higher will be the impact of market familiarity on the firm-level benefits.
**Hypothesis 5G (H5G):** The higher the switching costs of customers, the higher will be the impact of technological familiarity on the product-level benefits.

**Hypothesis 5H (H5H):** The higher the switching costs of customers, the higher will be the impact of technological familiarity on the firm-level benefits.

### 6.3.2. Prevalence of Aggressive Marketing Practices

Software is an information product\(^{36}\), in the sense that the value of the product lies in the information contained in the product rather than the physical embodiment of the product. Books, audio-CDs, movie-DVDs also are examples of information products. Such products have a distinctive cost structure: regarding production, while fixed costs are very high, marginal costs are very low. It other words, the first copy of an information product costs quite a lot but the second copy onwards costs almost nothing, particularly if the product is a digital one. This type of cost structure creates a problem for firms implementing a cost-based pricing policy, which is commonly used for industrial products. The cost-based pricing cannot be used for information products because the marginal unit cost is close to zero. In that case, rather a value-based approach makes more sense: selling a product at a different price to each (or a group of) customer(s), where the price offered depends upon the inherent value of the product for that particular customer and his/her willingness to pay for it.

In case of information products like software, the major part of fixed costs is sunk cost—cost that cannot be recovered at all if production is stopped or has little market salvage value. The marginal unit cost of information products also has a special feature: it does not increase even if a very large number of units are produced; it remains constant, or in some cases even decreases, with the number of units produced, because there is almost no natural capacity limit to the production of additional copies of information products. Large fixed costs and small marginal costs lead to significant economies of scale\(^{37}\).

These characteristics—high fixed costs but very low marginal costs; major costs as sunk costs; almost constant marginal costs; and no natural capacity limit—

\(^{36}\) In economics, the term “information goods” is more commonly used.

affect market structure. A typical competitive market is populated by a large number of firms offering similar products where no single firm is capable of influencing the price profitably, at least in the long run. Such a structure is typical in commodity industries where supply of goods is limited. Once several firms have sunk the (fixed) costs to produce the product, competition among them for market share usually forces the price close to the marginal cost. But in an information industry like software, the products are virtually in unlimited supply and marginal costs are negligible. In this situation what are the possible market structures and how product newness is significant for a firm?

Two possible, extreme scenario of a market structure can be visualized: (1) one, a “cost leader market,” in which a dominant firm prevails by leveraging its size and scale economies to gain a vital cost advantage over smaller competitors, and (2) the other, “a differentiated product market,” in which a number of firms produce similar, but differentiated products to serve niches of the markets (Shapiro and Varian, 1999). This visualization is based on Porter’s (1985) competitive strategy argument that a firm either opts to gain a cost leadership through economies of scale and scope, or to differentiate its products from that of competitors in order to compete successfully. But in either case the price of product is crucial in order to compete in any of the two market-structures—to be a cost and price leader based on scale or to charge a premium based on unique value to the customer.

Firms following a cost leadership strategy in traditional industries focus on marginal cost of production which is a function of costs of parts, assembly and distribution. In order to reduce costs, these firms adopt sophisticated supply chain management, workflow analysis, etc. But for a firm in information industry, marginal costs of production are almost zero and techniques like supply chain management has limited role which means a firm has no other way than to increase the sales volume in order to reduce the average unit cost. Moreover, firms in information industries get unique opportunities to implement differentiation strategy without incurring unduly high costs or taking huge risks. For example, software firms offer trial versions of their products, a menu of options out of which a buyer can choose what suits him/her, various modes of product delivery, different kinds of technical support, future upgrade

38 Even if in reality most markets are a combination of varying degrees of the both types, this visualization of two extremes is helpful in elucidating the value of price in either types of market structure.
options, all providing scope for ample differentiation of the product. Moreover, functions embedded in the product empower even users to customize the product to suit his/her needs and preferences. It is remarkable that many of these differentiations do not carry any additional, significant marginal cost on the part of the firm.

The firm’s compulsion to offer the new product in a range of differentiated forms and/or to differentiate from the competing products by including new features in to the new product is one of the manifestations of aggressive marketing practices.

For a first mover in the software industry, the adopted price-level can affect the future market structure and the firm’s profits. If setting too low a price may create a large installed customer base but little financial profit, setting too high a price may result in significant sales revenue per unit sold but more importantly it may invite many competitors. Any pricing policy other than the limit pricing—setting an optimum price high enough to make a profit but low enough to discourage potential competitors from investing sunk costs needed to enter the market—is less than ideal, because a durable product like software sold at a reasonable price (compared to at an exorbitant price) to a significant number of customers may reduce the residual demand for a similar product, at least for some time, limiting the attractiveness of the market for potential competitors. Moreover, customers may get locked in with the first mover and find it expensive to change the vendor in the future unless there is very significant reason to do so. In any case firms strive to set new products’ price in an aggressive, idiosyncratic manner, one more manifestation of aggressive marketing practices in the software product industry.

Software lends itself to personalization (and customization): variants of a basic product can be economically customized by the firm to suit a particular customer or a group of customers having similar needs. This feature of software makes it possible for a firm to differentiate the product even in a commodity-like market. The potential benefit for the firm is that the personalized product can be sold at a higher price due to the absence of generic competitors and because such a product holds a higher value in the eyes of customers in the target segment. A software firm’s inclination to offer variations of the basic product in order to meet the competition and increase the sales adds to the aggressive marketing practices.

Ideally every firm would like to practice perfect price discrimination—charging each customer exactly what he/she is ready to pay. However, in practice, it is very difficult. It is not easy for a firm: to find out what price a potential customer is
willing to pay; how to administer a differentiated pricing policy without the other customers not knowing about it; or to prohibit high-price category customers from availing the low-price. There can be three kinds of price discrimination: first, second and third degree price discriminations which are called more descriptively by Shapiro and Varian (1999, p. 39) as personalized pricing, versioning, and group pricing respectively. Under personalized pricing a product is sold to each customer at a different price; under versioning a firm offers a menu of options and the customer selects the most appropriate version; under group pricing different prices are charged from different groups of consumers for the same product.

Available information (e.g., location, demographics, past purchase behavior,) about a potential customer can be used by a firm to personalize the price very effectively. Tracking the IP address, an anti-virus software firm may offer a higher price to a long-time customer whose annual subscription is going to run out shortly and may offer a lower “invitation” price to a new, potential customer. This practice is not unique only to firms in software industry, but the ease, negligible cost, and largely automated function stands out. Software firms can be expected to follow differential pricing practice in order to increase installed customer-base as well as to increase sales revenue.

The practice of differential pricing can be a temporary one, e.g., for the purpose of market research to find out market potential in different market segments and/or at various price-points, or it can be a permanent one. A wide range of licensing practices is common in the software industry. Out of many which one a firm uses is not of particular interest for studying newness; but a departure from its usual pricing practice adopted at the firm for the new product is of interest, as the new model of revenue for the new product may create a discontinuity for the firm.

Interestingly a software firm may create a menu of variants of a basic product to offer and let the customer choose the most appropriate one. It takes little extra cost for the firm to create these variations on the basic product but it permits sales revenue to be close to optimum without much prior customer-related information, or market research. This versioning of a product into a menu of products (or product line) leads to market segmentation by self selection by the customers. Different variants highlight peculiar needs of a particular segment, seem more valuable to customers in that segment and extract higher revenue for the firm. Variations can be based upon any
parameter vital to potential customers, such as features and functions, support, user-interface, speed of operation, capability, etc.

In appropriate cases, a software product can be priced specially for a group of customers who has a distinct characteristic (market segmentation), a practice called third-degree price discrimination. Reasons for doing this include price-sensitivity of members of the group, anticipated network effects among the group (owing to the use of one and the same standard), and lock-in for the future as switching-costs increase with the use and time.

In the presence of the above mentioned prevalent marketing practices, termed collectively “aggressive marketing practices” fit with resources and familiarity with environment will be expected to enhance new product benefits in the form of higher product-level benefits as well as higher firm-level benefits. In the context of marketing fit and technological fit, following hypotheses could be derived:

**Hypothesis 6A** (H6A): The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of marketing fit on the product-level benefits.

**Hypothesis 6B** (H6B): The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of marketing fit on the firm-level benefits.

**Hypothesis 6C** (H6C): The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of technological fit on the product-level benefits.

**Hypothesis 6D** (H6D): The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of technological fit on the firm-level benefits.

And in the context of marketing familiarity and technological familiarity, following hypotheses could be derived:

**Hypothesis 6E** (H6E): The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of market familiarity on the product-level benefits.

**Hypothesis 6F** (H6F): The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of market familiarity on the firm-level benefits.
**Hypothesis 6G (H6G):** The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of technological familiarity on the product-level benefits.

**Hypothesis 6H (H6H):** The higher the prevalence of aggressive marketing practices in the industry, the higher will be the impact of technological familiarity on the firm-level benefits.

### 6.3.3 Prevalence of Computer Mediated Transactions

As far as distribution is concerned, a digital product like software has a few inherent advantages compared to physical products. Digital products can be replicated (produced) on physical media at multiple sites without any significant loss in the profitability or quality of the product. This characteristic not only means a multi-site production but also enables a software firm to launch its product full-fledged in many markets simultaneously. Another characteristic of a digital product is that customers can customize the product themselves without any significant cost to the firm. These customized products can be distributed through wide networks like Internet. If the software is directly downloaded from the producing firm, there is no risk of product getting obsolete. Even for installed products, customers can download minor, periodic revisions or patches keeping the software up-to-date. By the extended reach due to digital distribution made possible by the Internet, a firm has a potentially large target market. These advantages mean increased opportunities but few risks too to software product firms: while the cost of distribution is greatly reduced for the firm, the means available to protect the product from unauthorized copying is limited. While the firm can reach to a very wide market effectively and efficiently, it has limited protection from mala fide competitors even in its “home” market. This situation probably demands a revised business model.

Digital technology affects both reproduction costs and distribution costs *simultaneously*. Reproductions of digital products usually are perfect copies of the original and can be distributed easily, quickly and economically. The lower distribution costs can be used by a software firms to promote the product and to gain a critical market-share quickly. Through offering the product sample at almost negligible reproduction and distribution marginal costs, a software firm has the potential to create a demand for the new product. Since software is an experience goods, firms need to provide product samples to potential customers so that they can evaluate the product and make an informed buying decision. The reach and cost
effectiveness of distribution is not limited to the distribution of samples but is equally effective for selling the product. Existing capabilities and experience may affect the potential of a firm to exploit this opportunity of utilizing digital nature of the product and distribution media like Internet to distribute the sample or sell the product. Understandably software product firms will be expected to adopt direct channels to reach the end customers.

**Computer-mediated transactions**

There are several types of licensing arrangements used by software firms to sell their products. Many are formulated so as to maximize the sales revenue over a period of time. With every new version of the software, a new license (at a price) is offered to the existing customers by the firms. In this setup, a physical media carries the software from the software firm to the customer through a distribution channel. Until very recently, this was practically the only way used to distribute software products on an on-going basis. Now, many customers and software firms are connected directly through Internet making it possible to execute computer-mediated transactions bringing efficiency in the distribution process.

The availability of hardware and software to monitor computer-mediated transactions and licensing has become within the reach of many firms; the costs involved have decreased making it a viable option. The fast-connectivity of Internet has also made it a realistic distribution channel for digital products in the large part of industrially developed world. However, the expertise needed to leverage this new medium of distribution is yet to be mastered by many software firms. A unique facet of this medium of distribution is that it makes even a delivered product always a work-in-progress—the producing firm can make improvements, deliver and incorporate the new changes continually to the product being used by the customers. This can be done by the software firm automatically in the background with the explicit permission of customers. For example, many anti-virus software are continually updated in the background, or customers opt to check for available updates or technical bug-fixes time-to-time and install them manually. Software firms may either not have the infrastructure (hardware, software and manpower) or face a learning curve to make use of this new facility effectively and profitably. However, more prevalent the computer mediated transaction, higher will be the impact of fit
with resources and familiarity with environment on the new product benefits. Hence, in the context of marketing fit and technological fit, it will be expected that:

**Hypothesis 7A (H7A):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of marketing fit on the product-level benefits.

**Hypothesis 7B (H7B):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of marketing fit on the firm-level benefits.

**Hypothesis 7C (H7C):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of technological fit on the product-level benefits.

**Hypothesis 7D (H7D):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of technological fit on the firm-level benefits.

And in the context of marketing familiarity and technological familiarity, it will be expected that:

**Hypothesis 7E (H7E):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of market familiarity on the product-level benefits.

**Hypothesis 7F (H7F):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of market familiarity on the firm-level benefits.

**Hypothesis 7G (H7G):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of technological familiarity on the product-level benefits.

**Hypothesis 7H (H7H):** The higher the prevalence of computer mediated transactions in the industry, the higher will be the impact of technological familiarity on the firm-level benefits.

### 6.4 Chapter Summary

Based on the literature review of NP newness and NP benefits in the chapter 3, this chapter put forward the research framework and described the hypotheses that are going to be studied in this study. In short, it is hypothesized that the various dimensions of NP newness will be positively correlated with product-level benefits and firm-level benefits, the two components of NP benefits. Moreover, the level of industry-specific Environmental Factors will also positively moderate the link
between NP newness and NP benefits. The next chapter describes the research method used for this quantitative part of the study.
Chapter 7: Quantitative Research Method

This chapter describes the methods and principles used to investigate the research framework and the hypotheses presented in Chapter 6. In the first section variables and their measurements items and in the second section the research instrument and its face validity test are described. In the third section the pilot study and in the fourth sample and data collection method are presented. In the fifth section data analyses techniques are elaborated. The chapter ends with an overview of Structural Equation Modeling technique.

7.1 Measurements of the Variables

As mentioned in previous chapters, in this study Product Newness has been conceptualized as consisting of

1. Marketing Fit (MFit),
2. Technological Fit (TFit),
3. Market Familiarity (MFam), and
4. Technological Familiarity (TFam),

New Product Benefits has been conceptualized as consisting of

5. Product-Level Benefits (PLB), and

And Environmental Factors as consisting of

7. Switching Costs (SC),
8. Aggressive Marketing Practice (AMP), and

Table 8.1 lists the six variables constituting Product Newness and New Product Benefits and their corresponding measurement items. The first column from the left mentions the name of the variable. The second column lists the number of items used to measure the corresponding variable. The third column shows the primary reference the particular scale is based upon along with vital scale details. The fourth and fifth columns list item codes and their brief descriptions. The sixth column presents the questionnaire (see Appendix VI) question number of respective measurement item. The seventh, and the last, column mentions the theme or element number the
particular item refers to in the qualitative study findings. Most of the tested measurement items were adapted wherever needed to suit the special context of software.
Table 7.1 Variables and Measurement Items of Product Newness and New Product Benefits

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measured by</th>
<th>Scale derived primarily from</th>
<th>Item Code</th>
<th>Item Description</th>
<th>Questionnaire Q. No.</th>
<th>Refers to the qualitative study</th>
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</thead>
<tbody>
<tr>
<td>Marketing Fit (MFit)</td>
<td>6 Items</td>
<td>Danneels and Kleinschmidt (2001); - Measured by 10-point Likert type scale; - Cronbach α reported: 0,85.</td>
<td>MFit1</td>
<td>Additional Sales Force</td>
<td>21</td>
<td>Theme No. 6(a), Table 4.3, p. 129.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>MFit2</td>
<td>Additional Distribution Channels</td>
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<td>MFit3</td>
<td>New Product Launch Approach</td>
<td>23</td>
<td>Element No. 6, Table 5.1, p. 150.</td>
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<tr>
<td></td>
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<td></td>
<td>MFit4</td>
<td>New Sales and Marketing Approach</td>
<td>24</td>
<td>Element No. 6, Table 5.1, p. 150.</td>
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<td></td>
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<td></td>
<td>MFit5</td>
<td>Exceptionally Aggressive Marketing</td>
<td>25</td>
<td>Element No. 6, Table 5.1, p. 150.</td>
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<tr>
<td>Technological Fit (TFit)</td>
<td>5 Items</td>
<td>Danneels and Kleinschmidt (2001); Measured by 10-point Likert type scale; Cronbach α reported: 0,85.</td>
<td>TFit1</td>
<td>Additional Design Resources</td>
<td>27</td>
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<td></td>
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<td>TFit2</td>
<td>Additional Development Resources</td>
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<td>Theme No. 4(b), Table 4.3, p. 129.</td>
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<td>TFit3</td>
<td>Additional Customer Support Resources</td>
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<td></td>
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<td>TFit4</td>
<td>Additional System Resources for</td>
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<td>Distribution</td>
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<td>Additional Technical Personnel for Distribution</td>
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<tr>
<td>MFam1 New Markets</td>
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<td>MFam2</td>
<td>New Competitors</td>
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<td>MFam2 Unfamiliar Needs of Existing Customers</td>
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<td>MFam3</td>
<td>New Customers</td>
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<td>MFam4 New Customers</td>
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<td>MFam5</td>
<td>Cost of Finding New Customers (Item dropped after the pilot study)</td>
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<td>Element No. 6, Table 5.1, p. 150.</td>
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<td>Technological Familiarity (TFam)</td>
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<td>TFam1</td>
<td>New Design Technology</td>
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<td>TFam2 New Development Technology</td>
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<td>New Design Partners</td>
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<td>New Development Partners</td>
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<td>TFam5</td>
<td>New Distribution</td>
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<td>TFam5 New Distribution</td>
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<td>Product-Level Benefits (PLB)</td>
<td>4 Items</td>
<td>Channels</td>
<td>129.</td>
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<td>Dannels and Kleinschmidt (2001); Measured by 7-point Likert type scale; Cronbach α reported: 0.94</td>
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<td>PLB1</td>
<td>Sales revenue</td>
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<td>Product-related services revenue</td>
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<td>PLB4</td>
<td>Profit</td>
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<table>
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<tr>
<th>Firm-Level Benefits (FLB)</th>
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<th>129.</th>
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<td>Storey and Easingwood (1999); Measured by 7-point Likert type scale; Cronbach α reported: 0.77</td>
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<td>FLB1</td>
<td>Enhanced profitability of other offerings</td>
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<td>FLB2</td>
<td>Revenue by access-selling (Item dropped after the pilot study)</td>
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<td>Other products/services’ revenue</td>
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<td>Potential platform for future offerings</td>
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<td>FLB6</td>
<td>Enhanced image</td>
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Table 7.2 lists the three variables and corresponding measurement items of the Environmental Factors. The first column from the left lists the name of the variable. The second column presents the number of items used to measure the corresponding variable. The third column names the primary reference that lies behind the scale. The fourth and the fifth columns list item codes and their brief descriptions. The sixth column presents the questionnaire (see Appendix VI) question number of respective measurement item.

**Table 7.2: Variables and Measurement Items of Environmental Factors**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measured by</th>
<th>Scale derived primarily from</th>
<th>Item Code</th>
<th>Item Description</th>
<th>Questionnaire Q. No.</th>
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<td>Varian (2001)</td>
<td>SC1</td>
<td>[SC1 - Training cost]</td>
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<td>SC2</td>
<td>[SC2 - Data Porting cost]</td>
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<td>SC3</td>
<td>[SC3 - Additional hardware and/or software cost]</td>
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<td>Aggressive Marketing Practice (AMP)</td>
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<td>Varian (2001)</td>
<td>AMP1</td>
<td>[AMP1 - Product variety]</td>
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<td>AMP2</td>
<td>[AMP2 - Differentiated Pricing]</td>
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<td>AMP3</td>
<td>[AMP3 - New terms and conditions of sale]</td>
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<td>AMP4</td>
<td>[AMP4 - Reliance on Prestigious customers]</td>
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</tbody>
</table>
As explained above, Tables 7.1 and 7.2 provide an overview of the sources for operationalization and measurement of variables. As evident in the table, all the variables were measured using multiple items. Respondents were requested to indicate their choice on a 7-point Likert-type scale.

### 7.2 Development of Research Instrument

Questions representing the above-mentioned measurement-items were formulated into a questionnaire. A Web-based version of this questionnaire was developed using PHPSurveyor\(^{39}\) (Version 0.993) so as to collect data from CEOs, New Product Managers or equivalent of Swedish software product firms. Given the gamut of information needed in order to answer the survey questions, it was considered fit to approach such respondents who should be most aware about the “new product”—the object of the survey. Respondents were asked to provide basic information about the new product selected for the survey, their firms, and themselves—such as the type of software product and the year of its market launch, the number of employees in the home country and abroad, annual turnover of the firm, the designation of the respondent, etc, in addition to the detailed information about the scale items related to the product’s newness, benefits, and Environmental Factors. See Appendix V for the adapted\(^{40}\) questionnaire.

#### 7.2.1 Face Validity of Research Instrument

As evident from the second part of this dissertation (Chapters 6-9), measurement items used in the questionnaire for the newness and benefits were adapted/developed

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\(^{39}\) It is an open source online survey tool, written in PHP, which allows development, online publication, and management of survey and collection of data. (http://www.phpsurveyor.org/).

\(^{40}\) Adapted to exclude some of the questions which are not used in the analysis for this thesis.
in a qualitative study during the first phase of this study (Chapters 2-5). However, some of the measurement items, particularly for environmental factors, have been borrowed from the existing literature on new economy. Due to adaptation and borrowed measurement items, a need to test the face validity of the questionnaire was felt to confirm and to exclude, if needed, the items which decrease a scale’s validity.

In July 2006, ten CEOs or New Product Managers in different software product firms were interviewed for this face validity test. Six were interviewed face-to-face in Sweden, four through email followed by Instant Messengers (Skype and MSN Messenger). First six represented Swedish firms; from the rest of the four, one represented a Finnish firm and the three (represented) Indian firms. The reason to include different nationalities was to develop a questionnaire suitable for collecting data from various countries\textsuperscript{41}. Interviewees were asked first to fill-up the questionnaire as if responding to a survey. They were requested to mark or note their remarks about the terms, questions or options they felt to be difficult to understand, ambiguous or inappropriate for the survey. Once they had “done” the survey, an interview was conducted to discuss their response and remarks. The aim of the interview was to check if each item in the questionnaire was understandable, unambiguous and relevant to the context of the study.

One item related to a switching cost of customers was dropped as it was felt that respondents may not be able to estimate it correctly. Some of the terms, such as market-pull, technology push, design technology, etc., were re-defined and elaborated with the help of examples. Minor changes in the language of the questions were made to make the text unambiguous. Overall, the aim was to improve the understandability while maintaining the meaning of the text as it was intended from the beginning. Final instrument containing these changes was used for the pilot study as described in the next section.

\textbf{7.3 Pilot Study}

During September-October, 2006, a pilot study was conducted in and around Östergotland. Since it is home to over 80 software firms and many of prospective

\textsuperscript{41} The aim is to continue this research project beyond my doctoral studies and use the questionnaire for data collection in other countries as well.
respondents were known to the author, it was chosen so as to get a high response rate. Surpassing the targeted 50 responses, a total of 55 responses were received. As mentioned previously, the aim was to develop a final questionnaire by dropping measurement items, if needed, which would not be found statistically significant. To support the reliability of measurement items of the data to be finally collected, reliability of each scale was assessed via item to total correlation and Cronbach’s Coefficient Alpha using SPSS 14.0. Churchill (1979) has suggested the use of Cronbach’s Alpha as a measure of internal consistency, followed by item-to-total correlation to eliminate the measurement items that perform poorly in capturing the construct. Spector (1992) has recommended that for the internal consistency of the scale items the item-to-total correlation should be above 0.3.

Table 7.3 shows the results of the reliability analysis. The extreme right column lists the Cronbach Alpha value for each variable scale. All scales, except Market Familiarity, met the minimum criterion of Cronbach Alpha as 0.7, ranging from 0.70 to 0.86. Item to total correlation is shown in the 5th column from the left. One item of Market Familiarity (MFam5) and one of Firm Level Benefits (FLB2) exhibited item to total correlations as 0.2 and 0.09 respectively, two very low values.

Table 7.3: Reliability Analysis Results of Measurement Scales in the Pilot Analysis

<table>
<thead>
<tr>
<th>Scale</th>
<th>Items</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Item to Total Correlation</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing Fit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit1</td>
<td>4.73</td>
<td>1.01</td>
<td>0.68</td>
<td></td>
<td>0.86</td>
</tr>
<tr>
<td>MFit2</td>
<td>4.18</td>
<td>1.54</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit3</td>
<td>4.47</td>
<td>1.12</td>
<td>0.62</td>
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<td></td>
</tr>
<tr>
<td>MFit4</td>
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<td></td>
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<tr>
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<td>0.77</td>
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</tr>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>TFit3</td>
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<td>1.71</td>
<td>0.37</td>
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<td></td>
</tr>
<tr>
<td>TFit4</td>
<td>3.95</td>
<td>1.51</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

42 I used to work in a software firm at the Mjärdevi Science Park, prior to undertaking this research work.
<table>
<thead>
<tr>
<th></th>
<th>TFit5</th>
<th>4.87</th>
<th>1.29</th>
<th>0.53</th>
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</thead>
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<tr>
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</tr>
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<td></td>
<td>MFam2</td>
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<td>0.61</td>
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<td>MFam4</td>
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<td>0.02</td>
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</tr>
<tr>
<td></td>
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<td>0.54</td>
</tr>
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<td></td>
<td>TFam3</td>
<td>5.22</td>
<td>1.37</td>
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<td>TFam4</td>
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<td>1.05</td>
<td>0.55</td>
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<td>TFam5</td>
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</tr>
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<td>Product Level Benefits</td>
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<td>5.07</td>
<td>1.02</td>
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</tr>
<tr>
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<td>PLB2</td>
<td>4.96</td>
<td>0.90</td>
<td>0.65</td>
</tr>
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<td></td>
<td>PLB3</td>
<td>3.69</td>
<td>1.34</td>
<td>0.49</td>
</tr>
<tr>
<td></td>
<td>PLB4</td>
<td>2.87</td>
<td>1.11</td>
<td>0.58</td>
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<td>Firm Level Benefits</td>
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<td>4.95</td>
<td>1.19</td>
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<tr>
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<td>FLB2</td>
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<td>0.56</td>
</tr>
<tr>
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<td></td>
<td>FLB6</td>
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<td>Switching Cost</td>
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<tr>
<td></td>
<td>SC2</td>
<td>4.44</td>
<td>0.90</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>SC3</td>
<td>4.53</td>
<td>1.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Aggressive Marketing Practice</td>
<td>AMP1</td>
<td>4.24</td>
<td>1.28</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>AMP2</td>
<td>5.27</td>
<td>1.37</td>
<td>0.48</td>
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<td></td>
<td>AMP3</td>
<td>5.27</td>
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<tr>
<td></td>
<td>AMP4</td>
<td>4.00</td>
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<td>0.53</td>
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<td></td>
<td>AMP5</td>
<td>4.09</td>
<td>1.30</td>
<td>0.39</td>
</tr>
<tr>
<td>Computer Mediated Transactions</td>
<td>CMT1</td>
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<td>0.95</td>
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<td>4.76</td>
<td>0.98</td>
<td>0.61</td>
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<tr>
<td></td>
<td>CMT3</td>
<td>4.69</td>
<td>0.84</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>CMT4</td>
<td>4.38</td>
<td>1.25</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Deletion of MFam5 raised the Cronbach Alpha of Market Familiarity to 0.85. Similarly, deletion of FLB2 raised the Cronbach Alpha of Firm Level Benefits to 0.87, again a substantial increase from 0.76. Hence, it was decided to drop both MFam5 and FLB2 from their respective scales. All other measurement items exceeded the minimum acceptable criterion of 0.3 for item to total correlation. Table 7.4 shows the result of revised reliability analysis.

**7.4 Sample and Data Collection Method**

During October 2006-March 2007 a Web-based survey was carried out to collect further data for developing the scale for newness, benefits, and Environmental Factors, and testing the hypotheses of this study. In order to provide answer to the survey questions, CEOs in smaller firms and Product Managers in larger firms were expected to be the appropriate respondents. As this study attempted to measure market and technology newness and the benefits accruing to firms, only someone who had a holistic view of the firm and the product under study were expected to do a justice in answering the survey questions. While identifying the respondents was easy, identifying the firms was not.

Software itself is a comparatively recent phenomenon; software product is a more recent one. Definitions of software product and software firms are many and ambiguous. There is hardly any scientific attempt to study the software industry in Sweden; exception is one RedEye (2003) consulting report. The Swedish Patent and Registration office listed\(^43\) 2,276 firms involved in software-related activities (SNI codes 5184, 7221, 7222). A preliminary scrutiny (by visiting their Websites) showed that many of those were not software product firms. The branch interest organization SPI (Svensk Programvaruindustri) has collated a list of 769 software product firms. Computer Sweden (CS) magazine publishes “Swedish IT Industry guide” annually. In 2006 guide, 506 firms are listed under software category. A combined list of SPI and CS yields 935 unique software firms. Upon visiting their Web-sites to verify if they are in the software product industry, it was found that only 714 could qualify as a software product firm (excluding Swedish subsidiaries of MNCs, engaged primarily

\(^{43}\) As on 05 Sept 2006.
in Sweden in selling and marketing). Some of those listed firms were taken over by
some other firm or had gone bankrupt.

**Table 7.4:** Revised Results of Reliability Analysis of Measurement Scales in the Pilot Study

<table>
<thead>
<tr>
<th>Scale</th>
<th>Items</th>
<th>Mean</th>
<th>Std. Deviation</th>
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<tr>
<td><strong>Marketing Fit</strong></td>
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<td>1.01</td>
<td>0.68</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>MFit2</td>
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<tr>
<td></td>
<td>MFit3</td>
<td>4.47</td>
<td>1.12</td>
<td>0.62</td>
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<tr>
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<td>MFit4</td>
<td>4.36</td>
<td>1.28</td>
<td>0.66</td>
<td></td>
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<td>1.19</td>
<td>0.70</td>
<td></td>
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<tr>
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<td>MFit6</td>
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<td>1.13</td>
<td>0.77</td>
<td></td>
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<tr>
<td><strong>Technological Fit</strong></td>
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<td>0.50</td>
<td>0.71</td>
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<td></td>
<td>TFit3</td>
<td>4.22</td>
<td>1.71</td>
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<td>0.46</td>
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<tr>
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<td>TFit5</td>
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<td><strong>Market Familiarity</strong></td>
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<td>1.73</td>
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<tr>
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<td></td>
<td>MFam3</td>
<td>4.69</td>
<td>1.55</td>
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<td>MFam4</td>
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<td></td>
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<td>SC3</td>
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<td>1.00</td>
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<td><strong>Aggressive Marketing Practice</strong></td>
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<td>1.28</td>
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Taking into account a response rate usually of 30-40% or even less, 714 firms did not seem sufficient to achieve a response of approximately 350, recommended to be necessary for meaningful statistical analyses (Hair, Anderson, Tatham and Black, 1998). Moreover, the CS list or SPI list was not a random list of Swedish software product firms. A sole reliance on those lists ran a risk of being a non-representative sample. A decision was made to include those firms who were on Swedish Patent and Registration Office’s list but not on the combined list of SPI and CS. Again a confirmation process was undertaken to make sure if those firms were in software product business or not. Upon visiting their Websites 414 firms were identified who were involved in software product development and marketing but were not listed either in the SPI list or CS list of 2006.

A three-stage data collection process was followed: first a fax (see Appendix VI) was sent to the CEO or New Product Manager that an email containing an invitation to participate in the survey would be sent the following day. It was expected that a fax should decrease the chance of invitation email ending up as a spam. However, some firms did not have the fax or the attempt to send the fax did not succeed. To firms the fax message was sent as a letter by post. Since every invitation-email was created through the PHPSurveyor (Version 0.993), each invitation-email contained a unique token number (generated through SQL) created for that very respondent so as to ensure the integrity of the data collected and to monitor the survey response. Two email reminders at two weeks interval were sent. Telephone calls were made between the first and the second reminder.

To motivate the respondents, it was pointed out in the fax as well as during telephone calls that it was the first study of its kind in Sweden. Moreover, respondents were promised a reward in the form of research reports based on their inputs. In order to encourage respondents to answer as “honestly” as possible, a complete anonymity was promised. Questions were formulated in as neutral language as possible. Sensitive questions, such as annual sales, were made optional.

A total of 266 responses were collected as part of the main data collection. Since the 55 responses collected for the pilot study contained all the questions used in the main study, it was decided to include those 55 responses in the main data set for the
empirical analysis. Hence, a total of 321 responses constituted the data-set, resulting in a 28% response of the 1128 sample size. A data-set of 321 was relatively close to the 350 as recommended by Hair et al. (1998) for statistical analyses.

7.5 Statistical Analyses

7.5.1 Scale Formation
As per Gerbing and Anderson’s (1988) suggestions about how to develop scales, I followed a sequence from the concept to scale-formation as outlined at the top of the Figure 7.1. Newness, benefits and benefits are concepts at a fairly high, abstract-level. It was clear from the literature-review that visualizing either of them unidimensionally will lead to severe limitations. In other words, both newness and benefits were expected to have several distinct, independent dimensions.

Breaking the concepts into several dimensions makes it possible to explain theoretically each dimension more appropriately. For example, technological familiarity dimension can be explained in a better way (on the basis of organizational behavior theory) than the newness concept (on the basis of any single theory). Although dimensions are of immense utility for the sake of theoretical explanation but they are far too abstract to be measured directly. It means each dimension needs to be broken down to several levels until those indicators (measurement-items) could be empirically measured with precision. The fourth box from the left in the top row of Figure 7.1 represents that level. The dimension-level is important for the theoretical explanation purpose; the measurement-item-level is important for the empirical measurement. Finally, all the measurement-items of a particular dimension could be collapsed to form a scale. It was a three-stage process as discussed in the next section.
7.5.2 Exploratory Factor Analysis

In the first stage, an exploratory factor analysis (EFA) was performed using SPSS 14.0 separately on all the measurement-items related to each of the three concepts. EFA is an appropriate technique for identifying the underlying dimensions of a variable. As it will be seen in the next chapter, EFA resulted in similar dimensions of various variables as had been found in studies done in other contexts and reported in the extant NPD literature.

The aim of EFA was to reduce the number of items into few and to detect the structure among measurement-items (i.e., to find how many dimensions of newness,
benefits and Environmental Factors were present in the dataset). Principal component analysis was used for the factor extraction. The recommendation of Gerbing and Anderson (1988) seemed plausible that if prior theory about concepts is insufficient then an exploratory factor analysis should be unrestricted both in terms of factors and in terms of inter-correlations among the factors. In case of factors not meeting traditional Eigen value greater than one criterion, use of Scree plot is suggested to visually confirm inclusion/exclusion of “border-line” factors. Hair, et al. (1998) recommend that if the number of variables is less than 20 then the Eigen value greater than one criterion does not suffice as it extracts too few factors. While newness was measured by 20 measurement-items, benefits and Environmental Factors done by 9 and 10 respectively, hence it was situation to use Scree plot. The motivation to include more factors, rather than to include too few, is to be able to ultimately refine the definitions and operationalizations of product newness and benefits; too few factors may enhance parsimony but at the cost of representativeness, a situation which does not match very well with the aims of this study.

7.5.3 Confirmatory Factor Analysis
In the second stage, a confirmatory factor analysis (CFA) was done on the identified dimensions, found at the end of first stage, of each concept. CFA is a theory-based technique which is used to confirm the factor structure of various constructs. Even though the reliability and validity of constructs were assessed using Cronbach Alpha and EFA, such assessments were of only preliminary in nature. Moreover, EFA does not tell much about discriminant and convergent validity of the scales. Hence, a CFA analysis was done to conclusively establish the reliability and validity of the scales.

The CFA technique is based on the comparison of variance-covariance matrix obtained from the sample to the one obtained from the conceptual framework. This technique is very sensitive to the sample size and it is recommended to have several cases per free parameter (Bollen, 1989).

Based on the results of CFA, composite factor reliability and average variance extracted by each factor were calculated. Along with the significance of factor loadings of each item, these CFA results were used to establish convergent and
discriminant validity as well as reliability of different scales (Anderson and Gerbing, 1988).

7.5.4 Validity and Reliability

In the third and final stage, scales for the dimensions of newness, benefits and Environmental Factors were constructed. Scales could have been either a simple sum or a weighted sum of constituting items, weighted by the factor weights. However, a simple sum type scale seemed more appropriate for an initial study like this in its field. Not only equal weighing of the measurement-items makes it easier to replicate the study elsewhere but also because unique factor weightings are usually peculiar to that very sample (Hair et al., 1998). Moreover, there is no theoretical basis to give different weights to different items, so it is safer to assume equal importance and relevance of each measurement-item to the related dimension (Ibid.).

Once scales for various dimensions of each concept were constructed, it was the stage for conducting a reliability analysis. The test of reliability was necessary to ensure that the measuring procedure would yield the same results if repeated. Naturally, reliability can ideally be assessed by the test-retest method (measuring the same subjects at two different times), but it was not time-wise feasible during a doctoral research project. Moreover, it would not have been easy for a doctoral researcher to motivate the respondents, who were high-ranking executives in their firm and who were pressed for time, to answer the survey questions twice. Therefore, an internal consistency method, where high inter-item correlations confirm that all items are measuring the same entity, is used in this study for this purpose.

The internal consistency of the scales is commonly tested by item-to-total correlation and coefficient Alpha. Item-to-total correlations are the correlations between each item and the total score of the scale. In a reliable scale, all items should correlate with the total. The value of the correlation is subject to the sample size. Usually, for bigger sample size, smaller correlation coefficients are acceptable. In general, a value of item-to-total correlation less than 0.3 suggests that the particular item in question does not correlate very well with the overall scale (Spector, 1992). The Cronbach Alpha coefficient is also employed to test the reliability of various scales where the
minimum acceptable value is 0.7 (Nunnally, 1978). As it will be seen in the next chapter, these two values were used as cut-off point in this study.

To assess reliability it was checked if deletion of any item decreased the Alpha of its respective scale or not. If any deletion decreased the Alpha then that very item was not deleted from the scale. Once each and every item was verified as a constituent of its scale, a set of bivariate correlation analysis among dimensions (variables) of newness and benefits were done.

The validity test confirms whether the items are measuring what they are supposed to measure. The content or face validity was evaluated by a group of experts who scrutinized and vetted the research instrument. Two academic researchers who have studied software newness and published in top-ranking journals vetted the research instrument. Later on, the instrument was tested on the ten respondents as described in the Section 7.3. Together they add further validity to the measurement-items which were drawn/adapted from the literature and from the qualitative phase of this study. Further scale assessment were done using exploratory factor analysis (Spector, 1992) as described above.

7.5.5 Hypotheses Testing
In addition to the CFA, a path analysis was done to test the hypotheses of this study in a structural equation modeling (SEM) framework, an overview of which follows further below. AMOS (Version 6.0) was used for this purpose. In this study, the SEM test is used to reconfirm the findings of CFA.

A check of multicollinearity among the dimensions of newness was in place. Danneels and Kleinschmidt (2001), confirmed absence of any multicollinearity by inspecting Variance-Inflation-Factors (VIF) among newness (newness) measures as the highest VIF was only 1.975 posing no problem to multicollinearity; a similar test was used in this study too.

7.6 A Brief Overview of Structural Equation Modeling
Structural equation modeling (SEM) is a family of statistical techniques which contains and combines factor analysis and path analysis. SEM can be said an
extension of multiple regression which serves the similar purpose but in a more powerful way. The power of SEM techniques lies in its ability to combine the measurement and structural part of the model in one framework. In a regression analysis, the average scores of individual items of a particular construct are used for establishing a relationship between different constructs; it is assumed that all the items of a scale contribute equally to the construct in question. SEM obviates this assumption by explicitly incorporating the role played by individual items in the measurement of the construct.

The SEM process contains two stages: validating the measurement model and, then, fitting the structural model. The first is done primarily through confirmatory factor analysis, and the later is accomplished mainly through path analysis with latent variables. During the first stage, a model on the basis of theory is specified. Each variable in the model is conceptualized as a latent one, measured by multiple indicators. This is the primary stage of the analysis.

Model assessment is usually done using maximum likelihood estimation (MLE). For assessing the overall model fit, SEM software provide a variety of fit indices.

Goodness-of-fit tests based on the predicted vs. observed covariances
This set of goodness-of-fit measures are based on fitting the model to sample moments, which is done by comparing the observed covariance matrix to the one estimated on the assumption that the model being tested is true. These measures thus use the conventional discrepancy function.

Model chi-square, also called discrepancy, is the most common fit test. The chi-square value should not be significant if there is a good model fit; while a significant chi-square indicates, naturally, lack of satisfactory model fit. In a way, chi-square is a “badness of fit” measure—a finding of significance means the given model’s covariance structure is significantly different from the observed covariance matrix. If model chi-square is < 0.05, then the model is rejected. Although a very popular measure, the chi-square test may lead to erroneous results in case of (i) complex models, (ii) large sample sizes, and (iii) non compliance with multivariate normality requirement. For these reasons, SEM experts recommend that with a reasonable
sample size (e.g., > 200) and good approximate fit as indicated by other fit tests (ex., NNFI, CFI, RMSEA), the significance of the chi-square test could be discounted and that a significant chi-square is not a reason by itself to modify the model.

Relative chi-square, also called normal chi-square, is the chi-square fit index divided by degrees of freedom. It is an attempt to make this test less dependent on the sample size. Kline (1998) recommends 3 or less as an acceptable value. Some researchers are more lenient and allow values as high as 5 to consider a model adequate fit, while some are more stringent and insist relative chi-square should not exceed 2. AMOS, the software used for this research, lists relative chi-square as CMIN/DF.

Goodness-of-fit index (GFI) varies between 0 and 1, theoretically it can also yield meaningless zero value. A large sample size generally pushes GFI up. Though analogies are made to R-square, GFI cannot be interpreted as the percent of error explained by the model. Since GFI often runs high compared to other fit models, some researchers suggest using 0.95 as the cut-off. By convention, GFI should be equal to or greater than 0.90 to accept the model. Adjusted goodness of fit index (AGFI) is another measure of goodness of fit. AGFI is, obviously, a variant of GFI which uses mean squares instead of total sums of squares in the numerator and denominator of 1-GFI. It too varies from 0 to 1, theoretically it can also yield meaningless zero value. AGFI should also be at least 0.90. Similar to GFI, AGFI is also biased downward when degrees of freedom are large relative to sample size, except when the number of parameters is very large. It also tends to be larger as sample size increases (a property similar to GFI). There is a risk that AGFI may underestimate fit for a small sample size (Bollen, 1989).

Root mean square residuals (RMR) is another fit measures commonly used in research. The closer the RMR to 0 for a model being tested, the better the model fit. RMR are the coefficients which result from taking the square root of the mean of the squared residuals, which are the amounts by which the sample size variance and covariances differ from the corresponding estimated variances and covariances (it is assumed that the model is correct). Fitted residuals result from subtracting the sample covariance matrix from the fitted or estimated covariance matrix. It is called RMR in AMOS.
Standardized root mean square residual (SRMR) is similar to RMR. SRMR is the average difference between the predicted and observed variances and covariances in the model, based on the standardized residuals. Standardized residuals are fitted residuals divided by the standard error of the residual (this assumes a large enough sample to ensure stability of the standard error). The smaller the standardized RMR, the better the model fit. A SRMR value of 0 means the model fit is perfect.

The comparative fit index (CFI), also known as the Bentler Comparative Fit Index, compares the existing model fit with a null model assuming the latent variables in the model are uncorrelated. CFI varies from 0 to 1. CFI close to 1 indicates a very good fit. For the model to be acceptable, CFI should be equal to or greater than 0.90 indicating 90% of the covariation in the data can be reproduced by the given model.

The normal fit-index (NFI), also known as Bentler-Bonett normed fit index or DELTA1, was developed as an alternative to CFI. The advantage of NFI over CFI is that it does not require making chi-square assumptions. It reflects the proportion by which the researcher’s model improves fit compared to the null model (random variables). NFI varies from 0 to 1, where 1 denotes perfect fit. By convention, NFI values below 0.90 indicate a need to re-specify the model. However, some researchers have used a more liberal cut-off of 0.80. NFI may underestimate fit for small samples (Ullman, 2001). In addition to the above mentioned fit indices, there are others such as RMSEA, NNFI, TLI, etc, which are used to evaluate a fit of the model.

In the next chapter, a detailed account of the empirical analysis and results of this quantitative study is given.
Chapter 8: Quantitative Data Analysis and Results
This chapter presents data analysis and results of the quantitative part of the study. It is organized as follows: first of all, sample characteristics are briefly presented, then validity and reliability of the sample is assessed, followed by exploratory- and confirmatory-factor analyses of the data so as to validate and assess reliability of the measurement scales. The last two sections present tests of hypotheses, and path analysis using structural equation modeling.

8.1 Sample Characteristics
After a pilot study, the main data collection was done during October 2006 - March 2007. Responses collected for the pilot study (55 responses) were also included in the main data-set. Altogether there were 321 responses in the data set. Though it did not meet Hair et al.’s (1998) recommend ideal size of 350 responses but it was reasonably close to that. A brief description of respondents’ firms and their new products covered in this survey is presented in this section. Similar descriptions of new product newness, benefits and Environmental Factors are interspersed in the following section, which deals in an exploratory factor analysis. The reason to split description of sample in different sections is to provide information about one particular variable at one place reducing the degree of fragmentation. Tables and figures are also used for the presentation of data, wherever possible, to make the data easy to grasp.

8.1.1 Basic Information about Respondents’ Firms
First some basic information about the responding firms is presented. Most of the respondents were CEOs, Managing Directors, Directors, Vice Presidents or (New) Product Managers. Table 8.1 shows at a glance some of the characteristics of respondents’ firms. The extreme right column shows the year in which the new product—the focus of the questionnaire—was launched in the market.
Table 8.1: Characteristics of New Products and Respondents’ Firms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Firm Established in the Year</th>
<th>No. of Employees in Sweden</th>
<th>No. of Employees Overseas</th>
<th>No. of NPD Employees</th>
<th>Product Launched in the Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>321</td>
<td>321</td>
<td>321</td>
<td>321</td>
<td>321</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>NA*</td>
<td>44.61</td>
<td>8.03</td>
<td>15.46</td>
<td>NA*</td>
</tr>
<tr>
<td>Median</td>
<td>1998</td>
<td>10</td>
<td>0</td>
<td>4</td>
<td>2004</td>
</tr>
<tr>
<td>Mode</td>
<td>2004</td>
<td>30</td>
<td>0</td>
<td>2</td>
<td>2005</td>
</tr>
<tr>
<td>Minimum</td>
<td>1972</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1996</td>
</tr>
<tr>
<td>Maximum</td>
<td>2005</td>
<td>1100</td>
<td>250</td>
<td>450</td>
<td>2006</td>
</tr>
</tbody>
</table>

(*NA: Due the way some of the questions were formulated, it was meaningless to calculate mean of their answers. However, this information in an edited form are provided below.)

Figure 8.1 shows a distribution of age of the responding firms. Firms established before 1991 are grouped in two periods of ≥1980 and 1981-1990 for the sake of brevity. There is a sharp decline in the number of responding firms set up during 2002-2004. This could be due the fact that post IT-bubble burst around the turn of the century few software firms were established. As there is a sharp rise in the number of responding firms established in the year 2004. Another explanation could be that firms established during that period faced a tough market conditions and they simply did not survive long enough.

![Figure 8.1: Year of Establishment of Responding Firms](chart.png)

(Note: The number on the top of each bar indicates number of firms established in that year or period.)
The spread of responding firms set up during 1991-2000 reflects somewhat the growth of the software industry, peaking around 1998-1999. Responding firms established during 1980s probably represent the successful firms which have survived over a long period. Since there is no scientific survey of Swedish software product industry it is difficult to comment if this sample resembles the actual pattern of firm-formation or not.

Figure 8.2 shows the distribution of number of employees in the responding firms. Firms were asked to provide information about number of employees in Sweden and number of employees in other countries. Accordingly, each category shows two numbers. There is evidently a predomination of small firms in the sample which is similar to a pattern found in a scientific survey of Finnish Software firms.

A majority of firms—actually 186 firms (58% of the sample)—do not have any employee abroad. This indicates that a large part of these firms are focused on domestic market or rely on indirect sales and marketing for overseas market. The distribution of New Product Development (NPD) employees in the responding firms is shown in Figure 8.3.
Figure 8.3: Number of Employees Engaged in New Product Development (NPD) Activities

Annual turnover of responding firms are shown in Figure 8.4. Almost 30% of responding firms have a turnover not exceeding 1 Million SEK, whereas only 22% of firms have a turnover of more than 10 Million SEK. The overall pattern of annual turnover resembles to a large extent with the findings of the Finnish survey. If one presumes a resemblance between Sweden and Finnish software product industry then this sample seem to be representative of the population to a large extent.

Figure 8.4: Annual Turnover of Responding Firms
(Note 1: M = Million;
Note 2: Firms having a turnover equal to a number lying on the cutoff point of a category are included in the higher category, e.g., A firm having a turnover of 5 M SEK is included in the category 5-10 M SEK.)
8.1.2 Basic Information about New Products
More than half of the new products covered in the survey were of business software type. Figure 8.5 shows the details distribution. A low number of PC Application Software and a rather high number of Business Software indicate the preference towards Business-to-Business market orientation of the sample in comparison to the Business-to-Customer orientation. A rather sizeable number of Scientific and Engineering Software indicates the Swedish excellence in R&D.

Two third of the products covered in the survey were between one to three years old. See Figure 8.6. This ratio is similar to in accordance to the trend in software industry where a new product or a new major version of the product comes as a replacement between on an average one to two years. However, there are a few new products which have not been replaced for five, six years or more. Since there was a dominance of business software in the sample, it can be understood as some business software continue to be in use even as a legacy system as switching costs for customers are sometimes prohibitive or the firm behind the product did not keep up with the update and development due to internal reasons (resource crunch, lack of expertise, etc.).
In the surveyed new products, 64 (20%) of new products contributed to their firm’s one fifth or less of the annual turnover, whereas 31 (10%) of new products were more or less sole source of firm’s turnover (Figure 8.7). Evidently, the degree of success (in terms of contribution towards annual turnover) varies significantly. It can be assumed that the responses are not consisting merely of highly successful new products.

**Figure 8.6: Age of Products Covered in Survey**

**Figure 8.7: Contribution of New Product in Annual Turnover**

### 8.1.3 Characteristics of Product Newness

**8.2 Validity and Reliability Assessment of Measurement Items**

All the four variables representing Product newness, namely, Marketing Fit, Technological Fit, Market Familiarity, and Technological Familiarity have been measured using multiple items. Wherever needed, values for measurement items have
been reverse coded to measure items in the same direction. For example, all six measurement items of Marketing Fit measure the variable so as an increasing score denotes a higher marketing fit. Similarly, all measurement items of Technological Fit, Market Familiarity, and Technological Familiarity are coded to show a higher fit or familiarity as the value increases.

In a similar manner, measurement items of Product Level Benefits and Firm Level Benefits variables have been recoded, wherever needed, so as to show a higher benefit as the value increases from 1 towards 7. Similar is the scheme for measurement items of the Environmental Factors.

The use of Cronbach’s Alpha as a measure of internal consistency, followed by item-to-total correlation to eliminate the items which perform poorly in capturing the construct is suggested by Churchill (1979). Hence, in order to support the reliability of measures for the 321 respondents in this study, the reliability of each variable-scale was assessed through item-to-total correlation and Cronbach’s coefficient Alpha. Means, standard deviations and the item-to-total correlations were also calculated for all the variables (results are shown in Table 8.2). The item-to-total correlation measures met the commonly accepted standard of 0.3 and above (Spector, 1992) for good internal consistency.
Table 8.2: Reliability Analysis Results of Measurement Scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Items</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Item to Total Correlation</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing Fit</td>
<td>MFit1</td>
<td>5.03</td>
<td>1.01</td>
<td>0.53</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>MFit2</td>
<td>4.55</td>
<td>1.38</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MFit3</td>
<td>4.82</td>
<td>1.11</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MFit4</td>
<td>4.78</td>
<td>1.20</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MFit5</td>
<td>4.78</td>
<td>1.26</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MFit6</td>
<td>4.88</td>
<td>1.06</td>
<td>0.69</td>
<td></td>
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<tr>
<td>Technological Fit</td>
<td>TFit1</td>
<td>5.02</td>
<td>1.18</td>
<td>0.56</td>
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<tr>
<td></td>
<td>TFit2</td>
<td>4.68</td>
<td>1.23</td>
<td>0.55</td>
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<tr>
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<td>TFit3</td>
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<td>1.43</td>
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<tr>
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<td>TFit4</td>
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<td>1.41</td>
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<td>TFit5</td>
<td>5.13</td>
<td>1.19</td>
<td>0.53</td>
<td></td>
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<tr>
<td>Market Familiarity</td>
<td>MFam1</td>
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<td>1.44</td>
<td>0.74</td>
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<tr>
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<td>MFam4</td>
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<td>TFam1</td>
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<td>0.47</td>
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</tr>
<tr>
<td>Product Level Benefits</td>
<td>PLB1</td>
<td>5.23</td>
<td>0.97</td>
<td>0.62</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>PLB2</td>
<td>4.96</td>
<td>0.98</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
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<td>PLB3</td>
<td>4.02</td>
<td>1.24</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLB4</td>
<td>3.08</td>
<td>1.31</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>Firm Level Benefits</td>
<td>FLB1</td>
<td>5.00</td>
<td>1.09</td>
<td>0.82</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>FLB2</td>
<td>3.04</td>
<td>1.01</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>0.85</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>3.53</td>
<td>0.96</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLB5</td>
<td>4.21</td>
<td>1.28</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLB6</td>
<td>4.21</td>
<td>1.28</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>Switching Cost</td>
<td>SC1</td>
<td>4.72</td>
<td>1.12</td>
<td>0.57</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>SC2</td>
<td>4.80</td>
<td>1.09</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SC3</td>
<td>4.74</td>
<td>1.12</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Aggressive Marketing Practice</td>
<td>AMP1</td>
<td>4.77</td>
<td>1.30</td>
<td>0.64</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>AMP2</td>
<td>5.10</td>
<td>1.27</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMP3</td>
<td>5.14</td>
<td>1.25</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMP4</td>
<td>4.58</td>
<td>1.31</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMP5</td>
<td>4.75</td>
<td>1.37</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>Computer Mediated Transactions</td>
<td>CMT1</td>
<td>4.91</td>
<td>1.08</td>
<td>0.64</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>CMT2</td>
<td>5.03</td>
<td>1.07</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CMT3</td>
<td>4.90</td>
<td>1.01</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CMT4</td>
<td>4.61</td>
<td>1.40</td>
<td>0.63</td>
<td></td>
</tr>
</tbody>
</table>
8.3 Exploratory Factor Analysis

In order to investigate validity of each measurement item, the first step was an exploratory factor analysis (EFA). SPSS (version 14.0) was used for this purpose. In order to test the convergent and discriminant validity, all the measurement items of each of the three constructs\textsuperscript{44}—newness, benefits and Environmental Factors—were factor analyzed. The items were subjected to principal component analysis using Varimax rotation along with Kaiser Normalization. A factor loading represents a correlation between an item with the variable (Hair \textit{et al.}, 1998). Eigen value represents the amount of variance accounted for by a factor (Ibid.). In principal component analysis, only the factor having Eigen values more than 1 are considered to be significant. A minimum cut off value of 0.50 was used to indicate the loading of any factor. The EFA helped in verifying if there were any items that were cross loading and, hence, were causing any lowering of scale reliability. Below are the details for each variable as they performed in the EFA, along with a graphical description.

8.3.1 EFA Results of Newness

The EFA of all the 20 measurement items of newness led to four factors. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.91, meeting the requirement of 0.6 or above. The Barlett’s Test of Sphericity was significant \((p=0.000)\). Therefore factor analysis was appropriate. Details of the four factors are mentioned below:

\textbf{Marketing Fit}: EFA results showed that marketing fit was explained by a single factor. All the six items loaded on this factor and the loading on these factors ranged between 0.65 and 0.74. The internal reliability indicated by Cronbach Alpha for this scale was 0.84 and the variance explained by the factor was 56.33%. Figure 8.8 exhibits a distribution of values of the six measurement items.

\textsuperscript{44} To avoid confusion, I have used the term “construct” for Newness, Benefits and Environmental Factors, whereas “variable” for their underlying dimensions. For example, Marketing Fit, Technological Fit, Market Familiarity and Technological Familiarity are variables constituting Newness construct. Similarly, Product Level Benefits and Firm Level Benefits are variables constituting Benefits construct, and Switching Costs, AMP and CMT are variables making Environmental Factors.
Technological Fit: The EFA results further showed that technological fit was explained by a single factor. All the five items loaded on this factor and the loading on these factors ranged between 0.52 and 0.74. The internal reliability indicated by Cronbach Alpha for this scale was 0.78 and the variance explained by the factor was 53.25%. In the measurement item TFit4, system resources stands for hardware and software needed by the firm to distribute NP—to sell, to distribute sample or demo, to provide patches or minor updates of the product. TFit5 denotes additional employee hired by the firm to administer and manage part of the NP distribution carried in-house. Figure 8.9 exhibits a distribution of values of the five measurement items.
Market Familiarity: The EFA results showed that market familiarity was explained by a single factor. All the four items loaded on this factor and the loading on these factors ranged between 0.70 and 0.79. The internal reliability indicated by Cronbach Alpha for this scale was 0.85 and the variance explained by the factor was 68.91%. Figure 8.10 shows a distribution of values of the four measurement items of Market Familiarity.

![Distribution of Market Familiarity Measurement Items](image)

**Figure 8.10:** Distribution of Market Familiarity Measurement Items
Note: A value of 1 means no familiarity at all and a value of 7 denotes a complete familiarity. E.g., for Markets, a value if 1 means all markets were new, whereas a value of 7 means no new markets were entered for the new product.

Technological Familiarity: In the EFA it was found that technological familiarity was explained by a single factor. All the five items loaded on this factor and the loading on these factors ranged between 0.52 and 0.71. The internal reliability indicated by Cronbach Alpha for this scale was 0.71 and the variance explained by the factor was 46.14%. Figure 8.11 shows the distribution of values of the five measurement items.
Figure 8.11: Distribution of Technological Familiarity Measurement Items
Note: A value of 1 means no familiarity at all and a value of 7 denotes a complete familiarity.

8.3.2 EFA Results of Benefits
The nine measurement items of Product Benefits were subject to EFA which resulted in two factors. KMO value was 0.76, and the Barlett’s Test was significant (p=0.000), therefore factor analysis was appropriate.

Product Level Benefits: The EFA results showed that the Product Level Benefits (PLB) was explained by a single factor. All the four items loaded on this factor and the loading on these factors ranged between 0.65 and 0.85. The internal reliability indicated by Cronbach Alpha for this scale was 0.78 and the variance explained by the factor was 62.22%. Figure 8.12 shows the distribution of values of the measurement items of PLB.
Figure 8.12: Distribution of Product Level Benefits Measurement Items
Note: A value of 1 means very low benefit, whereas a value of 7 means a very high benefit of the new product.

Firm Level Benefits: The EFA results further showed that Firm Level Benefits (FLB) was explained by a single factor. All the five items loaded on this factor and the loading on these factors ranged between 0.71 and 0.85. The internal reliability indicated by Cronbach Alpha for this scale was 0.88 and the variance explained by the factor was 68.71%. Figure 8.13 exhibits the distribution of values of measurement items of FLB.

Figure 8.13: Distribution of Firm Level Benefits Measurement Items
Note: A value of 1 means very low benefit, whereas a value of 7 means a very high benefit of the new product.

8.3.3 EFA Results of Environmental Factors
Similarly, an EFA of environmental factors resulted in the three factors and showed KMO value as 0.82, and the Barlett’s Test was significant (p=0.000).
**Switching Costs:** In the EFA it was found that Switching Costs (SC) was explained by a single factor. All the three items loaded on this factor and the loading on these factors ranged between 0.68 and 0.84. The internal reliability indicated by Cronbach Alpha for this scale was 0.72 and the variance explained by the factor was 63.97%. Figure 8.14 shows a distribution of measurement item values of SC.

![Figure 8.14: Distribution of Switching Cost Measurement Items](image)

Note: A value of 1 means very low switching cost, whereas a value of 7 means a very high switching cost.

**Aggressive Marketing Practices:** The EFA results showed that Aggressive Marketing Practice (AMP) was explained by a single factor. All the five items loaded on this factor and the loading on these factors ranged between 0.69 and 0.79. The internal reliability indicated by Cronbach Alpha for this scale was 0.80 and the variance explained by the factor was 55.91%. Figure 8.15 shows a distribution of measurement items of AMP.
Figure 8.15: Distribution of Aggressive Marketing Practices Measurement Items
Note: A value of 1 means very low prevalence of aggressive marketing practices, whereas a value of 7 means a very high prevalence of aggressive marketing practices.

Computer Mediated Transactions: The EFA results showed that Computer Mediated Transactions (CMT) was explained by a single factor. All the three items loaded on this factor and the loading on these factors ranged between 0.74 and 0.81. The internal reliability indicated by Cronbach Alpha for this scale was 0.81 and the variance explained by the factor was 64.76%. Figure 8.16 shows a distribution of measurement item values of this variable.

Figure 8.16: Distribution of Computer Mediated Transactions Measurement Items
Note: A value of 1 means very low prevalence of computer mediated transactions, whereas a value of 7 means a very high prevalence of aggressive marketing practices.

In short, for all the variables, scale items loading were more than 0.50 on their respective variables-scales, Cronbach Alpha values were more than 0.70 and variance explained were significant. Moreover, since a majority of these items were taken or adapted from tested and validated scales (see Table 7.1), it was decided to retain all the measurement items. Since the results of the EFA were satisfactory, the next stage was to carry out a confirmatory factor analysis.

8.4 Confirmatory Factor Analysis
The use of multiple tests such as a confirmatory factor analysis (CFA) is recommended to ensure the factor reliability (Hair et al., 1998). Hence, a CFA was carried out to conclusively establish reliability and validity of the measurement scales. This was a necessary step before proceeding to test the hypothesized relationships of the model. As the scales used to operationalize the variables need to be validated through the estimation of measurement models (Anderson and Gerbing, 1988). Since newness of a new product is expected to affect product level benefits and firm level benefits, two separate measurement models were needed to investigate the effect of newness on the two types of benefits. A third model was needed to investigate the moderating role of Environmental Factors. So, three measurement models in total were created for conducting the confirmatory factor analysis:

(i) Newness-PLB Core Measurement Model: For the Newness variables and Product-Level Benefits (PLB), where newness variables were Marketing Fit (MFit), Technological Fit (TFit), Market Familiarity (MFam), and Technological Familiarity (TFam),

(ii) Newness-FLB Core Measurement Model: For the above mentioned Newness variables and Firm-Level Benefits (FLB), and

(iii) Environmental Factors Measurement Model: For environmental factors, namely Switching Costs (SC), Aggressive Marketing Practices (AMP) and Computer Mediated Transactions (CMT).
Composite Factor Reliability and Average Variance Extracted (AVE) are two major statistics used to assess the psychometric properties of scale measures (Fornell and Larcker, 1981, Werts, Linn and Jöreskog, 1974). AMOS 6.0 was used to generate these estimates for all the three models. Composite Factor Reliability assesses the internal consistency of a measure and it is similar to Cronbach’s coefficient Alpha. As per Fornell and Larcker (1981), Composite Factor Reliability ($\rho_\eta$) is calculated as shown below:

$$\rho_\eta = \frac{\left( \sum_{i=1}^{n} \lambda_{yi} \right)^2}{\left( \sum_{i=1}^{n} \lambda_{yi} \right)^2 + \sum_{i=1}^{n} Var(\epsilon_i)}$$

Where $\lambda_{yi}$ is the factor loading of the $i_{th}$ item on its latent variable and $\epsilon_i$ is the error variance associated with the item.

The numerator for calculating composite reliability is equal to the square of the sum of the standardized factor loadings, which are represented by $\lambda_{yi}$ in the equation above. The expression in the denominator is equal to the square of the sum of the standardized factor loadings plus the sum of the variance due to random measurement error for each loading (1 minus the square of each loading), which is shown by $\epsilon_i$. Through this formula one obtains a measure of scale reliability. This method of computing reliability is similar to Cronbach’s Alpha, except that rather than assuming that each item has equal weights as in Alpha, the items are weighted by their respective factor loadings (Bagozzi, 1994; Bollen, 1989).

The variance extracted estimate which measures the amount of variance captured by a construct in relation to the variance due to random measurement error is computed as shown below (Fornell and Larcker, 1981).
Average Variance Extracted =

\[ AVE = \frac{\sum \lambda_{yi}^2}{\sum \lambda_{yi}^2 + \sum Var(\varepsilon_i)} \]

The numerator is equal to the sum of the squared factor loadings and the denominator is equal to the sum of the squared factor loadings plus the sum of the variance due to random measurement error \(\varepsilon_i\) in each loading.

### 8.4.1 Newness-PLB Core Measurement Model

The measurement model for Newness variables and PLB is shown in Figure 8.17. Fit indices for this model were: AGFI = 0.85, CFI = 0.90, GFI = 0.88, NFI = 0.84, RMR = 0.08, RMSEA = 0.063, SRMR = 0.063, and TLI = 0.89. The values of AGFI, GFI, NFI, and TLI were slightly lower than acceptable cut off point of 0.90. Other four indices were within acceptable range. Since AGFI, GFI, NFI, and TLI indices were very marginally lower than acceptable limits, it was reasonable to treat this model fitting the data. Therefore, further analysis was carried out using the results of this Newness-PLB Core Measurement Model.
In order to establish scale reliability and convergent validity, composite factor reliabilities and AVEs for this model were calculated as per Fornell and Larcker (1981). Table 8.3 shows the composite reliability and AVE values for each variable as well as factor loadings and error variance for each measurement scale items.

**Figure 8.17**: Newness-PLB Core Measurement Model
### Table 8.3: Composite Reliability and AVE of Newness-PLB Core Measurement Model

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor Loading</th>
<th>Error Variance</th>
<th>Composite Factor Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing Fit</td>
<td></td>
<td></td>
<td>0.80</td>
<td>0.40</td>
</tr>
<tr>
<td>MFit1</td>
<td>0.56</td>
<td>0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit2</td>
<td>0.71</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit3</td>
<td>0.68</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit4</td>
<td>0.69</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit5</td>
<td>0.73</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit6</td>
<td>0.75</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Fit</td>
<td></td>
<td></td>
<td>0.68</td>
<td>0.30</td>
</tr>
<tr>
<td>TFit1</td>
<td>0.63</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit2</td>
<td>0.66</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit3</td>
<td>0.62</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit4</td>
<td>0.67</td>
<td>1.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit5</td>
<td>0.64</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing Familiarity</td>
<td></td>
<td></td>
<td>0.74</td>
<td>0.42</td>
</tr>
<tr>
<td>MFam1</td>
<td>0.82</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam2</td>
<td>0.75</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam3</td>
<td>0.73</td>
<td>0.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam4</td>
<td>0.76</td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Familiarity</td>
<td></td>
<td></td>
<td>0.69</td>
<td>0.32</td>
</tr>
<tr>
<td>TFam1</td>
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</tr>
<tr>
<td>TFam2</td>
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<td></td>
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</tr>
<tr>
<td>TFam3</td>
<td>0.66</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam4</td>
<td>0.64</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam5</td>
<td>0.52</td>
<td>0.72</td>
<td></td>
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<tr>
<td>Product-Level Benefits</td>
<td></td>
<td></td>
<td>0.74</td>
<td>0.46</td>
</tr>
<tr>
<td>PLB1</td>
<td>0.47</td>
<td>0.74</td>
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<tr>
<td>PLB2</td>
<td>0.96</td>
<td>0.07</td>
<td></td>
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</tr>
<tr>
<td>PLB3</td>
<td>0.32</td>
<td>1.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLB4</td>
<td>0.92</td>
<td>0.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The composite factor reliabilities for MFit, TFit, MFam, TFam and PLB were 0.80, 0.68, 0.74, 0.69 and 0.74 respectively and AVE for MFit, TFit, MFam, TFam and PLB were 0.40, 0.30, 0.42, 0.32 and 0.46 respectively (See Table 9.3). Evidently, all scales (except TFit and TFam) had composite factor reliability values more than
acceptable 0.7. However, all scales had AVE values less than the recommended 0.50 (Fornell and Larcker, 1981; Bagozzi and Youjae, 1988).

Technological Familiarity’s composite factor reliability bordered on the minimum cut-off point and it did not have any measurement item with high error variance, it was decided to accept its scale as it was. However, Technological Fit had a composite factor reliability value lower than the suggested minimum of 0.70 (Fornell and Larcker, 1981; Bagozzi and Youjae, 1988) and also had two measurement items with high variance (>1). So, an effort was made to investigate if the composite factor reliability value of Technological Fit could be improved by deletion of items TFit3 and/or TFit4 (the items having high error variance).

Since TFit3 had an error variance greater than TFit4, TFit3-deletion was tested first by dropping it off from the analysis. The composite factor reliability and AVE values were recalculated. It lead to a decrement in the composite factor reliability (old value=0.68; new value=0.65) and a slight improvement in the AVE value (old value=0.30; new value=0.32).

Subsequently, TFit4-deletion was tested by dropping it off from the analysis. The composite factor reliability and AVE values were recalculated. This too led to a drop in the composite factor reliability (old value=0.68; new value=0.64) and the AVE value remained the same (old value=0.30; new value=0.30).

Deletion of neither TFit3 nor of TFit4 made any significant improvement in the model fit either (see Table 8.4). Finally, both scale items, namely TFit3 and TFit4 were simultaneously dropped to see if there was any significant improvement in composite factor reliability and AVE values or the model fit indices. Recalculated composite factor reliability (old value=0.68; new value=0.62) and AVE value (old value=0.30; new value=0.36) did not justify their deletion. Though there was a slight improvement across the board, the improvement was not large enough to justify deletion of the two measurement items. As this study aims to refine the theoretical and operational definition of product newness, it was decided not to prefer parsimony but to retain TFit3 and TFit4 since these two items add to the richness of the measurement scale of Technological Fit and ultimately to the Product Newness construct.
Table 8.4: Fit Indices of Newness-PLB Core Measurement Model

<table>
<thead>
<tr>
<th>Fit Indices</th>
<th>All Items included</th>
<th>Tfit3 dropped</th>
<th>Tfit4 dropped</th>
<th>Tfit3 and Tfit4 dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGFI</td>
<td>0.85</td>
<td>0.86</td>
<td>0.86</td>
<td>0.87</td>
</tr>
<tr>
<td>CFI</td>
<td>0.90</td>
<td>0.91</td>
<td>0.91</td>
<td>0.92</td>
</tr>
<tr>
<td>GFI</td>
<td>0.88</td>
<td>0.89</td>
<td>0.89</td>
<td>0.90</td>
</tr>
<tr>
<td>NFI</td>
<td>0.84</td>
<td>0.85</td>
<td>0.85</td>
<td>0.86</td>
</tr>
<tr>
<td>RMR</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.063</td>
<td>0.062</td>
<td>0.062</td>
<td>0.05</td>
</tr>
<tr>
<td>SRMR</td>
<td>0.063</td>
<td>0.063</td>
<td>0.063</td>
<td>0.060</td>
</tr>
<tr>
<td>TLI</td>
<td>0.89</td>
<td>0.90</td>
<td>0.90</td>
<td>0.91</td>
</tr>
</tbody>
</table>

However, one point of concern was low AVEs values of all five scales, since none of them met the minimum value of 0.50. In such situations, it is recommended to carry out a constrained analysis (Sharma, 2000) to test scale reliability and convergent as well as discriminant validity of scales. A constrained analysis is done by constraining in sequence the covariance between all possible pairs of variables. Therefore, a constrained analysis was carried out by constraining scales one by one in following pairs: MFit-Tfit, TFit-MFam, MFam-TFam, TFam-PLB, MFit-MFam, MFit-TFam, MFit-PLB, TFit-TFam, TFit-PLB, and MFam-PLB.

This analysis was also a test to further examine convergent validity of the items within each scale and evaluate discriminant validity between scales. The analysis was done by comparing fit of unidimensional model (such as MFit and TFit factors with an assigned correlation of “1”) to the hypothesized two-factor model with MFit and TFit as two separate and correlated variables with no correlation assigned beforehand. If the fit of two-factor model is better than (in terms of a lower Chi Square value) than that of the unidimensional model, convergent and discriminant validity of the scales is supported (Anderson and Gerbing, 1988, Burnkrant and Page, 1982). Results of this constraining analysis are shown in Table 9.5. None of the constrained pair led to a lower Chi Square value than the unconstrained model. Hence, as per Anderson and Gerbing (1988), and Burnkrant and Page’s (1982) suggestions the unconstrained model was treated as significantly better than all the constrained models.
Table 8.5: Chi Square Values of Newness-PLB Core Measurement Model

<table>
<thead>
<tr>
<th>Variables restrained with unity correlation</th>
<th>Chi Square</th>
<th>Degree of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Unrestrained Model)</td>
<td>546.6</td>
<td>242</td>
</tr>
<tr>
<td>MFit-Tift</td>
<td>617.5</td>
<td>243</td>
</tr>
<tr>
<td>TFit-MFam</td>
<td>558.4</td>
<td>243</td>
</tr>
<tr>
<td>MFam-TFam</td>
<td>617.7</td>
<td>243</td>
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<tr>
<td>TFam-PLB</td>
<td>780.5</td>
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<td>MFit-MFam</td>
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<tr>
<td>MFit-TFam</td>
<td>723.3</td>
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</tr>
<tr>
<td>MFit-PLB</td>
<td>703.6</td>
<td>243</td>
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<tr>
<td>TFit-TFam</td>
<td>656.7</td>
<td>243</td>
</tr>
<tr>
<td>TFit-PLB</td>
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</tr>
<tr>
<td>MFam-PLB</td>
<td>636.9</td>
<td>243</td>
</tr>
</tbody>
</table>

One more test of discriminant validity was carried out, as prescribed by Fornell and Larcker (1981), by comparing the estimated AVE of each of the variable with the square of the correlation between the variables. If estimated AVEs of a pair of variables are greater than the square of correlation between the pair, discriminant validity is proved (Fornell and Larcker, 1981). This test too was carried out in ten pairs as in the previous test. Results are shown in Table 8.6. None of the original estimated AVE (shown in the second column from left) fell short of the corresponding square of correlation between the variables (shown in the extreme right column), except for a solitary case of TFit. So, overlooking a minor exception of TFit, this test too confirmed the discriminant validity of the scales.

Since the results of the foregoing convergent and discriminant validity tests were mostly affirmative, it was decided to use the PLB scale for regression analysis needed for hypotheses testing. The scales of newness (MFit, TFit, MFam and TFam) were subject to confirmation in the next model, namely, Newness-FLB Core Measurement Model.
Table 8.6: Parameter Estimates between Measures of Newness-PLB Core Measurement Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Original AVE</th>
<th>Parameter estimates between measures (covariance)</th>
<th>Square of correlation between variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.30</td>
<td>0.09</td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td>0.64</td>
<td>0.41</td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td>0.26</td>
<td>0.07</td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>PLB</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.40</td>
<td>0.16</td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.13</td>
<td>0.02</td>
</tr>
<tr>
<td>PLB</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td>0.18</td>
<td>0.03</td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td>0.14</td>
<td>0.02</td>
</tr>
<tr>
<td>PLB</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td>0.20</td>
<td>0.04</td>
</tr>
<tr>
<td>PLB</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.4.2 Newness-FLB Core Measurement Model

The measurement model for Newness variables and FLB is shown in Figure 8.18. Fit indices for this model were: AGFI = 0.84, CFI = 0.91, GFI = 0.87, NFI = 0.86, RMR = 0.077, RMSEA = 0.063, SRMR = 0.060, and TLI = 0.90. The values of AGFI, GFI and NFI were slightly lower than acceptable cut off point of 0.90. Other than those three all other indices were within acceptable range. Based on these indices values, it was fairly reasonable to treat this model fitting the data and hence further analysis were carried out using the results of this Newness-FLB Core Measurement Model.
In order to establish scale reliability and convergent validity, composite factor reliabilities and AVEs for this model were calculated as per Fornell and Larcker (1981). Table 8.7 shows the composite reliability and AVE values for each variable as well as factor loadings and error variance for each scale items.
Table 8.7: Composite Reliability and AVE of Newness-FLB Core Measurement Model

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor Loading</th>
<th>Error Variance</th>
<th>Composite Factor Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing Fit</td>
<td>0.80</td>
<td>0.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit1</td>
<td>0.57</td>
<td>0.69</td>
<td>0.68</td>
<td>0.30</td>
</tr>
<tr>
<td>MFit2</td>
<td>0.71</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit3</td>
<td>0.67</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit4</td>
<td>0.69</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit5</td>
<td>0.73</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit6</td>
<td>0.75</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Fit</td>
<td></td>
<td></td>
<td>0.74</td>
<td>0.42</td>
</tr>
<tr>
<td>TFit1</td>
<td>0.63</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit2</td>
<td>0.65</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit3</td>
<td>0.62</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit4</td>
<td>0.66</td>
<td>1.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit5</td>
<td>0.64</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing Familiarity</td>
<td></td>
<td></td>
<td>0.69</td>
<td>0.32</td>
</tr>
<tr>
<td>MFam1</td>
<td>0.82</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam2</td>
<td>0.75</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam3</td>
<td>0.73</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam4</td>
<td>0.76</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Familiarity</td>
<td></td>
<td></td>
<td>0.69</td>
<td>0.32</td>
</tr>
<tr>
<td>TFam1</td>
<td>0.41</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam2</td>
<td>0.59</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam3</td>
<td>0.65</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam4</td>
<td>0.64</td>
<td>0.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam5</td>
<td>0.52</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm-Level Benefits</td>
<td></td>
<td></td>
<td>0.86</td>
<td>0.58</td>
</tr>
<tr>
<td>FLB1</td>
<td>0.99</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLB3</td>
<td>0.98</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLB4</td>
<td>0.49</td>
<td>0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLB5</td>
<td>0.63</td>
<td>0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLB6</td>
<td>0.62</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The composite factor reliabilities for MFit, TFit, MFam, TFam and FLB were 0.80, 0.68, 0.74, 0.69 and 0.86 respectively and AVE for MFit, TFit, MFam, TFam and FLB were 0.40, 0.30, 0.42, 0.32 and 0.58 respectively (See Table 8.3). Evidently, all scales (except Technological Fit and Technological Familiarity) had composite factor reliability values more than acceptable 0.7. However, all scales (except FLB with
had AVE values less than the recommended 0.50 (Fornell and Larcker, 1981; Bagozzi and Youjae, 1988).

Technological Fit and Technological Familiarity had a composite factor reliability value lower than the suggested minimum of 0.70 (Fornell and Larcker, 1981; Bagozzi and Youjae, 1988). As argued earlier, since Technological Familiarity had a value of 0.69 (only slightly lower than the minimum cut off) and no item Technological Familiarity had high error variance (of more than 1), it was decided to accept as it was. However, an effort was made to investigate if the composite factor reliability value of Technological Fit could be improved by deletion of items TFit 3 and/or TFit4.

Since TFit3 had an error variance greater than TFit4, TFit3-deletion was tested first by dropping it off from the analysis. The composite factor reliability and AVE values were recalculated which led to a decrement in the composite factor reliability (old value=0.68; new value=0.65) and a slight increment in the AVE value (old value=0.30; new value=0.32).

Subsequently, TFit4-deletion was tested by dropping it off from the analysis. The composite factor reliability and AVE values were recalculated but it did not lead to any significant improvement in the composite factor reliability (old value=0.68; new value=0.63) or the AVE values (old value=0.30; new value=0.30).

Though PLB had acceptable composite factor reliability and AVE values, FLB6 had a high error variance (1.00). So, it was also tested, not to improve FLB scale, but to see if its deletion could improve the model fit.

Finally, all the three scale items, namely TFit3, TFit4 and PLB5 were simultaneously dropped to see if there was any significant improvement in the model fit indices. Since neither of the above deletion helped in any worthwhile improvement, it was decided to retain TFit3 and TFit4 in the Technological Fit scale and FLB5 in the Firm Level Benefits scale. See Table 8.8.
Table 8.8: Fit Indices of Newness-FLB Core Measurement Model

<table>
<thead>
<tr>
<th>Fit Indices</th>
<th>All Items Included</th>
<th>TFit3 dropped</th>
<th>TFit4 dropped</th>
<th>FLB6 dropped</th>
<th>TFit3, TFit4 and FLB6 dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGFI</td>
<td>0.84</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.87</td>
</tr>
<tr>
<td>CFI</td>
<td>0.91</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
<td>0.93</td>
</tr>
<tr>
<td>GFI</td>
<td>0.87</td>
<td>0.88</td>
<td>0.88</td>
<td>0.88</td>
<td>0.90</td>
</tr>
<tr>
<td>NFI</td>
<td>0.86</td>
<td>0.87</td>
<td>0.87</td>
<td>0.86</td>
<td>0.88</td>
</tr>
<tr>
<td>RMR</td>
<td>0.08</td>
<td>0.08</td>
<td>0.07</td>
<td>0.08</td>
<td>0.07</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.063</td>
<td>0.062</td>
<td>0.062</td>
<td>0.062</td>
<td>0.059</td>
</tr>
<tr>
<td>SRMR</td>
<td>0.060</td>
<td>0.600</td>
<td>0.059</td>
<td>0.059</td>
<td>0.057</td>
</tr>
<tr>
<td>TLI</td>
<td>0.90</td>
<td>0.91</td>
<td>0.91</td>
<td>0.91</td>
<td>0.92</td>
</tr>
</tbody>
</table>

One point of concern was low AVEs values of four out of five scales (except FLB) which did not meet a minimum value of 0.50. As argued in the previous section, it was decided to carry out a constrained analysis (Sharma, 2000) to test scale reliability and convergent as well as discriminant validity. This analysis was carried out by constraining scales one by one in following pairs: MFit-Tift, TFit-MFam, MFam-TFam, TFam-FLB, MFit-MFam, MFit-TFam, MFit-FLB, TFit-TFam, TFit-FLB, and MFam-FLB.

Results of this constraining analysis are shown in Table 8.9. None of the constrained pair led to a lower Chi Square value than the unconstrained model. Hence, the unconstrained model was treated as significantly better than all the constrained models.

Table 8.9: Chi Square Values of Newness-FLB Core Measurement Model

<table>
<thead>
<tr>
<th>Variables restrained with unity correlation</th>
<th>Chi Square</th>
<th>Degree of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestrained Model</td>
<td>600.2</td>
<td>265</td>
</tr>
<tr>
<td>MFit-Tift</td>
<td>671.3</td>
<td>266</td>
</tr>
<tr>
<td>TFit-MFam</td>
<td>612.1</td>
<td>266</td>
</tr>
<tr>
<td>MFam-TFam</td>
<td>670.7</td>
<td>266</td>
</tr>
<tr>
<td>TFam-FLB</td>
<td>707.2</td>
<td>266</td>
</tr>
<tr>
<td>MFit-MFam</td>
<td>642.3</td>
<td>266</td>
</tr>
<tr>
<td>MFit-TFam</td>
<td>776.3</td>
<td>266</td>
</tr>
<tr>
<td>MFit-FLB</td>
<td>686.1</td>
<td>266</td>
</tr>
<tr>
<td>TFit-TFam</td>
<td>710.3</td>
<td>266</td>
</tr>
<tr>
<td>TFit-FLB</td>
<td>641.5</td>
<td>266</td>
</tr>
<tr>
<td>MFam-FLB</td>
<td>620.9</td>
<td>266</td>
</tr>
</tbody>
</table>

One more test of discriminant validity was carried out by comparing the estimated AVE of each of the variable with the square of the correlation between the variables.
If estimated AVEs of a pair of variables are greater than the square of correlation between the pair, discriminant validity is proved (Fornell and Larcker, 1981). This test too was carried out in ten pairs as in the previous test. Results are shown in Table 8.10. None of the original estimated AVE (shown in the second column from left) fell short of the corresponding square of correlation between the variables (shown in the extreme right column), except for a solitary case of TFit. Except a minor exception of TFit, this test too confirmed the discriminant validity of the scales.

Table 8.10: Parameter Estimates between Measures of the Core Measurement Model ONE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Original AVE</th>
<th>Parameter estimates between measures (covariance)</th>
<th>Square of correlation between variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.30</td>
<td>0.09</td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td>0.64</td>
<td>0.41</td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td>0.27</td>
<td>0.07</td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLB</td>
<td>0.58</td>
<td>0.19</td>
<td>0.04</td>
</tr>
<tr>
<td>MFit</td>
<td>0.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFit</td>
<td>0.40</td>
<td>0.24</td>
<td>0.06</td>
</tr>
<tr>
<td>FLB</td>
<td>0.58</td>
<td>0.18</td>
<td>0.03</td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit</td>
<td>0.30</td>
<td>0.41</td>
<td>0.17</td>
</tr>
<tr>
<td>FLB</td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam</td>
<td>0.42</td>
<td>0.52</td>
<td>0.27</td>
</tr>
<tr>
<td>FLB</td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Considering the affirmative results of the convergent and discriminant validity test described above, it was decided to use the FLB scale for regression analysis. The scales of newness (MFit, TFit, MFam and TFam) were further confirmed in this model too, so these are good enough for further regression analysis for hypotheses testing.
8.4.3 Environmental Factors Measurement Model
The measurement model for Environmental Factors is shown in Figure 8.19. Fit indices for this model were: AGFI = 0.94, CFI = 0.98, GFI = 0.96, NFI = 0.94, RMR = 0.063, RMSEA = 0.038, SRMR = 0.042, and TLI = 0.97. All indices values were within acceptable range. Based on these indices values, it was fairly reasonable to treat this model fitting the data and hence further analysis were carried out using the results of this Environmental Factors Measurement Model.

![Figure 8.19: Environmental Factors Measurement Model](image)

In order to establish scale reliability and convergent validity, composite factor reliabilities and AVEs for this model were calculated as per Fornell and Larcker (1981). Table 8.11 shows the composite reliability and AVE values for each variable as well as factor loadings and error variance for each individual scale items.
Table 8.11: Composite Reliability and AVE of Environmental Factors Measurement Model

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor Loading</th>
<th>Error Variance</th>
<th>Composite Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching Cost (SC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC1</td>
<td>0.75</td>
<td>0.53</td>
<td>0.70</td>
<td>0.44</td>
</tr>
<tr>
<td>SC2</td>
<td>0.56</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC3</td>
<td>0.71</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aggressive Marketing Practice (AMP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP1</td>
<td>0.74</td>
<td>0.77</td>
<td>0.71</td>
<td>0.39</td>
</tr>
<tr>
<td>AMP2</td>
<td>0.58</td>
<td>1.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP3</td>
<td>0.61</td>
<td>0.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP4</td>
<td>0.72</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP5</td>
<td>0.69</td>
<td>0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Mediated Transactions (CMT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMT1</td>
<td>0.74</td>
<td>0.52</td>
<td>0.77</td>
<td>0.51</td>
</tr>
<tr>
<td>CMT2</td>
<td>0.73</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMT3</td>
<td>0.73</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMT4</td>
<td>0.71</td>
<td>0.97</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The composite factor reliabilities for SC, AMP and CMT were 0.70, 0.71 and 0.77 respectively and AVE for SC, AMP and CMT were 0.44, 0.39 and 0.51 respectively. All three variables met the composite factor reliability of criterion of 0.70, but only CMT met AVE criterion of 0.50 (Fornell and Larcker, 1981; Bagozzi and Youjae, 1988). Since SC scale had no measurement item with high variance and its AVE was close to the minimum criterion, it was decided to accept the scale as it is. However, since AMP2 showed a high error variance, it was decided to check if its deletion could improve the AMP scale.

The composite factor reliability and AVE values of AMP were recalculated but it did not lead to any significant improvement in the composite factor reliability (old value=0.71; new value=0.68) or the AVE values (old value=0.39; new value=0.35). Since the deletion did not help in improving the scale or the model fit in a significant manner (see Table 8.12), it was decided to retain AMP2 in the AMP scale.
Table 8.12: Fit Indices of Environmental Factors Measurement Model

<table>
<thead>
<tr>
<th>Fit Indices</th>
<th>All Items included</th>
<th>AMP2 dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGFI</td>
<td>0.94</td>
<td>0.96</td>
</tr>
<tr>
<td>CFI</td>
<td>0.98</td>
<td>0.99</td>
</tr>
<tr>
<td>GFI</td>
<td>0.96</td>
<td>0.98</td>
</tr>
<tr>
<td>NFI</td>
<td>0.94</td>
<td>0.98</td>
</tr>
<tr>
<td>RMR</td>
<td>0.063</td>
<td>0.057</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.038</td>
<td>0.02</td>
</tr>
<tr>
<td>SRMR</td>
<td>0.042</td>
<td>0.039</td>
</tr>
<tr>
<td>TLI</td>
<td>0.97</td>
<td>0.99</td>
</tr>
</tbody>
</table>

As AVE of AMP did not meet the minimum value of 0.50, a constrained analysis (Sharma, 2000) was carried out to test scale reliability and convergent as well as discriminant validity of the scales by constraining the scales one by one in the following pairs: SC-AMP, AMP-CMT and CMT-SC. However none of the constrained model resulted in a lower Chi Square (see Table 8.13). Hence, as per Anderson and Gerbing (1988), and Burnkrant and Page’s (1982) suggestions the unconstrained model was treated as significantly better than all the constrained models.

Table 8.13: Chi Square Values of Environmental Factors Measurement Model

<table>
<thead>
<tr>
<th>Variables restrained with unity correlation</th>
<th>Chi Square</th>
<th>Degree of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestrained Model</td>
<td>74.5</td>
<td>51</td>
</tr>
<tr>
<td>SC-AMP</td>
<td>157.4</td>
<td>52</td>
</tr>
<tr>
<td>AMP-CMT</td>
<td>183.0</td>
<td>52</td>
</tr>
<tr>
<td>CMT-SC</td>
<td>117.4</td>
<td>52</td>
</tr>
</tbody>
</table>

Finally, a test of discriminant validity as prescribed by Fornell and Larcker (1981), was done by comparing the estimated AVE of each of the variable with the square of the correlation between the variables.

If estimated AVEs of a pair of variables are greater than the square of correlation between the pair, discriminant validity is proved (Fornell and Larcker, 1981). This test too was carried out in three pairs of SC-AMP, AMP-CMT and CMT-SC. Results are shown in Table 8.14. None of the original estimated AVE (shown in the second column from left) fell short of the corresponding square of correlation between the variables.
variables (shown in the extreme right column) giving conclusive proof of discriminant validity.

Table 8.14: Parameter Estimates of Environmental Factors Measurement Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Original AVE</th>
<th>Parameter estimates between measures (covariance)</th>
<th>Square of correlation between variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>0.44</td>
<td>0.11</td>
<td>0.01</td>
</tr>
<tr>
<td>AMP</td>
<td>0.39</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>CMT</td>
<td>0.51</td>
<td>0.41</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Taking into account the positive results of tests for convergent and discriminant validity described above, it was decided to use the scale of environmental factors for further regression analysis. The scales of Newness, PLB and FLB were already deemed fit for the regression analysis needed for the hypotheses testing which is described in the next section.

8.5 Hypotheses Testing

Ideally all hypotheses should have been tested together in a structural equation framework (SEM) considering all measurement items and path models together. The chief advantage of such a model would be incorporation of errors of all measurement items simultaneously in the model. Unfortunately, SEM is still not advanced enough to efficiently handle multiple moderations involving continuous variables. Since this study contained a complex model, it was not possible to use SEM to investigate moderating effects of environmental factors. As the psychometric properties of variable scales were already established and overall fit of all three models were satisfactory, the hypothesis testing was done using multiple regression. To do that, the measurement items for each variable were averaged to develop a composite scale for all dependent, explanatory and moderating variables. As explained in the previous chapter, there was no convincing reason to assign different weight (e.g., based on factor loading of items) to constituent scale items. Moreover, it was assumed that all scale items contributed equally towards a scale. This assumption was based on the premise that until an opposite was found by researchers, it was the least risky option.
The regression models were developed in a hierarchical way. In Model 1, Marketing Fit (MFit), Technological Fit (TFit), Market Familiarity (MFam), Technological Familiarity (TFam) and Product Level Benefits (PLB) were entered. The first four variables were related to Hypotheses H1A, H2A, H3A, and H4A. In Model 2, the three moderating variables, namely Switching Cost (SC), Aggressive Marketing Practice (AMP), and Computer Mediated Transaction (CMT) were further entered.

Now was the time test moderating effect of SC, AMP and CMT on the relationship between newness variables and PLB. So, in Model 3 to 6, interaction of SC on MFit, TFit, MFam and TFam were investigated. This was done by entering one by one SC-MFit, SC-TFit, SC-MFam and SC-TFam interactions into Models 3 to 6 (see Table 9.17). This approach made interpretation of interaction coefficients easy. Since it is difficult to interpret interactions if more than one moderating variables are entered in one model. The reason is a coefficient of interaction terms gets affected by every new variable entered in that particular model.

Similarly, moderating role of AMP was investigated in Models 7 through 10 (See Table 8.18) and that of CMT in Models 11 through 14.

In a similar fashion, hypotheses involving MFit, TFit, MFam and TFam and FLB were tested in Model 15. Moderating effects of SC (Models 17-20), AMP (Models 21-24) and CMT (Models 25-28) on FLB were investigated in a similar way as explained above for the PLB.

In order to confirm the results of main hypotheses (involving newness variables and PLB, and newness variables and FLB), path analyses using SEM were also done (described in the next section.)

To test both core measurement models (Newness-PLB and Newness-FLB) as well as to investigate moderating effects of economic factors, multiple hierarchical regression analysis was done using SPSS (Version 14.0) following the process suggested by Baron and Kenny (1986).
Since a majority of hypotheses (except the main hypotheses involving newness variables and PLB/FLB) were tested using multiple hierarchical regression analysis, it was necessary to assess the multicollinearity among the explanatory and moderating variables. Multicollinearity creates a problem as it confounds the unique contribution of each explanatory variable on the dependent variable, which makes the interpretation of results difficult. For example, standardized coefficients might be incorrectly estimated or possess wrong signs (Hair et al., 1998). In moderated regressions too, multicollinearity creates a problem if the interacting variable is highly correlated with constituent variables. In that case multicollinearity runs the risk of inflating the standard errors of the regression coefficients and hence causing instability in their values.

To evaluate multicollinearity pair-wise correlations between explanatory and moderating variables were examined. Presence of high correlations, generally 0.90 or above, is one indication of substantial collinearity (Ibid.). However, a lack of high collinearity does not eliminate the chance of multicollinearity. Table 8.15 presents the means, standard deviations, and pair-wise correlations among the variables of Newness-PLB model. Most of the correlation values were either low or moderate.

Table 8.15: Means, Standard Deviations and Correlations for Newness-PLB Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>M Fit</th>
<th>T Fit</th>
<th>M Fam</th>
<th>T Fam</th>
<th>SC</th>
<th>AMP</th>
<th>CMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>M Fit</td>
<td>4.805</td>
<td>0.878</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T Fit</td>
<td>4.881</td>
<td>0.941</td>
<td>0.580</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M Fam</td>
<td>4.995</td>
<td>1.167</td>
<td>0.508</td>
<td>0.590</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T Fam</td>
<td>5.588</td>
<td>0.700</td>
<td>0.357</td>
<td>0.484</td>
<td>0.460</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>4.751</td>
<td>0.888</td>
<td>0.070</td>
<td>0.063</td>
<td>0.005</td>
<td>0.029</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP</td>
<td>4.867</td>
<td>0.973</td>
<td>0.469</td>
<td>0.402</td>
<td>0.436</td>
<td>0.227</td>
<td>0.096</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMT</td>
<td>4.864</td>
<td>0.917</td>
<td>0.003</td>
<td>0.003</td>
<td>-0.025</td>
<td>-0.041</td>
<td>0.468</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>PLB</td>
<td>4.324</td>
<td>0.883</td>
<td>0.443</td>
<td>0.373</td>
<td>0.338</td>
<td>0.287</td>
<td>0.063</td>
<td>0.415</td>
<td>0.026</td>
</tr>
</tbody>
</table>

8.5.1 Results of Product Newness on PLB

Table 8.16 shows the results of regression analysis of Newness variables on Product Level Benefits (Model 1). The first column lists the variables, the second unstandardized coefficients and the third standard error in parentheses. Significant levels of the coefficients are asterisk-marked and clarified below the table. Durbin-
Watson test statistic was 1.898, very close to recommended value of 2 which indicates that the residuals are uncorrelated (Field, 2005).

It was hypothesized that product newness comprises of four dimensions and each dimension of Marketing Fit, Technological Fit, Market Familiarity, and Technological Familiarity would have positive effects on Product Level Benefits.

Table 8.16 Results of Regression Analysis (Model 1)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1: Newness-PLB Core Measurement Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstandardized Reg. Coefficient  B</td>
</tr>
<tr>
<td>Constant</td>
<td>1.419</td>
</tr>
<tr>
<td>MFit</td>
<td>0.313***</td>
</tr>
<tr>
<td>TFit</td>
<td>0.096</td>
</tr>
<tr>
<td>MFam</td>
<td>0.059</td>
</tr>
<tr>
<td>TFam</td>
<td>0.113</td>
</tr>
<tr>
<td>R²</td>
<td>0.229</td>
</tr>
<tr>
<td>F</td>
<td>23.404***</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001; All two-tailed tests.

It is evident from Table 8.16 that Marketing Fit (β=0.311, p=0.000) is positively related to PLB. Technological Fit, Market Familiarity, and Technological Familiarity also are positively related to the Product Level Benefits but their coefficients are not significant at the conventional level of p = 0.05. These results can be summarized in as

Hypothesis 1A: The higher the marketing fit of the firm needed for the new product, the higher product-level benefits will it generate.

This hypothesis is supported (β=0.311, p=0.000).

Hypothesis 2A: The higher the technological fit of the firm needed for the development, distribution and support of the new product, the higher product-level benefits will it generate.

This hypothesis is not supported (β=0.103, p=0.139).
Hypothesis 3A: The higher the marketing familiarity of the firm needed for the new product, the higher product-level benefits it will generate.

This hypothesis is not supported ($\beta=0.079$, $p=0.227$).

Hypothesis 4A: The higher the technological familiarity of the firm needed for the development, distribution and support of the new product, the higher product-level benefits will it generate.

This hypothesis is not supported ($\beta=0.90$, $p=0.124$).

**8.5.2 Moderating Role of SC on Newness-PLB**

Next a series of multiple regression analysis was carried out to assess the moderating effect of Environmental Factors on the relationships between newness variables and PLB. Table 8.18 shows the results of the multiple regression analysis involving moderating effect of Switching Costs on MFit-PLB, TFit-PLB, MFam-PLB and TFam-PLB relationships.
<table>
<thead>
<tr>
<th>Hypothesis No.</th>
<th>Hypothesis Description</th>
<th>Standardized Beta Coefficient</th>
<th>Std. Error</th>
<th>Significance Level</th>
<th>Supported / Not Supported</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1A</td>
<td>The higher the marketing fit of the firm needed for the new product, the higher product-level benefits will it generate.</td>
<td>0.313</td>
<td>0.063</td>
<td>$p &lt; 0.001$</td>
<td>Supported</td>
<td>See Page No. 259</td>
</tr>
<tr>
<td>H2A</td>
<td>The higher the technological fit of the firm needed for the development, distribution and support of the new product, the higher product-level benefits will it generate.</td>
<td>0.096</td>
<td>0.065</td>
<td>NS</td>
<td>Supported</td>
<td>See Page No. 259</td>
</tr>
<tr>
<td>H3A</td>
<td>The higher the marketing familiarity of the firm needed for the new product, the higher product-level benefits it will generate.</td>
<td>0.059</td>
<td>0.049</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 260</td>
</tr>
<tr>
<td>H4A</td>
<td>The higher the technological familiarity of the firm needed for the development, distribution and support of the new product, the higher product-level benefits will it generate.</td>
<td>0.113</td>
<td>0.074</td>
<td>NS</td>
<td>Supported</td>
<td>See Page No. 260</td>
</tr>
<tr>
<td>H5A</td>
<td>The higher the switching costs of customers, the higher will be the impact of marketing fit on the product-level benefits.</td>
<td>0.024</td>
<td>0.057</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 264</td>
</tr>
<tr>
<td>H5C</td>
<td>The higher the switching costs of customers, the higher will be the impact of technological fit on the product-level benefits.</td>
<td>0.018</td>
<td>0.054</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 264</td>
</tr>
<tr>
<td>H5E</td>
<td>The higher the switching costs of customers, the higher will be the impact of market familiarity on the product-level benefits.</td>
<td>0.063</td>
<td>0.046</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 264</td>
</tr>
<tr>
<td>H5G</td>
<td>The higher the switching costs of customers, the higher will be the impact of technological familiarity on the product-level benefits.</td>
<td>0.104</td>
<td>0.074</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 264</td>
</tr>
<tr>
<td></td>
<td>Hypothesis</td>
<td>Description</td>
<td>p-value</td>
<td>Significance</td>
<td>Support Status</td>
<td>Reference</td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>-------------</td>
<td>---------</td>
<td>--------------</td>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>H6A</td>
<td>The higher the AMP of the new product, the higher will be the impact of marketing fit on the product-level benefits.</td>
<td>0.139</td>
<td>0.047</td>
<td><em>p</em> &lt; 0.01</td>
<td>Supported</td>
<td>See Page No. 267</td>
</tr>
<tr>
<td>H6C</td>
<td>The higher the AMP of the new product, the higher will be the impact of technological fit on the product-level benefits.</td>
<td>0.152</td>
<td>0.041</td>
<td><em>p</em> &lt; 0.001</td>
<td>Supported</td>
<td>See Page No. 267</td>
</tr>
<tr>
<td>H6E</td>
<td>The higher the AMP of the new product, the higher will be the impact of market familiarity on the product-level benefits.</td>
<td>0.108</td>
<td>0.033</td>
<td><em>p</em> &lt; 0.01</td>
<td>Supported</td>
<td>See Page No. 267</td>
</tr>
<tr>
<td>H6G</td>
<td>The higher the AMP of the new product, the higher will be the impact of technological familiarity on the product-level benefits.</td>
<td>0.215</td>
<td>0.062</td>
<td><em>p</em> &lt; 0.01</td>
<td>Supported</td>
<td>See Page No. 267</td>
</tr>
<tr>
<td>H7A</td>
<td>The higher the CMT of the new product, the higher will be the impact of marketing fit on the product-level benefits.</td>
<td>0.016</td>
<td>0.052</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 269</td>
</tr>
<tr>
<td>H7C</td>
<td>The higher the CMT of the new product, the higher will be the impact of technological fit on the product-level benefits.</td>
<td>0.074</td>
<td>0.045</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 269</td>
</tr>
<tr>
<td>H7E</td>
<td>The higher the CMT of the new product, the higher will be the impact of market familiarity on the product-level benefits.</td>
<td>0.052</td>
<td>0.034</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 269</td>
</tr>
<tr>
<td>H7G</td>
<td>The higher the CMT of the new product, the higher will be the impact of technological familiarity on the product-level benefits.</td>
<td>0.120</td>
<td>0.070</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No. 269</td>
</tr>
</tbody>
</table>

(NS: Not Significant)
### Table 8.18: Results of Multiple Regression Analysis (Moderation Effect of Switching Cost)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
</tr>
<tr>
<td>Constant</td>
<td>1.419</td>
<td>(0.373)</td>
<td>0.843</td>
<td>(0.458)</td>
<td>1.378</td>
<td>(0.373)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.313***</td>
<td>(0.063)</td>
<td>0.240***</td>
<td>(0.064)</td>
<td>0.128</td>
<td>(0.275)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.096</td>
<td>(0.065)</td>
<td>0.071</td>
<td>(0.064)</td>
<td>0.070</td>
<td>(0.064)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.059</td>
<td>(0.049)</td>
<td>0.017</td>
<td>(0.049)</td>
<td>0.017</td>
<td>(0.049)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.113</td>
<td>(0.074)</td>
<td>0.127</td>
<td>(0.072)</td>
<td>0.128</td>
<td>(0.072)</td>
</tr>
<tr>
<td>SC</td>
<td>0.005</td>
<td>(0.055)</td>
<td>-0.112</td>
<td>(0.282)</td>
<td>-0.085</td>
<td>(0.273)</td>
</tr>
<tr>
<td>AMP</td>
<td>0.216***</td>
<td>(0.052)</td>
<td>0.216***</td>
<td>(0.052)</td>
<td>0.218***</td>
<td>(0.052)</td>
</tr>
<tr>
<td>CMT</td>
<td>0.022</td>
<td>(0.053)</td>
<td>0.022</td>
<td>(0.053)</td>
<td>0.023</td>
<td>(0.053)</td>
</tr>
<tr>
<td>MFit x SC</td>
<td>0.024</td>
<td>(0.057)</td>
<td></td>
<td></td>
<td>0.018</td>
<td>(0.054)</td>
</tr>
<tr>
<td>MFam x SC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam x SC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| *p<0.05; **p<0.01; ***p<0.001; All two-tailed tests. 
(URE = Unstandardized Regression Coefficient; S E = Standard Error)
From the values in the Table 8.18 it is evident that there was no support for the moderating role of SC on MFit-PLB relationship ($\beta=0.169$, p not significant). Similarly SC had no support for the other three relationships TFit-PLB ($\beta=0.133$, p not significant), MFam-PLB ($\beta=0.510$, p not significant), and TFam-PLB ($\beta=0.715$, p not significant).

A summary of hypothesis test results:

Hypothesis 5A (H5A): The higher the switching costs of customers, the higher will be the impact of marketing fit on the product-level benefits.

This hypothesis is not supported ($\beta=0.169$, p=0.674).

Hypothesis 5C (H5C): The higher the switching costs of customers, the higher will be the impact of technological fit on the product-level benefits.

This hypothesis is not supported ($\beta=0.133$, p=0.738).

Hypothesis 5E (H5E): The higher the switching costs of customers, the higher will be the impact of market familiarity on the product-level benefits.

This hypothesis is not supported ($\beta=0.510$, p=0.176).

Hypothesis 5G (H5G): The higher the switching costs of customers, the higher will be the impact of technological familiarity on the product-level benefits.

This hypothesis is not supported ($\beta=0.715$, p=0.163).

8.5.3 Moderating Role of AMP on Newness-PLB

Another multiple regression analysis in the Newness-PLB series was carried out to assess the moderating effect of Aggressive Marketing Practices (AMP) on the relationships between newness variables and PLB. Table 8.19 shows the results of the
multiple regression analysis involving moderating effect of AMP on MFit-PLB, TFit-PLB, MFam-PLB and TFam-PLB relationships.
### Table 8.19: Results of Multiple Regression Analysis (Moderation Effect of Aggressive Marketing Practices)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 7</th>
<th>Model 8</th>
<th>Model 9</th>
<th>Model 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
</tr>
<tr>
<td>Constant</td>
<td>1.419</td>
<td>(0.373)</td>
<td>0.843</td>
<td>(0.458)</td>
<td>4.013</td>
<td>(1.167)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.313***</td>
<td>(0.063)</td>
<td>0.240***</td>
<td>(0.064)</td>
<td>-0.449</td>
<td>(0.241)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.096</td>
<td>(0.065)</td>
<td>0.071</td>
<td>(0.064)</td>
<td>0.061</td>
<td>(0.063)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.059</td>
<td>(0.049)</td>
<td>0.017</td>
<td>(0.049)</td>
<td>0.028</td>
<td>(0.049)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.113</td>
<td>(0.074)</td>
<td>0.127</td>
<td>(0.072)</td>
<td>0.129</td>
<td>(0.071)</td>
</tr>
<tr>
<td>SC</td>
<td>0.005</td>
<td>(0.055)</td>
<td>0.004</td>
<td>(0.054)</td>
<td>0.005</td>
<td>(0.054)</td>
</tr>
<tr>
<td>AMP</td>
<td>0.216***</td>
<td>(0.052)</td>
<td>-0.452</td>
<td>(0.232)</td>
<td>-0.528*</td>
<td>(0.206)</td>
</tr>
<tr>
<td>CMT</td>
<td>0.022</td>
<td>(0.053)</td>
<td>0.039</td>
<td>(0.052)</td>
<td>0.052</td>
<td>(0.052)</td>
</tr>
<tr>
<td>MFit x AMP</td>
<td></td>
<td></td>
<td>0.139**</td>
<td>(0.047)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit x AMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam x AMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam x AMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>23.404**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.229</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔR²</td>
<td>0.042</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<0.05; ** p<0.01; *** p<0.001; All two-tailed tests.
(URE = Unstandardized Regression Coefficient; S E = Standard Error)
The values in Table 8.19 show strong support for the moderating role of AMP on all four Newness-PLB relationships. MFit-PLB relationship was supported ($\beta=1.225$, $p=0.003$); similarly there was support for rest the three relationships TFit-PLB ($\beta=1.341$, $p=0.000$), MFam-PLB ($\beta=1.055$, $p=0.001$), and TFam-PLB ($\beta=1.713$, $p=0.001$).

A summary of hypothesis test results:

Hypothesis 6A (H6A): The higher the AMP of the new product, the higher will be the impact of marketing fit on the product-level benefits.

This hypothesis is supported ($\beta=1.225$, $p=0.003$).

Hypothesis 6C (H6C): The higher the AMP of the new product, the higher will be the impact of technological fit on the product-level benefits.

This hypothesis is supported ($\beta=1.341$, $p=0.000$).

Hypothesis 6E (H6E): The higher the AMP of the new product, the higher will be the impact of market familiarity on the product-level benefits.

This hypothesis is supported ($\beta=1.055$, $p=0.001$).

Hypothesis 6G (H6G): The higher the AMP of the new product, the higher will be the impact of technological familiarity on the product-level benefits.

This hypothesis is supported ($\beta=1.713$, $p=0.001$).

8.5.4 Moderating Role of Computer Mediated Transactions on Newness-PLB

The third multiple regression analysis in the series of was carried out to assess the moderating effect of Computer Mediated Transactions (CMT) on the relationships between newness variables and PLB. Table 8.19 shows the results of the multiple regression analysis involving moderating effect of AMP on MFit-PLB, TFit-PLB, MFam-PLB and TFam-PLB relationships.
Table 8.20: Results of Multiple Regression Analysis (Moderation Effect of Computer Mediated Transactions)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 11</th>
<th>Model 12</th>
<th>Model 13</th>
<th>Model 14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
</tr>
<tr>
<td>Constant</td>
<td>1.419</td>
<td>(0.373)</td>
<td>0.843</td>
<td>(0.458)</td>
<td>1.204</td>
<td>(1.245)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.313***</td>
<td>(0.063)</td>
<td>0.240***</td>
<td>(0.064)</td>
<td>0.163</td>
<td>(0.255)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.096</td>
<td>(0.065)</td>
<td>0.071</td>
<td>(0.064)</td>
<td>0.071</td>
<td>(0.064)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.059</td>
<td>(0.049)</td>
<td>0.017</td>
<td>(0.049)</td>
<td>0.017</td>
<td>(0.049)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.113</td>
<td>(0.074)</td>
<td>0.127</td>
<td>(0.072)</td>
<td>0.127</td>
<td>(0.072)</td>
</tr>
<tr>
<td>SC</td>
<td>0.005</td>
<td>(0.055)</td>
<td>0.004</td>
<td>(0.055)</td>
<td>0.001</td>
<td>(0.055)</td>
</tr>
<tr>
<td>AMP</td>
<td>0.216***</td>
<td>(0.052)</td>
<td>0.218***</td>
<td>(0.052)</td>
<td>0.228***</td>
<td>(0.052)</td>
</tr>
<tr>
<td>CMT</td>
<td>0.022</td>
<td>(0.053)</td>
<td>-0.054</td>
<td>(0.248)</td>
<td>-0.320</td>
<td>(0.215)</td>
</tr>
<tr>
<td>MFit x CMT</td>
<td>0.016</td>
<td>(0.052)</td>
<td>0.074</td>
<td>(0.045)</td>
<td>0.052</td>
<td>(0.034)</td>
</tr>
<tr>
<td>TFit x CMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam x CMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam x CMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.229</td>
<td>0.271</td>
<td>0.271</td>
<td>0.277</td>
<td>0.276</td>
<td>0.277</td>
</tr>
<tr>
<td>ΔR²</td>
<td>0.042</td>
<td>0.000</td>
<td>0.006</td>
<td>0.006</td>
<td>0.007</td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001; All two-tailed tests.
(URE = Unstandardized Regression Coefficient; S.E = Standard Error)
From the values in the Table 8.20 it was evident that there was no support for the moderating role of CMT on MFit-PLB relationship ($\beta=0.016$, p not significant). Similarly CMT had no support for the other three relationships TFit-PLB ($\beta=0.525$, p not significant), MFam-PLB ($\beta=0.418$ p not significant), and TFam-PLB ($\beta=0.828$, p not significant).

A summary of hypothesis test results:

Hypothesis 7A (H7A): The higher the CMT of the new product, the higher will be the impact of marketing fit on the product-level benefits.

This hypothesis is not supported ($\beta=0.016$, p=0.755).

Hypothesis 7C (H7C): The higher the CMT of the new product, the higher will be the impact of technological fit on the product-level benefits.

This hypothesis is not supported ($\beta=0.525$, p=0.102).

Hypothesis 7E (H7E): The higher the CMT of the new product, the higher will be the impact of market familiarity on the product-level benefits.

This hypothesis is not supported ($\beta=0.418$, p=0.123).

Hypothesis 7G (H7G): The higher the CMT of the new product, the higher will be the impact of technological familiarity on the product-level benefits.

This hypothesis is not supported ($\beta=0.828$, p=0.087).

8.5.5 Results of Product Newness on FLB
Table 8.21 shows the results of regression analysis of Newness variables on Firm Level Benefits (Model 15). The first column lists the variables, the second unstandardized coefficients and the third standard error in parentheses. Significant levels of the coefficients are asterisk-marked and clarified below the table. Durbin-
Watson test statistic was 1.898, very close to recommended value of 2 which indicates that the residuals are uncorrelated (Field, 2005).

It was hypothesized that product newness comprises of four dimensions and each dimension of Marketing Fit, Technological Fit, Market Familiarity, and Technological Familiarity would have positive effects on Firm Level Benefits.

**Table 8.21: Results of Regression Analysis (Model 15)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 15: Newness-FLB Core Measurement Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstandardized Reg. Coefficient B</td>
</tr>
<tr>
<td>Constant</td>
<td>0.313 (0.348)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.109 (0.059)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.225*** (0.061)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.063 (0.046)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.286*** (0.069)</td>
</tr>
<tr>
<td>F</td>
<td>32.588***</td>
</tr>
<tr>
<td>R²</td>
<td>0.292</td>
</tr>
</tbody>
</table>

*\(p<0.05; **p<0.01; ***p<0.001; All two-tailed tests.\)

It is evident from Table 8.21 that Technological Fit and Technological Familiarity are positively related to PLB. Marketing Fit and Market Familiarity also are positively related to the Product Level Benefits but their coefficients are not significant. These results can be summarized as

Hypothesis 1B: The higher the marketing fit of the firm needed for the new product, the higher firm-level benefits will it generate.

This hypothesis is not supported (\(\beta=0.111, \ p=0.065\)).

Hypothesis 2B: The higher the technological fit of the firm needed for the development, distribution and support of the new product, the higher firm-level benefits will it generate.

This hypothesis is supported (\(\beta=0.246, \ p=0.000\)).
Hypothesis 3B: The higher the marketing familiarity of the firm needed for the new product, the higher firm-level benefits it will generate.

This hypothesis is not supported ($\beta=0.085$, $p=0.173$).

Hypothesis 4B: The higher the technological familiarity of the firm needed for the development, distribution and support of the new product, the higher firm-level benefits will it generate.

This hypothesis is supported ($\beta=0.233$, $p=0.000$).

8.5.6 Moderating Role of SC on Newness-FLB

Next a more series of multiple regression analysis was carried out to assess the moderating effect of Environmental Factors on the relationships between newness variables and FLB. Table 8.22 shows the results of the multiple regression analysis involving moderating effect of Switching Costs on MFit-FLB, TFit-FLB, MFam-FLB and TFam-FLB relationships.
### Table 8.22: Results of Multiple Regression Analysis (Moderation Effect of Switching Cost)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 15</th>
<th>Model 16</th>
<th>Model 17</th>
<th>Model 18</th>
<th>Model 19</th>
<th>Model 20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
</tr>
<tr>
<td>Constant</td>
<td>0.313</td>
<td>(0.348)</td>
<td>0.222</td>
<td>(0.428)</td>
<td>-1.282</td>
<td>(1.261)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.109</td>
<td>(0.059)</td>
<td>0.049</td>
<td>(0.060)</td>
<td>0.365</td>
<td>(0.256)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.225***</td>
<td>(0.061)</td>
<td>0.207**</td>
<td>(0.060)</td>
<td>0.209**</td>
<td>(0.060)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.063</td>
<td>(0.046)</td>
<td>0.022</td>
<td>(0.046)</td>
<td>0.022</td>
<td>(0.046)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.286***</td>
<td>(0.069)</td>
<td>0.296***</td>
<td>(0.067)</td>
<td>0.293***</td>
<td>(0.067)</td>
</tr>
<tr>
<td>SC</td>
<td>0.190***</td>
<td>(0.048)</td>
<td>0.190***</td>
<td>(0.048)</td>
<td>0.189***</td>
<td>(0.049)</td>
</tr>
<tr>
<td>AMP</td>
<td>-0.22</td>
<td>(0.049)</td>
<td>-0.023</td>
<td>(0.049)</td>
<td>-0.022</td>
<td>(0.050)</td>
</tr>
<tr>
<td>CMT</td>
<td>32.588**</td>
<td>*</td>
<td>21.752**</td>
<td>*</td>
<td>19.271**</td>
<td>*</td>
</tr>
<tr>
<td>F</td>
<td>18.973**</td>
<td>*</td>
<td>19.274**</td>
<td>*</td>
<td>19.450**</td>
<td>*</td>
</tr>
<tr>
<td>R²</td>
<td>0.292</td>
<td>0.327</td>
<td>0.331</td>
<td>0.327</td>
<td>0.331</td>
<td>0.333</td>
</tr>
<tr>
<td>ΔR²</td>
<td>0.035</td>
<td>0.003</td>
<td>0.000</td>
<td>0.003</td>
<td>0.006</td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001; All two-tailed tests.
(URE = Unstandardized Regression Coefficient; S E = Standard Error)
From the values in the Table 8.22 it was evident that there was no support for the moderating role of SC on MFit-FLB relationship ($\beta=-0.487$, p not significant). Similarly SC had no support for the other three relationships TFit-FLB ($\beta=-0.032$, p not significant), MFam-FLB ($\beta=-0.461$, p not significant), and TFam-FLB ($\beta=-0.788$, p not significant).

A summary of hypothesis test results:

From Table 8.22 it is evident that

Hypothesis 5B (H5B): The higher the switching costs of customers, the higher will be the impact of marketing fit on the firm-level benefits.

This hypothesis is not supported ($\beta=-0.487$, p=0.206).

Hypothesis 5D (H5D): The higher the switching costs of customers, the higher will be the impact of technological fit on the firm-level benefits.

This hypothesis is not supported ($\beta=-0.032$, p=0.933).

Hypothesis 5F (H5F): The higher the switching costs of customers, the higher will be the impact of market familiarity on the firm-level benefits.

This hypothesis is not supported ($\beta=-0.461$, p=0.203).

Hypothesis 5H (H5H): The higher the switching costs of customers, the higher will be the impact of technological familiarity on the firm-level benefits.

This hypothesis is not supported ($\beta=-0.788$, p=0.113).

8.5.7 Moderating Role of AMP on Newness-FLB

Next in the second series of multiple regression analysis was carried out to assess the moderating effect of Aggressive Marketing Practices (AMP) on the relationships between newness variables and FLB. Table 8.22 shows the results of the multiple regression analysis involving moderating effect of AMP on MFit-FLB, TFit-FLB, MFam-FLB and TFam-FLB relationships.
Table 8.23: Results of Multiple Regression Analysis (Moderation Effect of Aggressive Marketing Practices)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 15</th>
<th>Model 16</th>
<th>Model 21</th>
<th>Model 22</th>
<th>Model 23</th>
<th>Model 24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
</tr>
<tr>
<td>Constant</td>
<td>0.313</td>
<td>(0.348)</td>
<td>0.222</td>
<td>(0.428)</td>
<td>1.755</td>
<td>(1.102)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.109</td>
<td>(0.059)</td>
<td>0.049</td>
<td>(0.060)</td>
<td>-0.284</td>
<td>(0.229)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.225***</td>
<td>(0.061)</td>
<td>0.207**</td>
<td>(0.060)</td>
<td>0.202**</td>
<td>(0.060)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.063</td>
<td>(0.046)</td>
<td>0.022</td>
<td>(0.046)</td>
<td>0.027</td>
<td>(0.046)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.286***</td>
<td>(0.069)</td>
<td>0.296***</td>
<td>(0.067)</td>
<td>0.297***</td>
<td>(0.067)</td>
</tr>
<tr>
<td>SC</td>
<td>-0.403</td>
<td>(0.051)</td>
<td>-0.043</td>
<td>(0.051)</td>
<td>-0.043</td>
<td>(0.051)</td>
</tr>
<tr>
<td>AMP</td>
<td>0.190***</td>
<td>(0.048)</td>
<td>-0.133</td>
<td>(0.220)</td>
<td>-0.045</td>
<td>(0.196)</td>
</tr>
<tr>
<td>CMT</td>
<td>-0.022</td>
<td>(0.049)</td>
<td>-0.013</td>
<td>(0.049)</td>
<td>-0.012</td>
<td>(0.050)</td>
</tr>
<tr>
<td>MFit x AMP</td>
<td></td>
<td></td>
<td>0.067</td>
<td>(0.044)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit x AMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam x AMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam x AMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>32.588**</td>
<td>*</td>
<td>21.752**</td>
<td>*</td>
<td>19.395**</td>
<td>*</td>
</tr>
<tr>
<td>R²</td>
<td>0.292</td>
<td>0.327</td>
<td>0.332</td>
<td>0.331</td>
<td>0.327</td>
<td>0.339</td>
</tr>
<tr>
<td>ΔR²</td>
<td>0.035</td>
<td>0.005</td>
<td>0.003</td>
<td>0.000</td>
<td>0.000</td>
<td>0.012</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001; All two-tailed tests.
(URE = Unstandardized Regression Coefficient; S E = Standard Error)
From the values in the Table 8.23 it was evident that there was support for one of the relationships, that of TFam-FLB ($\beta=1.134$, $p=0.020$). There was no support for the moderating role of AMP on other three relationships: MFit-FLB relationship ($\beta=0.609$, $p$ not significant), TFit-FLB ($\beta=0.434$, $p$ not significant), and MFam-FLB ($\beta=0.032$ $p$ not significant).

A summary of hypothesis test results:

Hypothesis 6B (H6B): The higher the AMP of the new product, the higher will be the impact of marketing fit on the firm-level benefits.

This hypothesis is not supported ($\beta=0.609$, $p=0.132$).

Hypothesis 6D (H6D): The higher the AMP of the new product, the higher will be the impact of technological fit on the firm-level benefits.

This hypothesis is not supported ($\beta=0.434$, $p=0.218$).

Hypothesis 6F (H6F): The higher the AMP of the new product, the higher will be the impact of market familiarity on the firm-level benefits.

This hypothesis is not supported ($\beta=0.032$, $p=0.849$).

Hypothesis 6H (H6H): The higher the AMP of the new product, the higher will be the impact of technological familiarity on the firm-level benefits.

This hypothesis is supported ($\beta=1.134$, $p=0.020$).

8.5.8 Moderating Role of CMT on Newness-FLB

The last multiple regression analysis was carried out to assess the moderating effect of prevalence of Computer Mediated Transactions (CMT) on the relationships between newness variables and FLB. Table 8.24 shows the results of the multiple regression analysis involving moderating effect of CMT on MFit-FLB, TFit-FLB, MFam-FLB and TFam-FLB relationships.
Table 8.24: Results of Multiple Regression Analysis (Moderation Effect of Computer Mediated Transactions)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 15</th>
<th>Model 16</th>
<th>Model 17</th>
<th>Model 18</th>
<th>Model 19</th>
<th>Model 20</th>
<th>Model 21</th>
<th>Model 22</th>
<th>Model 23</th>
<th>Model 24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
<td>U R C</td>
<td>S E</td>
</tr>
<tr>
<td>Constant</td>
<td>0.313</td>
<td>(0.348)</td>
<td>0.222</td>
<td>(0.428)</td>
<td>-0.676</td>
<td>(1.163)</td>
<td>0.066</td>
<td>(1.051)</td>
<td>0.421</td>
<td>(0.821)</td>
</tr>
<tr>
<td>MFit</td>
<td>0.109</td>
<td>(0.059)</td>
<td>0.049</td>
<td>(0.060)</td>
<td>0.241</td>
<td>(0.238)</td>
<td>0.049</td>
<td>(0.060)</td>
<td>0.048</td>
<td>(0.060)</td>
</tr>
<tr>
<td>TFit</td>
<td>0.225***</td>
<td>(0.061)</td>
<td>0.207**</td>
<td>(0.060)</td>
<td>0.207**</td>
<td>(0.060)</td>
<td>0.240</td>
<td>(0.213)</td>
<td>0.208**</td>
<td>(0.060)</td>
</tr>
<tr>
<td>MFam</td>
<td>0.063</td>
<td>(0.046)</td>
<td>0.022</td>
<td>(0.046)</td>
<td>0.021</td>
<td>(0.046)</td>
<td>0.021</td>
<td>(0.046)</td>
<td>-0.022</td>
<td>(0.160)</td>
</tr>
<tr>
<td>TFam</td>
<td>0.286***</td>
<td>(0.069)</td>
<td>0.296***</td>
<td>(0.067)</td>
<td>0.297***</td>
<td>(0.067)</td>
<td>0.297***</td>
<td>(0.068)</td>
<td>0.295***</td>
<td>(0.068)</td>
</tr>
<tr>
<td>SC</td>
<td>-0.403</td>
<td>(0.051)</td>
<td>-0.041</td>
<td>(0.051)</td>
<td>-0.042</td>
<td>(0.051)</td>
<td>-0.043</td>
<td>(0.051)</td>
<td>-0.043</td>
<td>(0.051)</td>
</tr>
<tr>
<td>AMP</td>
<td>0.190***</td>
<td>(0.048)</td>
<td>0.187***</td>
<td>(0.049)</td>
<td>0.189***</td>
<td>(0.049)</td>
<td>0.192***</td>
<td>(0.049)</td>
<td>0.193</td>
<td>(0.049)</td>
</tr>
<tr>
<td>CMT</td>
<td>-0.022</td>
<td>(0.049)</td>
<td>0.166</td>
<td>(0.231)</td>
<td>0.010</td>
<td>(0.202)</td>
<td>-0.064</td>
<td>(0.157)</td>
<td>-0.181</td>
<td>(0.368)</td>
</tr>
<tr>
<td>MFit x CMT</td>
<td>-0.040</td>
<td>(0.048)</td>
<td>-0.007</td>
<td>(0.042)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFit x CMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFam x CMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFam x CMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.029</td>
</tr>
</tbody>
</table>

F 32.588** * 21.752** * 19.100** * 18.977** * 18.987** * 19.007** *
R² 0.292 0.327 0.329 0.327 0.327 0.310
ΔR² 0.035 0.001 0.000 0.000 0.000 0.000

*p<0.05; **p<0.01; ***p<0.001; All two-tailed tests.
(URE = Unstandardized Regression Coefficient; S E = Standard Error)
From the values in the Table 8.24 it was evident that there was no support for the moderating role of CMT on MFit-FLB relationship ($\beta=-0.283$, p not significant). Similarly SC had no support for the other three relationships TFit-FLB ($\beta=-0.050$, p not significant), MFam-FLB ($\beta=0.074$ p not significant), and TFam-FLB ($\beta=0.203$, p not significant).

A summary of hypothesis test results:

Hypothesis 7B (H7B): The higher the CMT of the new product, the higher will be the impact of marketing fit on the firm-level benefits.

This hypothesis is not supported ($\beta=-0.283$, p=0.407).

Hypothesis 7D (H7D): The higher the CMT of the new product, the higher will be the impact of technological fit on the firm-level benefits.

This hypothesis is not supported ($\beta=-0.050$, p=0.872).

Hypothesis 7F (H7F): The higher the CMT of the new product, the higher will be the impact of market familiarity on the firm-level benefits.

This hypothesis is not supported ($\beta=0.074$, p=0.776).

Hypothesis 7H (H7H): The higher the CMT of the new product, the higher will be the impact of technological familiarity on the firm-level benefits.

This hypothesis is not supported ($\beta=0.203$, p=0.663).
### Table 8.25: Overview of FLB-related Hypothesis Test Results

<table>
<thead>
<tr>
<th>Hypothesis No.</th>
<th>Hypothesis Description</th>
<th>Standardized Beta Coefficient</th>
<th>Std. Error</th>
<th>Significance Level</th>
<th>Supported / Not Supported</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1B</td>
<td>The higher the marketing fit of the firm needed for the new product, the higher firm-level benefits will it generate.</td>
<td>0.111</td>
<td>0.059</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.270</td>
</tr>
<tr>
<td>H2B</td>
<td>The higher the technological fit of the firm needed for the development, distribution and support of the new product, the higher firm-level benefits will it generate.</td>
<td>0.246</td>
<td>0.061</td>
<td>( p &lt; 0.001 )</td>
<td>Supported</td>
<td>See Page No.270</td>
</tr>
<tr>
<td>H3B</td>
<td>The higher the marketing familiarity of the firm needed for the new product, the higher firm-level benefits it will generate.</td>
<td>0.085</td>
<td>0.046</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.271</td>
</tr>
<tr>
<td>H4B</td>
<td>The higher the technological familiarity of the firm needed for the development, distribution and support of the new product, the higher firm-level benefits will it generate.</td>
<td>0.233</td>
<td>0.069</td>
<td>( p &lt; 0.001 )</td>
<td>Supported</td>
<td>See Page No.271</td>
</tr>
<tr>
<td>H5B</td>
<td>The higher the switching costs of customers, the higher will be the impact of marketing fit on the firm-level benefits.</td>
<td>-0.487</td>
<td>0.054</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.273</td>
</tr>
<tr>
<td>H5D</td>
<td>The higher the switching costs of customers, the higher will be the impact of technological fit on the firm-level benefits.</td>
<td>-0.032</td>
<td>0.050</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.273</td>
</tr>
<tr>
<td>H5F</td>
<td>The higher the switching costs of customers, the higher will be the impact of market familiarity on the firm-level benefits.</td>
<td>-0.461</td>
<td>0.043</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.273</td>
</tr>
<tr>
<td>H5H</td>
<td>The higher the switching costs of customers, the higher will be the impact of technological familiarity on the firm-level benefits.</td>
<td>-0.788</td>
<td>0.070</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.273</td>
</tr>
<tr>
<td>H6B</td>
<td>The higher the AMP of the new product, the higher will be the impact of marketing fit on the firm-level benefits.</td>
<td>0.609</td>
<td>0.044</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.275</td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Coefficient</td>
<td>Standard Error</td>
<td>Significance</td>
<td>Support Status</td>
<td>Reference</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>--------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>H6D</td>
<td>The higher the AMP of the new product, the higher will be the impact of technological fit on the firm-level benefits.</td>
<td>0.434</td>
<td>0.039</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.275</td>
</tr>
<tr>
<td>H6F</td>
<td>The higher the AMP of the new product, the higher will be the impact of market familiarity on the firm-level benefits.</td>
<td>0.032</td>
<td>0.032</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.275</td>
</tr>
<tr>
<td>H6H</td>
<td>The higher the AMP of the new product, the higher will be the impact of technological familiarity on the firm-level benefits.</td>
<td>1.134</td>
<td>0.059</td>
<td>p &lt; 0.05</td>
<td>Supported</td>
<td>See Page No.275</td>
</tr>
<tr>
<td>H7B</td>
<td>The higher the CMT of the new product, the higher will be the impact of marketing fit on the firm-level benefits.</td>
<td>-0.283</td>
<td>0.048</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.277</td>
</tr>
<tr>
<td>H7D</td>
<td>The higher the CMT of the new product, the higher will be the impact of technological fit on the firm-level benefits.</td>
<td>-0.050</td>
<td>0.032</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.277</td>
</tr>
<tr>
<td>H7F</td>
<td>The higher the CMT of the new product, the higher will be the impact of market familiarity on the firm-level benefits.</td>
<td>0.074</td>
<td>0.042</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.277</td>
</tr>
<tr>
<td>H7H</td>
<td>The higher the CMT of the new product, the higher will be the impact of technological familiarity on the firm-level benefits.</td>
<td>0.203</td>
<td>0.066</td>
<td>NS</td>
<td>Not Supported</td>
<td>See Page No.277</td>
</tr>
</tbody>
</table>

(NS: Not Significant)
8.6 SEM for Sensitivity Analysis

The hypotheses related to Newness-PLB and Newness-FLB were also tested through path analysis using SEM framework. AMOS (Version 6.0) was used for this purpose. Both models and their results are described below.

8.6.1 SEM for Sensitivity Analysis of Newness-PLB Measurement Model

Figure 8.20 shows the hypothesized newness-PLB model with the estimated path coefficients. So as not to make the figure too complicated and difficult to read, the correlations lines are not shown but those relationships are mentioned at the bottom of the figure. Table 8.26 shows the path coefficients of the model.

Chi Square statistic was found to be high (546.6) and significant (p=000) which suggested a “misfit” of the model to the data. However, Chi Square should be interpreted with caution, as a Chi Square test of model fit is quite sensitive to the sample size which could reject any model if the sample is large enough (Bagozzi and Youjae, 1988). So, it was decided to evaluate the model using the fit indices (as outlined in Chapter 8).

Fit indices for this model were: AGFI = 0.85, CFI = 0.90, GFI = 0.88, NFI = 0.84, RMR = 0.08, RMSEA = 0.063, SRMR = 0.063, and TLI = 0.89. Adjusted goodness of fit index (AGFI) meets the minimum requirement of 0.80 (Tanaka and Huba, 1985). CFI too met 0.90 minimum criterion, TLI bordered just below the minimum required value of 0.90, and NFI fell short a bit short of 0.90—a value of 0.90 for these indices indicate a good fit of the model (Bagozzi and Youjae, 1988). However, the shortfall was only marginal, indicating a fair-enough fit of the model to the data. So, it was reasonable to assume that the model moderately fit the data and the model could be used to investigate further for assessing path coefficients.
The result of the path analysis is shown in Table 8.26. It confirms the finding of regression analysis. H1A (MFit-PLB) is supported with right sign and significance, while H2A (TFit-PLB), H3A (MFam-PLB), and H4A (TFam-PLB) are not supported. The results show that the effect of Marketing Fit on Product Level Benefits was positive and significant (Standardized path coefficient = 0.40; T Value = 3.95), but the effects Technological Fit (Standardized path coefficient = 0.07; T value = 0.222), Market Familiarity (Standardized path coefficient = 0.08; T value = 0.838), and Technological Familiarity (Standardized path coefficient = 0.01; T value = 0.328) were not found to be significant.

In short, Marketing Fit affected the product level benefits but Technological Fit, Market Familiarity, and Technological Familiarity had no such effect on Product Level Benefits.
**Table 8.26: Path Analysis Results for Newness-PLB Measurement Model**

<table>
<thead>
<tr>
<th>Structural Path</th>
<th>Standardized Coefficient</th>
<th>Std. Error</th>
<th>T Value (Critical Ratio for Variance)</th>
<th>P Value (Level of Significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFit-PLB</td>
<td>0.40</td>
<td>0.212</td>
<td>3.953</td>
<td>( p &lt; 0.001 )</td>
</tr>
<tr>
<td>TFit-PLB</td>
<td>0.07</td>
<td>0.222</td>
<td>0.473</td>
<td>( p = 0.636 )</td>
</tr>
<tr>
<td>MFam-PLB</td>
<td>0.08</td>
<td>0.099</td>
<td>0.838</td>
<td>( p = 0.402 )</td>
</tr>
<tr>
<td>TFam-PLB</td>
<td>0.01</td>
<td>0.328</td>
<td>0.328</td>
<td>( p = 0.913 )</td>
</tr>
</tbody>
</table>

\( R^2 = 0.26 \) for PLB

**8.6.2 SEM for Sensitivity Analysis of Newness-FLB Measurement Model**

Figure 8.21 shows the hypothesized newness-FLB model with the estimated path coefficients. In this figure too correlations lines are not shown for the sake of clarity. Table 9.27 shows the path coefficients of the model.

For this model too Chi Square statistic was quite high (600.2) and significant (\( p = 0.000 \)). As argued in the previous section, it was decided to overlook this dubious criterion and to evaluate the model using the various fit indices (as outlined in Chapter 7).

Fit indices for this model were: AGFI = 0.84, CFI = 0.91, GFI = 0.87, NFI = 0.86, and TLI = 0.89. AGFI and CFI were over the minimum criteria but GFI, NFI and TLI fell marginally short. However, the shortfall was only marginal, indicating a fair-enough fit of the model to the data. So, it was reasonable to assume that the model moderately fit the data and the model could be used to investigate further for assessing path coefficients.
The result of the path analysis is shown in Table 8.26. It confirmed the finding of regression analysis. Hypotheses H2B (TFit-FLB), and H4B (TFam-FLB) were supported with similar sign but at a less significant level than the multiple regression analysis; Hypotheses H3B and H4B were not supported. From this result, it is evident that Technological Fit (Standardized path coefficient = 0.30; T Value = 2.161) had a positive effect on Firm Level Benefits; and so does Technological Familiarity (Standardized path coefficient = 0.26; T Value = 2.516). However, Marketing Fit (Standardized path coefficient = 0.07; T Value = 0.826) and Market Familiarity (Standardized path coefficient = -0.01; T Value = -0.116) did not turn out to be significant.
Table 8.27: Path Analysis Results for Newness-PLB Measurement Model

<table>
<thead>
<tr>
<th>Structural Path</th>
<th>Standardized Coefficient</th>
<th>Std. Error</th>
<th>T Value (Critical Ratio for Variance)</th>
<th>P Value (Level of Significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFit-FLB</td>
<td>0.07</td>
<td>0.126</td>
<td>0.826</td>
<td>$p = 0.409$</td>
</tr>
<tr>
<td>TFit-FLB</td>
<td>0.30</td>
<td>0.146</td>
<td>2.161</td>
<td>$p = 0.031$</td>
</tr>
<tr>
<td>MFam-FLB</td>
<td>-0.01</td>
<td>0.063</td>
<td>-0.116</td>
<td>$p = 0.907$</td>
</tr>
<tr>
<td>TFam-FLB</td>
<td>0.26</td>
<td>0.227</td>
<td>2.516</td>
<td>$p = 0.012$</td>
</tr>
</tbody>
</table>

$R^2=0.31$ for FLB

It could be summarized that Technological Fit and Technological Familiarity affected the firm level Benefits but Marketing Fit and Market Familiarity had no such effect on Firm Level Benefits.

8.7 Chapter Summary

In this chapter, the empirical data was described and analyzed. The results of the analysis were presented. Some of the hypotheses regarding effects of newness variables on product and firm level benefits found good support. However, only a small number of hypotheses about moderating effect of environmental factors found support. In the next chapter, an interpretation of these results, their implications, and conclusions are presented.
Chapter 9: Discussion and Conclusions of Quantitative Study

The main aims of this research were to explore (i) how new product newness and benefits in the context of software products can be operationalized, and (ii) what effect newness has on the benefits of new products. In general, both newness and benefits of new products are not only operationalized very narrowly in the majority of research, but also grounded rarely on empirical data. In the case of software, there is little research to throw light on newness and benefits of new products. In any case, there is hardly any consensus of researchers about the effect of newness on benefits of new products. In this research, an attempt is made to address these two issues, namely to develop measures of new product newness and benefits based on empirical data and to investigate the effect of newness on benefits of new software products. The first part of this research (Chapters 2-5) reported the development of measures for newness and benefits for new software products. This second part is about the effect of newness on benefits in the context of new software products.

Taking into account the ambiguity of relationship between newness and benefits, these two constructs have been studied at their underlying dimensions’ level with an expectation that such an approach could be successful in capturing the nuances of the relationship. New product newness has been visualized in terms of firm’s fit with marketing-, and technological resources needed for the development and marketing of new products and familiarity with market-, and technological environment of the new products. New product benefits has been captured in terms of product-level benefits and firm-level benefits generated by the new products. It was suspected that the effect of new product newness on benefits could be seriously affected by the prevailing environmental factors in the industry. Hence, those factors were controlled while investigating the effect of newness on benefits of new products and the moderating effects of industry specific environmental factors in affecting the relationship between various dimensions of new product newness on benefits were also hypothesized.

In order to study the effect of newness on benefits, a theoretical framework was developed based on an extensive literature review (See Chapter 2 and Appendix II). Figure 6.1 exhibits this framework. It intended to include underlying dimensions of constructs newness and benefits as well as to include environmental factors specific to software industry.
which could affect the relationship between newness and benefits. The dimensions of newness and benefits were operationalized through the findings of the first part of this research; industry specific environmental factors were operationalized by measures suggested in the extant literature specific to the software. Empirical data were collected to validate the hypotheses. Chapter 9 presented the salient features of the data and a detailed analysis along with the results of hypothesis testing.

In the next section, a summary of the findings and corresponding discussion is presented. Subsequent sections present implications, and limitations of this research. The following section lays out few suggestions for future research and the last section presents conclusions of this research.

9.1 Summary of Results and Discussion

First the summary of results pertaining to the impact of Newness on NP benefits and then that of pertaining to the moderating role of environmental factors on the newness’ impact on NP benefits.

9.1.1 Impact of Newness on NP Benefits

The results of the data analysis show that that in the context of new software products various dimensions of product newness affect new product benefits differently. Marketing fit and technological familiarity were found to affect product-level benefits but technological fit and market familiarity seemed to have no effect. In case of firm-level benefits technological fit and technological familiarity were found to have an effect whereas marketing fit and marketing familiarity had no effect. These findings were supported both through the regression analyses using the aggregate measures as well as through the path analyses in the structural equation modeling framework.

The four dimensions of product newness account for the 34.4% of the variance in new product benefits, giving a strong support to the robustness of the hypothesized model. Hence, this study also contributes towards the development and validation of a model of newness and new benefits of new software products.

Given, in general, software firms’ focus on technology rather than on marketing, this study highlights the importance of marketing fit when it comes to the product-level benefits of
new software products. Resources comprising marketing fit, namely, sales force, distribution channel, product launch approach, sales and marketing approach, aggressive marketing, and sales and marketing partners significantly affect the new product’s sales revenue, product-related services revenue, market share and profit. Software product firms may enhance new product benefits by paying more attention to the marketing fit of their new products by taking into account selling and distribution needs, product launch and marketing approach, and sales and marketing partners required for a new product. Design and development resources, customer support resources, systems and technical manpower for product distribution constituting technology fit were found to affect firm-level benefits earned by the new products.

Even if there is a good fit with technological resources, a software product may not prove to be successful in terms of revenue, market share or profit if there is a poor fit in terms of marketing resources. Findings of this study indicate that a technological fit can however contribute towards firm-level benefits such as enhanced profitability of other offerings of the firm, sales revenue of other products or services, platform for future offerings, vital customer base or enhanced image of the firm. Only the first two benefits occurring to existing products or services, the rest entail a future potential. However, the noteworthy point is that a technological fit of a new software product can be beneficial for a firm if there readily are other products or services which could leverage the opportunity or the firm is able to harness the potential in future; the new product per se is only a medium for benefit for other products or services (present or future), not much of a direct and immediate success in itself.

Technological familiarity in terms of design and development technology, design and development partners, and distribution channels were found to affect the product-level benefits. On the face of it, it sounds little surprising that technological fit is not that relevant whereas the technological familiarity is relevant for the product-level benefits. Given the rapid change in technology in the software industry it is only understandable that familiarity with technology and that too even an indirect (through partners) one is actually effective. One explanation of technological resources being not effective could be the sheer improbability of fit with technological resources in most cases. It is very unlikely that in a highly dynamic industry like software a firm can have the needed technology for design and development of
new products all the time. The second best and pragmatic alternative could be to keep abreast -- itself or through partners -- with several evolving technologies.

Overall the results of this study highlight the importance of the effect of product newness on new product benefits. The findings to a large extent support the results of other studies which have confirmed a positive relationship between product newness and various measures of new product benefits. However, the findings do not support the results of the studies which have found a negative or no relationship. There are two reasons for this apparent anomaly. First, both product newness and new product benefits constructs have been studied at a detailed level, comprising of several dimensions. Hence, the relationship at dimensions’ level differs from the relationship at an aggregate, summated level. Second, the context of software product differs largely from other products or services, the other studies are based upon.

9.1.2 Moderating Role of Environmental Factors
The results show support for only a few of the hypothesized relationships of moderating effect of industry specific environmental factors on product newness and new product benefits. Aggressive marketing practices (AMP) moderated the impact of each of marketing fit, technological fit, market familiarity and technological familiarity on product-level benefits. However, AMP was found to have a positive impact only on technological familiarity’s effect on firm-level benefits. The other two moderating factors, switching costs and computer mediated transactions were found to have no effect on product newness effect on new product benefits.

These findings suggest that when aggressive marketing practices are widespread effects of product newness on new product benefits gets positively affected—higher the aggressive marketing practices, higher the new product benefits. In this study AMP constitutes of larger product variety, differentiated pricing, new terms and conditions of sales, reliance and role of prestigious customers. New software products having more variants of the product, priced differentially according to the customer type, sold under new, innovative terms and conditions of sales, and where firms have relied on influential initial customers to gain stature for the new products, the effect of each of marketing fit, technological fit, market
familiarity and technological familiarity on product-level benefits is enhanced; even technological familiarity’s effect on firm-level benefits is improved.

Contrary to expectations, neither switching costs nor computer mediated transactions were found to have any moderating role on product newness’ impact on new product benefits. It seems switching costs are far from being significant for software product users: training costs of new products, data porting costs, or additional hardware and software costs are either insignificant or overshadowed by other factors by so much so that these costs do not affect product newness’ impact on new product benefits. Either learning new software is not a great challenge any more (due to inbuilt functionality in the product itself) or users have become smart enough to learn new software without much fuss; archival data could be ported smoothly and easily; there is not much need of additional hardware and software for new software. The results of this study question the role of switching costs in the context of software—either it is overhyped or there are other factors which outweigh these costs.

Computer mediated transactions (CMT) also was not found to have any moderating role on product newness’ impact on new product benefits. It also seems that the use of computers along with Internet to sell, to make accessible product demo or sample, to distribute product updates or to provide customer support is either exaggerated or is outweighed by other factors; the presence of CMT has no significant effect. Since CMT is quite prevalent in the studied firms, the only plausible explanation is that it is so commonplace that it does not enable any significant advantage to software firms as far as enhanced new product benefits of their new products are concerned.

9.2 Conclusions
First conclusions regarding impact of newness of new product on new product benefits are described and then conclusions about moderating role of environmental factors on newness’ impact on benefits.

9.2.1 Conclusions: Impact of NP Newness on NP benefits
Results of this quantitative study of 321 software products throw light on the impact of new product newness on new product benefits. More specifically, what effect marketing fit,
technological fit, market familiarity and technological familiarity have on product-level benefits and firm-level benefits. Following conclusions can be drawn in this respect.

First, marketing fit and technological familiarity affect product-level benefits positively. Software firms having good marketing fit and ample technological familiarity can gain more product-level benefits from their new products.

Second conclusion is that market familiarity and technological fit seem to have no impact on product-level benefits.

Third conclusion pertains to technological fit and technological familiarity’s impact on firm-level benefits and it can be concluded that these have positive effect on firm-level benefits in case of software firms.

Fourth conclusion from this study can be drawn that marketing fit and market familiarity however do not affect firm-level benefits in case of software firms.

9.2.2 Conclusions: Moderating Role of Environmental Factors on NP Newness’ Impact on NP Benefits

Aggressive marketing practices, switching costs and computer mediated transactions were the three environmental factors supposed to moderate the role of new product newness on new product benefits. Based on the results of this study following conclusions can be elicited.

First, switching costs do not affect the impact of either of marketing fit, technological fit, market familiarity, or technological familiarity on product level benefits or firm level benefits.

Second, whereas aggressive marketing practices affect positively the impact of marketing fit, technological fit, market familiarity, and technological familiarity on product level benefits, it does so only in case of technological familiarity’s impact on firm level benefits. Aggressive marketing practices was found to have no affect on the impact of marketing fit, technological fit, or market familiarity on firm level benefits.

Third, computer mediated transactions do not affect the impact of either of marketing fit, technological fit, market familiarity, or technological familiarity on product level benefits or firm level benefits.
9.3 Implications
This section reviews the relevance of findings of this quantitative study for new product researchers as well as for new product managers. Section 9.3.1 draws implications for researchers and Section 9.3.2 does that for practitioners.

9.3.1 Implications for New Product Researchers
Research findings on product newness and benefits are quite ambiguous, actually "conflicting and inconclusive" in words of Kleinschmidt and Cooper (1991, p. 242). By focusing only on one industry, and operationalizing “newness” and “benefits” constructs from findings of a qualitative study (see Part I), this research tried to elicit findings that comparatively more precise than usually found in New Product research.

Rather than investigating “newness” or “benefits” as one single construct, the attempt to delve deeper by looking at their constituting elements has yielded more plausible and concrete results in this research. This implies that New Products researchers may give it a serious thought to investigate at a detailed level as conclusions drawn at detailed level are less ambiguous.

In similar vein limiting an investigation to a particular industry has also helped in arriving at comparatively precise findings. Similar approach may be suggested based on the experience from this research.

Operationalizing major constructs from the findings of a detailed, qualitative study of a particular industry has proved to be beneficial. Even if at the cost of being limited to only one particular industry, findings of an industry-specific research are at least not ambiguous. This practice implies that New Product researchers should consider it, if precision of findings is of priority.

9.3.2 Implications for New Product Managers
Even if the managerial implications of this research cannot be translated into very clear-cut normative recipes, some suggestions can be advanced for top management and project managers of new products in software firms.

The findings of quantitative study suggest that marketing fit and technological familiarity enhance product-level benefits. Managers in software product firms should ensure
that marketing fit elements such as effective sales force, proper distribution channel, product launch strategy, aggressive sales and marketing drive, and appropriate marketing partners are in place, if they want the new product to generate desired revenue and profit, and to gain expected market share.

Similarly technological familiarity comprising of familiarity with design- and development-technology, design- and development-partners, and distribution channels enhances product-level benefits.

Findings of this study also suggest that technological fit and technological familiarity enhance firm-level benefits—enhanced revenue and profitability of other offerings of the firm, potential technological platform for future offerings, vital customer base, and enhanced firm’s image. Managers can have a broader outlook while deciding whether to invest in a new product project, to continue or kill an ongoing new product project, or a nascent product. In other words, evaluation criteria for a new product benefits in the software industry should include both product-level benefits as well as firm-level benefits.

While considering the moderating role of environmental factors it was concluded that in the presence of aggressive marketing practices marketing fit, technological fit, market familiarity, and technological familiarity lead to higher product-level benefits. Aggressive marketing practices also help in technological familiarity leading to higher firm-level benefits. Managers will do well to understand the role of prestigious customers in the product segment and the degree of reliance on such customers to influence subsequent mass customers. As product variety offered in a particular segment, use of differentiated pricing and terms of sale do play a role in new product benefits, as evident from this study findings, managers are encouraged to keep themselves abreast of these issues and take appropriate actions during the product development phase and thereafter.

9.4 Limitations

There are some limitations to this quantitative study that should be kept in mind while interpreting its results. First, the sample was made up of Swedish software firms only, hence while generalizing the results one should be aware of this fact. Findings may or may not be
fully applicable to software firms of other countries owing to cultural and structural differences.

Second, since the survey was conducted using a Web-based questionnaire, collected data and in turn results may differ if data were collected in a more traditional face-to-face meeting. Notwithstanding obvious advantages of Web-based surveys in terms of time and cost, the fact remains that face-to-face data collection method makes it possible to clarify ambiguous terms to respondents and to elicit more “accurate” response.

Third, results of study cannot be readily generalized to software services obviously because this study covered only software products. With better and faster Internet connectivity there is a growing tendency to offer some of software products as service45. Until future studies consisting of software services confirm, results of this study should be limited to software products as defined in Chapter 1.

Fourth, results of this study cannot be applied to significant number of non-software firms that develop software initially for their internal use and then in due course of time launch it as a commercial product.

9.5 Recommendations for Future Research
This quantitative study explored the effect of new product newness on new product benefits in the context if software products taking into account moderating effects of industry-specific environmental factors. The sample consisted of 321 Swedish software product firms.

This study needs to be replicated in different geographical settings, for example, in the US, India, or China. Such studies could confirm or contradict this study’s findings. Confirmations will lead to a conclusion that these findings are universally applicable; contradictions will lead to the conclusion that these findings pertain only to Swedish software firms.

This study focused only on software products. The software-services is another significant segment of the software industry (Campbell-Kelly, 2003). A similar study in the context of software services firm should point out similarities and differences between the two types of software offerings (products and services).

45 Google’s Docs and Spreadsheets is an example.
Findings of this study should be in-depth, qualitatively investigation. Such an investigation could throw light on processes and events between conceptualization and market launch of new products—both for successful new products and failed new products.

More focused research can be carried out to explore the individual elements of new product newness—Marketing Fit, Technological Fit, Market familiarity, and Technological Familiarity—affecting new product benefits at product-level and firm-level.

A Web-based survey was used to collect data in the present study. Like any other data collection method, Web-based survey also has its advantages and disadvantages. It would be interesting to know if findings were different had another data collection method been used. Hence, this study should also be replicated by collecting data through alternative methods, for example, via face-to-face interviews.

The next chapter, the last one in this dissertation, presents overall conclusions from both parts, the qualitative study (Part I) and the quantitative study (Part II) respectively.
Chapter 10: Overall Conclusions

In the context of new software products, this study (i) developed measures to operationalize product newness and new product benefits, and (ii) investigated the impact of product newness on new product benefits.

Product newness is conceptualized along fit with resources and familiarity with environment concepts which result in product newness having four dimensions—marketing fit, technological fit, market familiarity and technological familiarity. New product benefits is conceptualized as having two dimensions, namely, product-level benefits and firm-level benefits.

The qualitative study of seven software products, the first part of this research, suggested relevant measures to operationalize various dimensions of product newness and new product benefits. The statistical analyses in the second empirical study, the second part of this research, led to a refined list of valid measures for both the constructs. In this refined list, the relevant measures of marketing fit for new software products are sales force, distribution channel, product launch approach, sales and marketing approach, exceptionally aggressive marketing and sales and marketing partners. 46 Similarly, relevant measures of technological fit are design resources, development resources, customer support resources, system resources for distribution, technical manpower for distribution; 47 of market familiarity are markets, competitors, needs of customers, and (new) customers 48; and that of technological familiarity are design technology, development technology, design partners, development partners, and distribution channels. Those for the new product benefits are product revenue, product-related sales revenue, market share and product for the product-level benefits, and enhanced profitability of other offerings, other products’/services’ revenue, potential platform for future offerings, vital customer base and enhanced image of the firm for firm-level benefits.

In the quantitative investigation of product newness on new product benefits, it was hypothesized that each of the four dimensions of product newness would have a positive impact on both the dimensions of new product benefits. In other words, higher the market fit,
technological fit, market familiarity, or technological familiarity, higher would be product-level benefits and firm-level benefits. Splitting the new product benefits into product-level benefits and firm-level benefits to investigate the role of product newness seems to be a better alternative than to investigate new product benefits as one construct. Split into two--product-level benefits and firm-level benefits, one could gain a better understanding regarding which dimension(s) of product newness affect and which do(es) not. However, it was found that only marketing fit, and technological familiarity enhance product-level benefits, whereas technological fit, and familiarity enhance firm-level benefits. Technological fit and market familiarity were not found to affect product-level benefits, neither marketing fit or market familiarity to affect firm-level benefits.

It was also hypothesized that industry specific environment factors, namely, switching costs, aggressive marketing practices, and computer mediated transactions would moderate product newness’ impact on new product benefits. However, only aggressive marketing practices was found to significantly affect the role of four dimensions of product newness on product-level benefits and only one dimension (technological familiarity) of product newness on firm-level benefits. Neither switching costs nor computer mediated transactions were found to have any moderating role on product newness and new product benefits relationship.

These results point towards the importance of product newness to the firm on new product benefits in the context of software products. This study proposes a set of measures\(^\text{49}\) for operationalizing product newness and new product benefits for new software products and concludes that marketing fit and technological familiarity enhance product-level benefits whereas technological fit and technological familiarity enhance firm-level benefits. In the presence of aggressive marketing practices marketing fit, technological fit, market familiarity, and technological familiarity lead to higher product-level benefits. Aggressive marketing practices also help in technological familiarity leading to higher firm-level benefits. However, further investigation is needed into moderating effects of industry specific environmental factors on product newness-new product benefits relationship.

\(^{49}\) Since these measures are based upon rich qualitative empirical data of seven cases and, further, refined through a statistical analysis of 321 cases, these could be used with confidence in future studies.
Overall, this study extends previous research in the area of product newness-new product benefits and fills the gap in the literature by investigating newness and new product benefits in a greater detail at their constituting dimensions. By limiting to a particular industry, this study aims to provide useful findings both for researches of new product development and for managers in software product industry in improving the new product development benefits.
Appendix I: Reflections of the Researcher

In this appendix I present my personal interest and background which led to this research and which might have influenced during the research process, particularly in the interpretation of the qualitative study’s results. During my basic schooling physical science and mathematics were major subjects. I graduated as an architect, practiced couple of years before studying business management with a major in marketing. The topic of this research crystallized gradually over a decade of my working with new products and services in diverse fields. At my first job at a Helsinki architectural consultancy, my firm pioneered but failed to make a success of CAD assisted design and drafting service. The firm had core competence of architectural design, resources to invest in the new service and brand equity in the market – still the new service failed.

Subsequently at an architectural consultancy at Patna (India), my first start-up, resource crunch took its toll and the new service of CAD assisted design and drafting remained a limited success. Later at my second start-up, a cookies venture, I saw new product achieving remarkable success, where firm was able to provide for needed resources, even though it was an unfamiliar field. The firm monitored market continually and made changes quickly in the newly introduced product. Recently at a Linux firm in Scandinavia, either my firm did not know the customers’ expectations or we could not bridge the gap between customers’ expectations and our new products and services. The development team and top management comprised mostly of technical professionals and believed strongly in the technical superiority of the offerings but that “assumed superiority” somehow did not click with the customers.

Time and again I found myself pondering about what are prerequisites for a new product or service to be successful. As a working manager I was interested to understand it from the firm’s point of view. My MBA education, an entrepreneurial inclination and an avid interest in business management – all contributed towards my keen interest in the new product benefits topic.

IT has not ceased to fascinate me since 1990 when I got introduced to a computer at my first job. AutoCAD made possible for us not only to cut down on man-hours needed for a project but complete the process in shorter period of time. Once we submitted from start to finish an architectural competition entry for a township in seven days, an impossible proposition using conventional manual method. Without AutoCAD I could not have imagined getting established in Patna architectural consultancy market in such a short period as it made possible for me to bring excellence in design for the clients at an affordable cost. Its presentation features not only impressed prospective clients but also helped them select preferred alternative. Even in the absence of CAD-proficient architects available to hire we harnessed CAD’s productivity features and managed to create a successful niche. At my cookies venture software made it all possible – from PLC\textsuperscript{50}-controlled production line\textsuperscript{51} to spread-sheet based production and management accounting. Since the factory was located in a remote country side, it was too expensive to hire sufficient qualified production supervisory staff to have a traditional mechanical-controlled manufacturing line. PLC-controlled

\textsuperscript{50} Programmable Logic Controller

\textsuperscript{51} Embedded software lies at the core of a PLC
production meant not only consistent quality in production but also significant reduction in rejections. Variation in product quality would have made acceptance of our cookies very difficult. I was naturally highly impressed with the prowess of software.

Working in the IT industry I also came to know about high number of failures of new products in software industry. Entry barriers were (and still are) low. Many new products were launched but only few made it in the long run. I was perplexed at the phenomenon and found it as an attractive context for my research in new product newness and benefits.

When I began to explore past research I was surprised to find that little was done in the context of software industry. My initial research proposals were too ambitious—I wanted to find answers to all new products problem of a software firm. My research supervisors rightly encouraged me to focus on a narrow topic. After writing few more research proposals I realized that to understand relationship between product newness and benefits, I needed to explore product newness and benefits first and understand what it meant to the firm. I chose the topic because I had seen how much impact product newness could have on a software firm and how product benefits could differ from that of a traditional product, because I had felt that software industry differed from other industries in respect of entry barrier to the market, pace of technological change, role of standards, law of increasing (and not decreasing) returns, shorter product life cycle, etc. I found software firm developing software product with primary aim to get acquired by another industry major rather than grow on its own. Even the promise of a “killer product” attracted sizeable venture funding for software firms. I realized newness of a software product entailed great rewards but I also found newness of the new product or its new version creating great challenge for the firm. Newness and benefits of a software product seemed not only to differ from other products but also had serious implications for the firm. I wanted to learn more about what product newness and benefits are for a software firm, and how far these concepts are similar to or different from firms dealing in traditional products and services. I split the research project into two parts. First, the current one reported as licentiate dissertation, aimed to explore dimensions of newness and benefits through a qualitative study. Second one, the doctoral phase, will investigate relationship between product newness and benefits for software products through a quantitative study.

At the onset of the research project I had some notions, based on my past work experience and exposure, about the research questions. About product newness I thought firms conceive and develop new product with familiar technology and for familiar markets. I expected new version of products to largely built upon familiar technology and serving familiar market. I assumed software firms would find themselves in need of (new) resources for marketing and distribution of new products. I anticipated firms to rely on marketing research for product development. I did not, in retrospect, expect new version of products to cause such a discontinuity in fit and familiarity of firms. I also expect firms to point out inevitable partnership for development and marketing of new products.

Regarding new product benefits, I anticipated firms to acknowledge financial expectations, such as revenue and profit. I had an inkling of software firms expecting products to bring non-monetary benefits also. I assumed firms would point out new product being meaningful in opening new markets, attracting new customers, serving new needs of existing

52 A killer product (called killer app in IT jargon) refers to a new software program that creates a new product category and which has a wide market potential. A classic example of killer app was VisiCalc which created spreadsheet category.
customers and increasing their loyalty. I expected software firms to throw few surprises as the basis of product benefits evaluation; beyond the typical financial measures.

Results of the present study clearly point out that some of my notions were based only on my personal experience and outlook but some genuinely reflect software firm’s perspective also.
Appendix II: A Brief Literature Review of the Newness-Benefits of New Products

This section presents a brief literature review of new product newness and benefits. It should be noted that “new product innovativeness” is also often used for new product newness in the (new product) literature, and so is the term “new product performance” for new product benefits. However, innovativeness and performance are a lot wider in scope. Hence, newness and benefits have been preferred in this dissertation. As it will be seen, (i) the effect of newness on benefits is largely vague, and (ii) a better conceptualization and operationalization of both newness and benefits is needed in order to get to an unambiguous finding.

1. Newness and Benefits of New Products
While new product research has been in vogue for quite a while, new product newness and benefits have started to attract attention only in the last twenty years or so. Like new product research, product newness-benefits have also attracted the interest of scholars from different sub-fields of business studies, particularly from R&D, engineering, marketing and general management fields. Increasing number of empirical studies are being gradually added to the product newness-benefits research field. For example, a meta-review of the topic by Szymanski et al. (2004) has identified 38 empirical studies.

While the interest from diverse business studies areas is enriching for the product newness-benefits research field, researchers employ theories and research methods pertinent to their own fields, as has been the common practice in new product research. Newness of product is studied at various levels — Project-, SBU-, firm-, industry- or even world-level. Definitions of newness and benefits vary greatly; newness is treated as independent, dependent or even moderating variable in the newness-benefits relationship. Notwithstanding different units of analysis or even different theoretical perspectives adopted, it is generally proposed that product newness affects benefits.

1.1 Newness-Benefits Relationship
There are no comprehensive theories in the new product literature pertaining exclusively to newness-benefits relationship but some perspectives help in advancing a conceptual understanding. Considering that newness affects first and foremost the firm behind the product and its customer, Szymanski, Kroff and Troy (2004) categorized these perspectives into two groups: firm-based effects and customer-based effects. Firm-based effects obviously apply to the firm and its management, whereas customer-based effects apply to the end user of new products. Major product newness effects on the firms and on the customers are summarized in the table below. As evident, newness causes some positive effects and some negative effects on both.
If a new product is highly innovative, it creates a sense of prestige among workers of the firm that helps firms in attracting and retaining key employees thus lowering employee turnover, reducing cost and providing continuity in idea generation (Urban, Weinberg and Hauser, 1996). Newness of a product also provides the firm an opportunity to create entry barriers for competitors by means of patent or setting industry standards. Innovative product involves firm to nurture unique competencies and experience curve effects which could lead to higher returns over a period of time (Szymanski, Troy and Bhardadwaj, 1995). If newness entails such advantages to the firm, it causes some challenges too. Some of those challenges, listed in “Negative effects” column of Table 1.1, pose great risk to the firm. Lately scholars have tried to understand the newness-benefits phenomenon and to figure about what it entails for a firm. A review of the selected literature in the following section shows that the newness-benefits relationship continues to remain an enigma.

### 1.2 Previous Studies
Under the project NewProd Cooper (1979) studied 200 product innovations to identify differences relating to characteristics of the firm and project team and its effect on new product success. His findings include superiority of the product, marketing knowledge, technical synergy and marketing synergy causing success and marketing and technical unfamiliarity hampering the success. In a follow up to the NewProd, Cooper and Kleinschmidt (1986) studied 203 new products. They found marketing and technical synergy as one of three most important success factors and suggested that in order to succeed new products should take advantage of firm’s existing marketing expertise, R & D and production capabilities.

In their study of over 330 new products in electronics industry Zirger and Maidique (1990) included “synergy with existing competencies” as one of the measures of product-firm

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**Table II:1. Effects of Product’s Newness on the Firm and its Customers**

<table>
<thead>
<tr>
<th>On the firm</th>
<th>Positive effects</th>
<th>Negative effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly innovative product</td>
<td>- fosters spirit of innovation</td>
<td>- leads to unfavourable employee response (if misfit with existing systems)</td>
</tr>
<tr>
<td>- attracts/retains creative employees</td>
<td>- means greater diversity of tasks</td>
<td></td>
</tr>
<tr>
<td>- improves workers’ productivity</td>
<td>- calls for new skills and structures</td>
<td></td>
</tr>
<tr>
<td>- creates first mover’s barrier for competitors (e.g., patent)</td>
<td>- involves cannibalization risk</td>
<td></td>
</tr>
<tr>
<td>- experience curve effects</td>
<td>- difficult to execute (design, develop and market)</td>
<td></td>
</tr>
</tbody>
</table>

**On the customer**

| Highly innovative product | - leads to greater product trial (due to novelty effect) | - misfits with risk averse (social, benefits, financial, etc.) customer segment |
| - generates excitement and positive publicity | - relies on extensive new learning affecting adoption |
| - reinforces loyalty | - needs other compatible items for meaningful use |
| - makes more receptive to future products | - demands new behavior |

(Note: Based on Szymanski et al., 2004)
fit. They measured synergy on products, markets and technology counts and found higher synergy among successful projects. However they did not distinguish between marketing and technical synergy even though in earlier phase of their study they had found a new product gained significant benefit from firm’s existing marketing and technical strengths. In a study of new service, Cooper and de Brentani (1991) found synergy with firm’s resources as one of the most important factors for success but newness of the service to the firm or to the market having no bearing on success.

Using Canadian dataset NewProd II collected in 1985-86 Kleinschmidt and Cooper (1991) investigated effect of newness of new product on its success. They categorized newness of a new product into three categories and found high and low levels of innovative products were more successful, resulting in a U-shaped relationship between product newness and commercial success. They followed Booz, Allen and Hamilton typology and used only a single dimension measure of new product’s newness; familiarity dimension of newness was not taken into account. Better success rates for more innovative products vis-à-vis less innovative new products were also reported by Song and Montoya-Weiss’ (1998) study.

Cooper and Kleinschmidt (1993a) included project fit and familiarity measures in a study of chemical industry but did not find these measures of any significance in predicting success or failure of new products. However, they also used a narrow classification of new products as per Booz, Allen and Hamilton’s typology and treated newness on a single dimension. In a subsequent study, their study found marketing and technological fit, among other factors, which made a difference between success and failure of new products (Cooper and Kleinschmidt, 1995). Their study did not consider fit as an element of newness of the new product. Whereas Calantone, Vickery and Dröge (1995) found technological fit critical for new product success in the furniture industry. However they are guarded against if such findings can be generalized across industries.

In their study of Japanese firms Song and Parry (1996) considered marketing fit, technical fit, market and technical understanding, and technical proficiency among factors influencing success of a new product. They found marketing fit having positive effect on financial success of new products. They also found technical synergy and marketing intelligence influencing the financial success. In another cross-cultural comparative study, Song and Parry (1997) found both marketing and technological fit enhanced new products success largely due to their positive effect on marketing and technological tasks carried out during development process of the new product. In a comparative study of American and Japanese electronics firms, Souder and Song (1997) used market familiarity as a factor for success of new products and found mixed results for small and large firms. In their study of 65 new product projects consisting successful and failed products in roughly equal numbers, Song, Souder et al. (1997) found marketing and technological familiarity as causal factors, among others, for new product success. While studying Fortune 500 manufacturers of industrial products, Calantone, Schmidt and Di Benedetto (1997) conclude marketing fit enhances success rate of new products.

To measure newness of a new product to the firm, Sethi (2000) used Booz, Allen and Hamilton’s typology and limited himself to a single measure of newness. In his research, product newness is measured in the context of product quality which in turn is expected to influence product success. His result includes market familiarity contributing finally towards new product success.
Danneels and Kleinschmidt (2001) used NewProd II dataset to test their proposed framework to study newness of a new product including that from a firm’s perspective and recognized that a new product from a firm perspective has two distinct components. One is a familiarity component and another is a fit component. Further, familiarity and fit both is made up of a marketing component and a technological component. They found that marketing fit and technological fit of a new product enhanced its success. However, they could not substantiate if market familiarity and technological familiarity aided to success. Their use of a decade old dataset makes their findings tentative.

In a research showcasing evidence from pharmaceutical industry, Sorescu, Chandy and Prabhu (2003) treated newness of a new product along marketing and technological dimensions and strong fit of existing resources contributing to financial success.

This seemingly incoherence in the empirical evidence among above cited studies makes it difficult to see a pattern among a new product’s benefits to the firm being influenced by various aspects of product newness. Song and Montoya-Weiss (1998) found no conclusive evidence of product newness on the new product success. However, Danneels and Kleinschmidt (2001) blamed this confusion to the lack of precise conception and measurement of product newness. Conceptualization and operationalization (for measurement) of not only new product newness but also of new product benefits remains poor as it will be seen in Section 3.

2. New Products Newness

Newness of a product denotes its “newness” as an innovation. Innovation can be defined in several ways. However, OECD’s definition of innovation is comprehensive (Garcia and Calantone, 2002) and serves the purpose of this study. According to OECD (1991) innovation is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention. This definition points out two important aspects of innovation: (i) innovation consists of technological development of an invention and market introduction of that invention, and (ii) innovation process is iterative—the initial introduction of a new innovation follows by subsequent reintroductions of enhanced version of the same innovation. Utterback and Abernathy had proposed:

“A basic idea underlying the product innovation is that products will be developed over time in a predictable manner with initial emphasis on product benefits, then emphasis on product variety, and later emphasis on standardization and costs (1975, p. 642).”

The pursuit to improve the innovation leads to different types of innovation. An innovation at the early stage of diffusion and adoption is labeled “radical innovation.” With continual improvement and upgrade made during the adoption phase and later stage of product life cycle, these are called “incremental innovation,” because diffusion is hardly ever a simple process of replication by unimaginative imitators (Freeman, 1994). Innovations in its different forms can be imagined embodying varying degree of newness.

Although newness is most common measure of the degree of “innovativeness” of an innovation, it is measured and operationalized in an ad hoc manner without outlining what is “new” and newness from whose (e.g., customer’s, firm’s, or industry’s) perspective (Garcia and Calantone, 2002). This randomness in treatment of newness makes comparison among
different studies difficult. No matter which perspective is used to see “newness”, the basis of categorization is almost always degree of discontinuity in marketing and/or technological factors (Ibid.). Hence, product newness can be defined as the capacity of a new product to influence the firm’s existing marketing resources, technological resources, skills, knowledge, capabilities, or strategy (Ibid.).

2.1 Typologies of New Product Newness
Innovation, manifest in a new product, has been a popular subject for theorizing and empirical research. Innovations on the basis of similarity in innovative characteristics or degree of newness can be placed in separate categories. Since varying degree of newness contained in a new product and corresponding discontinuity can influence the firm in different ways, categorization can be helpful in studying and managing new products. Sadly an agreed schema to categorize newness is missing and researchers have used ad-hoc typologies, as evident in Table II:2, to categorize degree of newness:

Similar type of innovations labeled under different names, and same name used to denote different types of innovations have led to so many different typologies. As some researchers have tried to over simplify by having only two categories, others have chosen to have four or even five categories. Depending on the typology used by a researcher, same innovation can be labeled differently using different typology. This ambiguity in terminology makes it extremely difficult to compare research studies and hampers the knowledge accumulation in the field of new product research.
<table>
<thead>
<tr>
<th>No. of Categories</th>
<th>Typology</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Discontinuous – Continuous</td>
<td>Anderson and Tushman (1990)</td>
</tr>
<tr>
<td></td>
<td>Variation – Reorientations</td>
<td>Normann (1971)</td>
</tr>
<tr>
<td></td>
<td>True – Adoption</td>
<td>Maidique and Zirger (1984)</td>
</tr>
<tr>
<td></td>
<td>Original – Reformulated</td>
<td>Yoon and Lilien, (1985)</td>
</tr>
<tr>
<td></td>
<td>Evolutionary – Revolutionary</td>
<td>Utterback (1996)</td>
</tr>
<tr>
<td></td>
<td>Sustaining – Disruptive</td>
<td>Christensen (1997)</td>
</tr>
<tr>
<td></td>
<td>Breakthrough – Incremental</td>
<td>Rice, Colarelli, Peters and Morone (1998)</td>
</tr>
<tr>
<td></td>
<td>Radical – Incremental</td>
<td>Atuahene-Gima (1995); Balachandra and Friar (1997); Kessler, and Chakrabarti, (1999); Freeman (1994); Schumpeter (1934)</td>
</tr>
<tr>
<td>3</td>
<td>Low newness – Moderate newness – High newness</td>
<td>Kleinschmidt and Cooper (1991)</td>
</tr>
<tr>
<td></td>
<td>Niche creation – Architectural – Regular – Revolutionary</td>
<td>Abernathy and Clark (1985)</td>
</tr>
<tr>
<td></td>
<td>Incremental – Evolutionary market – evolutionary technical – radical</td>
<td>Moriarty and Kosnik (1990)</td>
</tr>
<tr>
<td></td>
<td>Incremental – Architectural – Fusion – Breakthrough</td>
<td>Tidd (1995)</td>
</tr>
</tbody>
</table>

2.2 Dimensions of New Product Newness

As seen in Table II:2, there is a significant inconsistency in the new product literature in labeling types of newness of new products. The incoherence continues, because researchers have used different constructs to study newness. Table II:3 showcases a sample of randomness of bases to categorize newness:
Table II:3. Basis of Product Newness in Empirical Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Basis of newness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoon and Lilien (1985)</td>
<td>New product line, New process, New competition</td>
</tr>
<tr>
<td>Christensen (1997)</td>
<td>New technology</td>
</tr>
<tr>
<td>Kleinschmidt and Cooper (1991)</td>
<td>New technology, New product design,</td>
</tr>
<tr>
<td>Green, Gavin and Aiman-Smith (1995)</td>
<td>New technology, New product line</td>
</tr>
<tr>
<td>Olson, Walker and Ruekert (1995)</td>
<td>New technology, New product line, New changes</td>
</tr>
<tr>
<td>Souder and Song (1997)</td>
<td>New features, New consumption pattern, New uses</td>
</tr>
<tr>
<td>Chandy and Tellis (2000)</td>
<td>New technology, New benefits</td>
</tr>
<tr>
<td>Lawton and Parasuraman (1980)</td>
<td>New product line, New product design, New consumption patterns</td>
</tr>
<tr>
<td>Cooper and de Brentani (1991)</td>
<td>New technology, New product line, New process, New service, New competition, New customers , New customer need, New changes, New skills</td>
</tr>
<tr>
<td>Kessler, and Chakrabarti (1999)</td>
<td>New technology, New product design</td>
</tr>
<tr>
<td>Veryzer (1998)</td>
<td>New technology, New uses</td>
</tr>
</tbody>
</table>

The complexity increases further with the number of different measures used to operationalize newness. Garcia and Calantone (2002) identified 51 distinct measures from NPD literature, but despite this complexity, found a single theme underlying all these classification: newness as a measure of discontinuity in the status quo of (i) marketing factors and/or (ii) technology factors. OECD’s definition of innovation, cited earlier, also recognizes two phases: (new) product development and market introduction. While development is a technological act, market introduction is a marketing act for the firm. Hence, product newness can be said to have a technology dimension and a marketing dimension.
In the extant empirical research, product newness has been treated as an independent variable (Ali, Krapfel and LaBahn, 1995; Cooper, 1979), a dependent variable (Green, Gavin and Aiman-Smith, 1995) or a moderator (Souder and Jenssen, 1999; Yoon and Lilien, 1985). Based on an extensive overview of prior empirical newness research, Daneels and Kleinschmidt (2001), deduced dimensions of product newness. They find familiarity and fit as two distinct dimensions of product newness.

2.3 Familiarity Dimension of New Product Newness
Familiarity dimension of product newness pertains to a firm and its environment. This concept draws from organizational theory and posits that an organization establishes a periphery, a domain, which demarcates the interaction points at which the organization is dependent upon inputs from environment (Thomson, 1967). To develop a new product and introduce it into the market, a firm may need to enlarge its domain and find itself in unfamiliar environment (Normann, 1971). It is assumed that firm perceives and interprets events and signals more easily from the familiar environment than the unfamiliar one (Ibid.).

2.4 Fit Dimension of New Product Newness
Fit dimension has its root in “resource-based view of the firm” (Penrose, 1959, Wernerfelt, 1984). This lately popular strategy theory views firm as a collection of resources (instead of products); resources, which can be put to different uses (Ibid.). Resources like R&D expertise, marketing research skills, knowledge about customer needs, marketing skills, etc., are needed to develop and commercialize a new product. The fit concept refers to how well the internally available resources fit the requirements for the new product’s development and commercialization (Danneels and Kleinschmidt, 2001). Combining both the familiarity and fit dimensions with their corresponding technological and market(ing) factors, Figure II.2, on p. 306, presents product newness from the firm’s perspective.

2.5 Newness of New Software Products
Let’s consider few common practices in software industry: Software firms develop often their products in cooperation with prime customers and suppliers. Many functions (e.g., coding, testing, bug fixing) of new product development are outsourced and so are installation, implementation and technical support. Special skill sets needed for a particular software project is recruited on a project basis. Venture capitalists help new firms acquire vital resources (e.g., key technical personnel, marketing tie-ups) via their network which would
have been otherwise beyond the reach of a new start-up, fledgling firm. If these features are
taken into account, newness as per extant literature does not fully cover product newness from
the software firm’s perspective as resources, skills, knowledge, capabilities etc. are much
more shared or hired temporarily and lie beyond the boundary of the firm. Obviously we need
a more appropriate and fine-grained description of the software newness concept.

3. New Product Benefits
To evaluate benefits of a new product, firm commonly uses financial measures, such as
revenue, profit, profit margin. The reason could be that these are easy to measure for the firm
(linked directly to the new product). Moreover financial numbers could give a telltale sign of
product benefits, particularly in a short term. But use of only financial measures may not
cover new product benefits comprehensively. Although financial motives are probably almost
always the primary reason behind new product, firms introduce new products for other
reasons too, such as, to complement existing product portfolio, to improve firm image, to
diversify, etc. Even when financial benefits is main criterion used by the firm, a new product
will invariably leave its effect on the firm beyond the monetary profit and loss.

3.1 Dimensions of New Product Benefits
In extant literature numerous benefits measures have been used to measure new product
benefits (see, among others, Hutlink and Robben, 1995, Griffin and Page, 1993, Griffin and
Page, 1996, Hart, 1993, Hutlink and Robben, 1999). For example, as per Griffin and Page
(1993) up to 75 different measures have been used. They identify 15 core measures, used
both by researchers and practitioners, which constitute three independent dimensions of new
product benefits, namely, market acceptance, financial benefits, and technical product
benefits. Market acceptance measures capture mainly market position and sales benefits vis-à-
vis competitors. Financial benefits dimension tells about new product’s profitability.
Technical product benefits measures reflect how customers evaluate the product’s quality and
technical benefits. To capture a complete view of product benefits, Griffin and Page
recommend multiple—two market acceptance, one financial and one technical product
benefits—measures (Ibid.).

Hultink and Robben (1995) found Griffin and Page’s recommended measures
relevant in their study of 197 large companies and 272 new industrial and consumer products
in The Netherlands. Their choice of multiple measures reflects the emerging thinking that new
product benefits is a multidimensional concept and a combination of financial and non-
financial measures provide a more complete picture (Hart, 1993).

Since new product benefits is one facet of a firm’s overall benefits, hence firm benefits
literature also throws light on new product benefits (Hutlink and Robben, 1995). Venkataraman
and Ramanujam (1986) have developed a two dimensional classification
scheme. One of their dimension treats financial (e. g., sales growth, turnover, profit, ROI) vs.
operational criteria (e. g., newness, market position, etc.). They make an explicit distinction
between financial and operational benefits. Some researchers have dealt new product benefits
explicitly and recommend a set of measures to be used in future research (Hart, 1993, Cooper,
1984, Cooper and Kleinschmidt, 1986, Cooper and Kleinschmidt, 1987, Griffin and Page,
1993). Most of these recommended measures find place in Cooper and Kleinschmidt’s
suggested set of measures (Cooper and Kleinschmidt, 1987). They built upon Cooper’s (1984)
previous research and suggested three independent dimensions: (i) financial benefits (e.g.,
relative profit to sales, payback period), (ii) opportunity window (new market or opportunities opened by the new product), and (iii) market impact (market share) (Cooper and Kleinschmidt, 1987). Storey and Easingwood (1999) see new product benefits in terms of benefits and divide new product’s benefit into two groups: one group of benefits are applicable strictly to the new product (e.g., sales, market share), but another group of benefits are applicable generally to the firm (e.g., improved customer loyalty, platform for future products). They tend to see new product benefits along sales, enhanced opportunities and profitability dimensions.

Despite differences in the use of finer basis of benefits evaluation, a clear distinction between financial and non-financial benefits is obvious in extant literature. Figure II:2 presents it graphically.

![Benefits Diagram](image)

**Figure II:2. Dimensions of Product Benefits**

### 3.2 Benefits of New Software Products

In case of a software product, even if it do not bring financial profit directly it may create another opportunity for the firm which could be profitable—some Linux companies provide OS (Operating System) free of charge but sell their service to provide customer support. In some cases, the profit may come from other type of customers as happened in the Netscape browser-server case—Netscape provided web browsers free to customers but sold its browser server to corporate clients at a profit. A new product, even at a loss, can be used to lock-in customers and in due course of time customers can be made to pay to continue or upgrade the product. Onebox.com provided free web mail service and at a later date made the service available only to the paying customer. A variant of this strategy was used by hotmail to sell a larger mailbox. Google “sells” its email service free to customer but earns profit from sponsored advertisements based on the keywords contained in the body of emails. It is obvious new software products can be beneficial to a software firm in many different ways—it may bring financial rewards, may open opportunity window, may create a captive market that can be leveraged in future by means of other new products. These anecdotal instances indicate that there is more to a software product benefits than only financial return.
Appendix III: Sample Interview Guide
(Used for interview for TermMate)

Interview questions are grouped and arranged according to research questions:

1. What are constituents of product newness considered important by new product managers of software firms?

How familiar was Nescit with the technology behind TermMate?

- Was the technology used to develop TermMate new to Nescit?
- Was the engineering and design work involved in TermMate’s development project new to Nescit?
- Was TermMate’s distribution technology and distribution process familiar to Nescit?
- Did the situation change with new releases/versions?

How would you describe market familiarity of Nescit for TermMate?

- Was TermMate aimed at new customers (to the customers Nescit has not sold before)?
- Did Nescit face new competitors when it introduced TermMate (New competitors Nescit has not faced before)?
- Did TermMate serve new needs of old customers (Old customers Nescit has sold before)?
- Was TermMate’s market new (or different) to Nescit (Was it your existing market or totally new to you)?
- Was TermMate a new product category for Nescit?

How much Technological synergy Nescit had for TermMate?

- Were Nescit’s product development resources, people and skills sufficient to develop TermMate?
- If it was not, how Nescit developed TermMate?

How many of following were done in-house: investigation/modeling, design, coding, debugging, testing, portability, documentation, user's training?
How Nescit distributed TermMate to the customer?

- Had Nescit all needed distribution resources?
- Which distribution resources Nescit acquired from outside of Nescit?

Did Nescit need partnering (to complement) to develop or distribute TermMate?

- If yes, why couldn’t Nescit do it alone?

How would you describe Nescit’s Marketing Fit for TermMate?

- How far was Nescit’s existing sales-force adequate for TermMate?
- Had you used distributor’s sales force earlier for other products? Did you use it for TermMate?
- Were this time distributor’s sales force adequate or new one had to be hired?

To what extent Nescit’s advertising and promotional people, skills and resources adequate for the advertising and promotion of TermMate?

Was Nescit’s market research people, skills and resources adequate for the market research of TermMate?

Was Nescit’s customer support - people, skills and resources - adequate for the customer support of TermMate?

Did Nescit need to partner to market TermMate?

- If yes, why the need to partner? Why not alone?

Has collaboration (with customers, suppliers, and/or partners) helped TermMate in development, selling, marketing and/or distribution? If yes, please tell us about it.

Additional comments about newness of TermMate.

2. What are constituents of product benefits considered important by new product managers of software firms?

During development phase, what were important aims for TermMate to achieve in the market?
- Did the aim change during or after the commercialization with the launch of revised versions?

How would you describe benefits (success) of TermMate?

- What is your basis of judging the benefits of TermMate?

How is the sale of TermMate in comparison to other Nescit products?

Is TermMate more profitable than other new products of Nescit?

Did TermMate meet Nescit’s sales target?

Did TermMate meet Nescit’s profit objectives?

Did TermMate achieve the expected market-share?

- Was market share vital for Nescit? If yes, why?

Did TermMate improve Nescit’s perceived image?

- To whom (customers, investors, potential employees…)?

- Was it valuable for Nescit? If yes, why?

Did TermMate improve loyalty of existing customers of Nescit?

- Why it was valuable?

Did introduction of TermMate improved profitability of other products of Nescit?

- If yes, how?

Did TermMate attract a great number of new customers?

- Why was that valuable to Nescit?

Did TermMate provide an important competitive advantage?

- Why was that special?

Additional comments about benefits of TermMate.
Appendix IV: Research Project Introduction
(sent to QVIQ for the study of Swelog)

Research aim: New products are vital for firms, but only few achieve success, many fail. Despite a lot of research, what leads to the success of a “new product” for sure is not clear – neither to managers nor to researchers. However, “newness” or newness of a new product, among other factors, seems to play a role. Even success of a new product for the firm is found to be multi-dimensional.

This research project explores the newness (called newness) and benefits (success/failure) from the firm’s perspective. In other words, what makes a new product “new” to the firm – is it new resources necessary to develop and commercialize the new product; is it familiarity with underlying technology and market environment or something else? About benefits, what are the expectations of the firm from a new product – is it only monetary profit (the most popular measure), or creating an opportunity window, or something else? Research aim is to list what constitutes newness and benefits (from the firm perspective) in respect of a new software product.

Respondent: New product manager (or equivalent) who has been involved from conception to design, development and commercialization of the Swelog and who can present business aspects of the product from the Q.V.IQ’s perspective.

Software product: In this research project, software product stands for mass-produced, shrink-wrapped software to business applications software (such as Swelog) which is sold to several customers. These business application software may need nominal customization for implementation, but custom made applications for only one customer or other software services are excluded from this definition. Your Swelog qualifies as a new software product for my study.

Case study and Info needed: Through the case study I want to gather information from the firm about newness and benefits of a new software product. Based on collected information from Q.V.IQ I will describe newness and benefits from the firm perspective.

Other than basic details about Swelog and Q.V.IQ, I will have 20-25 questions for you. There can be few supplementary questions too. Your reply to these questions will be major input for describing Swelog’s newness and benefits. To write a descriptive case I may make use of publicly available information to complement information gathered from you. You will get to approve all the information.

In analysis part of my dissertation, your replies will be quoted (anonymously if you wish) to describe Swelog or Q.V.IQ and support or refute past theories. Swelog’s and Q.V.IQ’s identity will be disclosed in the dissertation only by your permission. If you prefer, these can be kept anonymous. During our introductory meeting I can sign non-disclosure agreement, if needed.

Mode of conducting case-study: We need to have an introductory meeting (lasting about 30 minutes) followed by one or two sessions to conduct interview(s). In the introductory meeting I can tell more about my research project and answer your queries. During free-wheeling
interview I would like to know about Swelog’s newness and benefits (success/failure) for Q.V.IQ. After interview I may need to get back to you with few supplementary questions which we may take on phone, Instant Messenger (MSN or ICQ) or email.

**Time-schedule:** You will have to spare approximately two to three hours, in total. I would appreciate, if we could complete the process within May-June.
Appendix V: Sample Case Description

Case of Lynx

Part A: Background of Lynx

1. The firm
L.Co was established in Tampere, Finland in 1991. During the initial years it was focused exclusively on software-related consulting services. In 1995, it delved into Linux open source OS and other software products. It selected GNU/Linux to develop its open source software products. Over the period, the firm has been developing software and carrying out turn-key systems development project for private- and public corporations, and governmental organizations. Now, it has expertise across Windows, Mac, Linux and different flavours of UNIX platforms. Currently L.Co provides services related to software product development and ICT-infrastructure.

L.Co has offices at Tampere and Helsinki in Finland, Tallinn in Estonia and St. Petersburg in Russia. In 2001, it also had an office in Sweden and representatives in the US and Australia but none of them are active any more.

2. The product
Lynx was introduced in 1998. It was primarily a Linux OS, aimed at home and office users which claimed to provide more stability (lesser crash), better functionality, more security and enhanced usability. At CeBIT trade fair in Feb 2000, L.Co showcased its Linux OS in English. The product included an office suite, many multimedia applications, games, PC-utilities, and Internet-related software. By 2001, it became the most popular Linux OS (popularly called Linux distribution) in Finland. It had a sizeable number of users in other Nordic countries as well. But, the product could not generate the kind of revenue L.Co had expected. In 2002, L.Co decided to re-launch Lynx under a different name.

3. Features of the product
Though the product was not completely new to the market, it was rich in new features. Installation, a big hurdle for many novice Linux users, was easier and smoother than many other Linux distributions. Ease of installation of the OS and installation of additional hardware are two aspects which differentiate different distributions (flavours) of Linux. Lynx had a graphical installation user interface. It gave the user option to install Lynx side by side with other OSs and it was simple to select the OS one desired to run while computer was booting up. Many users found installation comparable to RedHat, one of the leading market leader. Lynx had KDE, a graphical and intuitive desktop with a number of application programs, games and tools.

53 Open Source refers to software source code that can be freely examined, changed, distributed, sold and used on the condition that source code must be made available, either delivered with the executables, or provided when requested.

54 Information and Communication
Lynx supported many more hardware than were supported by many other Linux distributions. It made easy for user to configure new piece of hardware. Technical support in local language was an additional feature for customers in Estonia, Finland and Sweden, in addition to support in English to users in all other countries. Having been involved in supporting a leading Linux distribution in Finland for about a year before launching the Lynx, L.Co had a firsthand experience of problems faced by typical Linux users.

New customers could download Lynx, like many other open source software, free of cost from the Internet. However the process of installing such a downloaded version was cumbersome and required a fair degree of technical proficiency. The kind of people used this mode were mostly “techies” and “geeks” who wanted to test different software or Linux volunteers – non-paying customers. Technology used to develop Lynx was largely in public domain. However, installation program was L.Co’s in-house contribution.

Lynx required many new activities on its part which were new to L.Co. Participating in Linux kernel development, organizing intermediate release(s), coordinating volunteers to test and bug-fix the programs and drivers, were some of activities on technical front. New marketing activities included reaching to the mass market (for the first time for L.Co) via mass media and participating in industry trade fairs and conferences. Administratively, coordinating business across border was also rather new to L.Co.

4. Product Newness

**Technological Familiarity**

L.Co was familiar with the technology involved in developing Lynx. Prior experience of providing support to another Linux distribution in Finland was valuable. It gave L.Co an opportunity to update its skills needed for the job. However the magnitude of work was unfamiliar to L.Co. Its past experience of managing smaller size projects was not adequate. Lynx required an unprecedented level of new product development.

L.Co was used to communicating with volunteer Linux developers. These developers used to download codes and programs from L.Co’s servers, but distributing (selling) programs to typical end users at home or office via Internet was new for L.Co. L.Co developed adequate web infrastructure for secure transaction and tracking of order by customers, but it never really took off. L.Co attempted to distribute Lynx through book shops and computer software shops in Finland and Sweden. L.Co has no experience of such distribution channels and found it difficult to manage.

**Market Familiarity**

It was a completely new market for L.Co. L.Co had served only to a niche comprising of local companies and few governmental organizations. It had sold them software related services. Lynx was aimed at individual users both at home and office. Not only customers were new to the L.Co, it faced new competitors in the new market, competitors who had more experience and exposure of the market. Interestingly it found itself in markets where it had not planned formally to be. Lynx were downloaded from Internet and tested, reviewed and compared (with other Linux distributions) in far flung countries. Being a small company on the path of growth, it was not even prepared to handle so many national markets.

L.Co had a lot more to offer to its old customers but number of such customers were too small. On the other hand, market beyond its old customer was absolutely unfamiliar. L.Co’s saw Lynx’s initial sales projection going haywire.
**Technological fit**
L.Co did not originally have sufficient resources and skills to develop Lynx. It found difficult to hire competent software developers in the home country. Establishing a development center at Tallinn, Estonia not only solved the scarcity of skills L.Co lacked, it also proved a lot more economical. (Later L.Co made Tallinn share major load of technical customer support also.) New team at Tallinn was led by CEO based in Finland, who later moved base to Tallinn. Tallinn office concentrated on software design, Lynx installation program development and manual documentation. In primary testing and bug fixing Linux volunteers helped L.Co. These volunteers brought a lot of supplementary knowledge and skills that a software company like L.Co needed. However coordinating volunteers’ activities to meet quality standard and schedule was a challenge.

**Marketing Fit**
L.Co had to build sales team from almost scratch. It used to sell its services locally through its personal network. Selling a software packaged product to a great number of customers was new to L.Co. Distributing through Internet it attracted many users who tested the product but there was not much paid sales through this channel.

L.Co’s effort to reach retail customers through book shops and computer shops also met with limited success. L.Co had no prior experience of managing such channels. L.Co preferred to count on its industry experience and skipped market research. It found out later at a great cost that it knew little about potential market. Lack of advertising and promotional skills suited to a mass market also hampered Lynx’s success.

L.Co developed quickly a good Lynx customer support which played a key role in enhancing the reputation of L.Co. To serve distant customers L.Co had to partner with resellers and other local service providers. Such partnering was also new to L.Co but vital for wider adoption of Lynx.

5. **Product Benefits**
With launch of Lynx L.Co aimed for a major market share of OS. Its first target market was home and office users in Finland but it had dreams of becoming a global major OS producer. It had projected exponential sale of Lynx in the forthcoming years from the launch. It wished to end the monopoly of Microsoft. Having developed Lynx, a Linux OS, which had a very promising sales projection, L.Co secured venture funding from an American firm to market the product and consolidate the business. Without this external funding it would have been very difficult for L.Co to embark on the marketing drive and build infrastructure to provide sales and customer support. However, those sales projections never materialized; even increased sales and marketing efforts failed to jack up the revenue. On revenue and profit count Lynx was a big disappointment. Inclusion of more applications, launch of improved versions and more support increased the expenses but failed to improve the sales or profit. Gradually L.Co felt it was unable to cater to the retail customers and began concentrating on corporate customers.

L.Co strongly believes that although Lynx did not bring much money directly, it brought other benefits. It bundled its office suite, L.Co office with the OS, which facilitated new users to sample its other product. Lynx enhanced the reputation and legitimacy of L.Co not only in Finland but also in other Nordic countries and to a certain extent in Europe. But it
was only in Finland that L.Co managed to leverage that reputation to generate additional revenue channels. It is regarded as a reliable software systems and solutions provider in Finland. L.Co credits Lynx for its existence today. Having Lynx in its portfolio, it became easier for L.Co to sell its other services profitably. L.Co found it difficult to gain economy of scale by selling more of Lynxs, it found economy of scope easier to achieve. It sold value added services, such as server solutions, remote server monitoring and maintenance services profitably. It concentrated on serving its existence and prospective customers in Finland by bringing more offerings at a lesser cost. L.Co enhanced its head count in Tallinn, its main development center and opened a new office in St. Petersburg in Feb 2003.

Lynx also brought respectability to L.Co in the eyes of Linux volunteer developers. Attracting good quality developers were critical for the L.Co to test and fix the bugs in Linux kernel as well as in Lynx. Obviously it helped L.Co in keeping the cost of product development low and launch its release earlier than its competitors (RedHat, Suse, Caldera, etc.).

Despite peripheral but significant benefits of Lynx, L.Co was consuming fast the venture funding it has secured for the marketing and consolidating its position in OS market. It could not let the attraction of direct revenue go and decided to re-introduce Lynx as a new product in 2002. It is too early to evaluate the financial benefits of Lynx’s new avatar. L.Co values its association with Linux so much that it has joined LBA (Linux Business Alliance)—an industry consortium which promotes member’s interests.

**Part B: Identified Themes (Underlined below)**

Research Question 1: What are the relevant elements of newness of a new product to the firms that develop and market computer software products?

Thirteen themes emerged while considering product newness of Lynx towards its firm. L-Co was familiar only to a small extent with the programming technology involved in developing (designing and programming) Lynx. The firm realized that its past experience of managing smaller size software projects was not adequate for the purpose of the design of Lynx. New products made their firms acquire new design technology. The firm had of a couple of years’ experience of providing technical support to another Linux distribution in Finland but that did not suffice for the design purpose of Lynx; it had to use new design technology. New products made their firms acquire new programming technology.

L.Co had been using Internet to communicate to and to provide access to program codes to Linux volunteer developers. These developers downloaded program codes from the firm’s servers via Internet (and eventually uploaded their own and/or modified) program codes. But distributing (selling) software programs to end users at home or office via Internet, the preferred medium by Linux users, was new for the firm. New products made their firms acquire new distribution technology. While the firm was equipped for product delivery but it had to acquire adequate Web infrastructure for facilitating secure financial transaction. L.Co had served only to a niche market comprising of local firms and few governmental organizations selling them software related services. The firm had anticipated that Lynx held a lot of promise for L.Co’s old customers (New products made their firms to fulfill new, unfamiliar needs of existing customers) but actual number of such customers turned out to be
much smaller. From the beginning Lynx was aimed at a new market comprising both of home
users as well as office users. This was a new market for L.Co. Not only customers were new
to the L.Co (New products required their firms to sell to new customers) but also competitors
in the product’s market were new to the firm. Providing technical support in native language
worked in the favour of the firm in the home country but overseas market proved weak turf
for the firm against seasoned competitors, because these new competitors had more
experience and exposure of the market. New products compelled their firms to face new
competitors.

Interestingly L.Co found itself in markets which were not formally intended by the
firm. As many open source software products Lynx was downloaded by users from the
Internet and tested, reviewed and compared with other Linux distributions in far flung
countries. The firm saw this as an unanticipated market opportunity. This sudden expansion
of target market size required additional resources to be pursued successfully.

L.Co did not originally have sufficient resources and skills to develop Lynx. New
product required additional technological resources. It faced difficulty in hiring competent
software developers in the home country. Establishing a development center at Tallinn,
Estonia not only solved the scarcity of skills the firm lacked for programming (New products
necessitated their firms to increase and/or update programming resources) and design New
products necessitated their firms to increase and/or update design resources, it also proved to
be a lot more economical. (Later L.Co also made Tallinn office share major load of customer
support.) New team at Tallinn was initially led by the CEO, who later moved base to Tallinn.
This office concentrated on Lynx’s design, installation program development and manual
documentation.

For testing and bug fixing of trial versions of Lynx, and for driver routine writing for
supported hardware and software, Linux volunteers helped L.Co. These volunteers brought
complementary knowledge and skills that L.Co needed for quick and economical
development of Lynx and its later versions. New products required their firms to access
complementary technological resources. Some of these volunteers had advanced skills needed
to write specific drivers; L.Co could have found it expensive to get all such driver routine
writing in-house. However, coordinating volunteers’ activities to meet quality standard and
schedule proved to be a challenge for the firm.

L.Co had to build a sales team almost from scratch. New products required their firms
to increase and/or update the sales force. It used to sell its services locally through its personal
network. Selling a software packaged product to a great number of customers was new to the
firm. Distributing through Internet, it attracted many users who tested the product but there
was not much paid-sales through this channel. The firm’s effort to reach retail customers
through book shops and computer shops also met with limited success. It had no prior
experience of managing such channels. New products required their firms to increase and/or
update their distribution channel(s).

For Lynx, the firm quickly developed a good customer support (New products
required their firms to increase and/or update their customer support) which was vital for an
evolving product like Lynx. To serve distant customers L.Co had to partner with resellers and
other local service providers. New products required their firms to increase and/or update
their sales and marketing partners. These partners bundled Lynx with their own offerings and
were better placed to serve their local markets. Such partnering was also new to the firm but
vital for wider market reach of Lynx.
Research Question 2: What are the relevant elements of benefits of a new product to the firms that develop and market computer software products?

There are nine themes symbolizing Lynx’s benefits for its firm. With the launch of Lynx L.Co had aimed for a major market share of OS. New products gained or were expected to gain market share. Its first target market was home and office users in Finland but it had dreams of becoming a global major OS producer. It had projected exponential rise in sales of Lynx in the forthcoming years from the year of launch. New products generated or were expected to generate sales revenue. It wished, like many other open source software firms, to see the end of the monopoly of Microsoft in OS. Having developed Lynx which, as mentioned earlier, had a very promising sales projection, the firm secured venture funding from an American firm (New products assist their firms in attracting venture capital) to market the product and consolidate its position in the OS market. Without this external funding it would have been very difficult for the firm to embark on the marketing drive and build infrastructure to provide sales and customer support.

The firm was able to sell Lynx to some of its existing customers (New products met new needs of existing customers of their firms) but such opportunities remained limited to new systems designed and developed around Lynx. Though increased dependency on Linux based solutions added to customers’ loyalty towards the firm (New products enhanced loyalty of existing customers of their firms) but such customers were limited in number. Majority of Lynx customers were new to the firm. New products attracted new customers and created a potential customer base for their firms’ other present or future offerings. The firm created a revenue stream by selling value added technical support and other services to those Lynx customers.

However, those sales projections never materialized; even increased sales- and marketing-efforts showed limited effect on the sales revenue. Both on revenue and profit (New products earned or were expected to earn profit) criteria Lynx was a big disappointment for the firm. Free bundling of more application software, introduction of improved versions and more technical support—all these increased the expenses but failed to improve the sales or profit of Lynx. Gradually L.Co realized it was unable to cater to the retail customers and began concentrating on corporate customers to whom it can sell value added software services profitably.

However, the firm believed that although Lynx did not bring much money directly, it brought other benefits. The firm was able to bundle its new office suite product with Lynx (New products established platforms for future new products of their firms). This facilitated new users to sample its other product in addition to the OS. Lynx enhanced the reputation and legitimacy of the firm not only in Finland but also in other Nordic countries and, to a certain extent, in the rest of Europe. But it was only in Finland that the firm managed to leverage that reputation to generate additional revenue channels in the form of value added services (such as server solutions, remote server monitoring and maintenance services, data replication, high availability clustering and disaster recovery solutions).

L.Co is now regarded as a reliable software systems and solutions provider in Finland. New products helped their firms in repositioning themselves in the industry. The firm gives credit to Lynx for its new found identity. Having Lynx in its portfolio, it became easier for the firm to sell its other services profitably. L.Co could not achieve economy of scale as sales of
Lynx never took off, but the firm achieved economy of scope to a certain extent. It sold value added services profitably. It concentrated on serving its existing and prospective customers in Finland by bringing more offerings at a lesser cost. The firm enhanced its head count in Tallinn, its main development center and opened a new office in St. Petersburg in Feb 2003.

Lynx also brought respectability to the firm in the eyes of Linux volunteer developers. Attracting good quality developers were critical for the firm to test and fix the bugs in Linux kernel as well as in Lynx. Obviously it helped L.Co in keeping the cost of product development low and release new versions in time. Lynx also made possible L.Co to get into partnerships with reputed firms. These new partners were valuable to the firm for selling Lynx and Lynx based solutions to large customers. New products helped their firms in attracting new partners. For example, on its own L.Co might have found it difficult to sell to prestigious and large customers which it managed through Compaq.

Despite peripheral but significant benefits of Lynx, L.Co was consuming fast the venture funding it has secured for the marketing and consolidating its position in the OS market. It could not let the attraction of direct revenue go and decided to re-introduce Lynx under a different name in 2002. The firm values its association with Linux so much that it has joined LBA (Linux Business Alliance)—an industry consortium which promotes members’ interests.
Appendix VI: Survey Questionnaire

This survey of new software products is examining features of a new product and its effect on new product benefits for software product firms in Finland, India and Sweden. Software product means a computer program which is sold as a standard product to many customers and can be configured as per customers’ needs. A software product firm is one which develops and maintains software products in-house exclusively or along with other software-related services only.

To answer survey questions please select the latest software product of your firm which has been sold in the market for at least one year. We will call your chosen product as “NP.” A new product (NP) need not be the first major (public) release of the product. Even a later, thoroughly updated, major version of an “old product” can also be treated as a new product. For example, Adobe Systems Inc. may correctly choose Adobe Reader version 7.0 as a new product for this survey.

Questions in this survey are about:
1. Some general information about your firm.
2. Benefits of NP (how NP has performed for your firm)
3. Newness of NP to your firm (specifically about technological and marketing newness of NP),
Please select the most appropriate choice after each question. All your response will be used anonymously and that too only for academic purpose.

Section-A: General Information about Your Firm
Questions in this section are about your firm, yourself and the product you have chosen for this survey (we will call it “NP”).

1. Which software category describes the NP best?
   1. Business software
   2. Engineering/ scientific software
   3. PC software
   4. System software
   5. Other

2. NP was launched in the market in the year: ____

3. Your firm was established in the year: ____

4. Number of employees in your firm in Sweden: ____

5. Number of employees abroad: ____

6. Number of employees (actual or equivalent to) engaged full time in new product development activities: ____
7. (Optional question) Last reported annual turnover of your firm (A round figure is to be counted under the higher category. For example if your annual turnover is 5 million SEK, then it should be counted in the category "5-10 million SEK):

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<tr>
<td>Less than 1 million SEK</td>
<td>$1-5$ million SEK</td>
<td>$5-10$ million SEK</td>
<td>$10-20$ million SEK</td>
<td>$20-50$ million SEK</td>
<td>$50-100$ million SEK</td>
<td>More than 100 million SEK</td>
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8. (Optional question) Contribution of NP in the above mentioned annual turnover:

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<tr>
<td>0-20 %</td>
<td>21-40 %</td>
<td>41-60 %</td>
<td>61-80 %</td>
<td>81-100 %</td>
</tr>
</tbody>
</table>

9. Your title (designation): ________________

10. Your email address (optional): ________________
(Note: This info will be stored in a separate database and will be used only to email you an executive summary and a detailed report of this research.)

**Section-B: Benefits of NP to Your Firm**

In this section we wish to know what benefits NP has brought to your firm.

I. To answer most of the following questions, you have to select a value on the scale 1-7, where 1 and 7 are two extreme values. Please select a value which is most applicable to the NP and your firm.

II. Key terms are asterisk (*) marked and explained just below the answer-choices in the same question box. (Note: In this appendix, for the sake of simplicity, explanation is mentioned in parentheses in the question itself.)

Please consider the market benefits (namely, product sales revenue, product-related services revenue, market share and profit) of your earlier products (if NP is your firm’s first product then compare the actual benefits of NP with the expected benefits along the four criteria asked below) in a similar time period as long as NP has been in the market and evaluate the following:

**[PLB1 - Sales revenue]**

11. NP’s sales revenue is

   [Far Less than our earlier products]  1 2 3 4 5 6 7 [Far greater than our earlier products]

**[PLB2 - Product-related services revenue]**

12. NP-related services revenue (such as paid technical support, configuration, deployment, customization services) is

   [Far Less than our earlier products]  1 2 3 4 5 6 7 [Far greater than our earlier products]
[PLB3 - Market share]
13. NP’s market share is
   [Far Less than our earlier products] 1 2 3 4 5 6 7 [Far greater than our earlier products]

[PLB4 - Profit]
14. NP’s profit is
   [Far Less than our earlier products] 1 2 3 4 5 6 7 [Far greater than our earlier products]

[FLB1 - Enhanced profitability of other offerings]
15. How much has NP increased the profitability of your firm’s other products and/or services?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[FLB2 - Revenue by access-selling (Item dropped after the pilot study)]
16. How much revenue does your firm earn by selling access to NP customer-base (by allowing other firms to sell/market their products or services to NP customers)?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[FLB3 - Other products/services’ revenue]
17. How much revenue does your firm earn by selling your firm’s other products and/or services to NP customers who are first time customers of your firm?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[FLB4 - Potential platform for future offerings]
18. To what extent does your firm expect to use NP as a platform to develop future products or services?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[FLB5 - Vital customer base]
19. To what extent could the NP customer base play a role in the success of future products or services of your firm?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[FLB6 - Enhanced image]
20. To what extent NP has enhanced the image of your firm which your firm could leverage profitably in future?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

Section-C: Newness of NP to Your Firm

In this last section our aim is to identify
• Which aspects of NP were new to your firm,
• What kind of new activities your firm had to do, and
• Which new resources were needed for the design, development and marketing of NP.
For this survey, we treat a software development process to consist of two stages—design and development. Design stage consists of requirements analysis and definition, system design and program design functions; Development stage consists of program implementation (conversion of abstract algorithms into a concrete computer program), unit testing, integration testing, and system testing functions.
28. To what extent were your firm’s already existing resources (hardware, software, manpower, etc.) sufficient for the development of NP?

[TFit3 –Customer Support Resources]
29. To what extent were your firm’s existing resources sufficient for providing customer support for NP?

[TFit4 –System Resources for Distribution]
30. To what extent your firm had to invest in new hardware and software to distribute (sample, demo, updates, etc.) NP?

[TFit5 –Technical Personnel for Distribution]
31. In order to make use of new distribution system (hardware and software), to what extent your firm had to hire new technical manpower?

[MFam1 – Markets]
32. Especially for NP, to what extent your firm had to enter new markets (for example, a new country)?

[MFam2 – Competitors]
33. For NP, to what extent is your firm facing new competitors—whom your firm has not faced before?

[MFam3 – Familiar Needs of Customers]
34. To what extent NP serves new customers’ needs which your firm has not served before?

[MFam4 – Customers]
35. How many of NP customers are new to your firm?

[MFam5 – Cost of Finding New Customers (Item dropped after the pilot study)]
36. The cost of finding and selling NP to potential customers is
[TFam1 - Design Technology]
37. The tools, techniques, processes and methodologies used in the design of NP were how much familiar to your firm?
   [Completely familiar] 1 2 3 4 5 6 7 [Not at all familiar]

[TFam2 - Development Technology]
38. The tools, techniques, processes and methodologies used in the development of NP were how much familiar to your firm?
   [Completely familiar] 1 2 3 4 5 6 7 [Not at all familiar]

[TFam3 - Design Partners]
39. To what extent your firm had to rely on new partners or outside firms for the design of NP? (The basic difference between a partner and an outside firm is based on the nature of relationship—a partnership is an ongoing relationship, whereas am outside firm is an one off supplier)
   [Not at all] 1 2 3 4 5 6 7 [Very extensively]

[TFam4 - Development Partners]
40. To what extent your firm had to rely on new partners or outside firms for the development of NP?
   [Not at all] 1 2 3 4 5 6 7 [Very extensively]

[TFam5 - Distribution Channels]
41. In order to make use of new distribution channels of NP, to what extent your firm had to learn new things?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[SC1 - Training cost]
In your industry (of NP and similar products), to what extent typical switching customers from competing products need
42. additional training to use a new product?
   [Not at all] 1 2 3 4 5 6 7 [Very extensively]

[SC2 - Data Porting cost]
43. to spend time and money in porting their existing data from the older format to a new format?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[SC3 - Additional hardware and/or software cost]
44. new hardware and software to be able to use the new product?
   [Not at all] 1 2 3 4 5 6 7 [Quite a lot]

[AMP1 - Product variety]
45. In some industries, firms offer a number of variants of a product, so that customers may select a suitable variant as per their choice. In your industry (of NP and similar products), what kind of product variety policy is most common?
   [No variants at all] 1 2 3 4 5 6 7 [A large number of
46. What kind of pricing policy is used in your industry? (There can be two extreme types of pricing policy: One where a product is sold at one flat price to every customer no matter what. And the other where a product is sold at a different price to different customers depending upon the volume, type of customer, etc. Between these two extremes there can be many variations).

[Just one fixed price for each and every customer] 1 2 3 4 5 6 7 [Different price for different customers]

47. In your industry what kind of terms and conditions of sale is commonly used by firms for new products?

[Older, standard terms and conditions] 1 2 3 4 5 6 7 [Altogether new/revised terms and conditions]

48. To what extent firms in your industry sell new products aggressively (for example by giving large discounts) to “prestigious” customers who could influence other prospective customers?

[Not at all] 1 2 3 4 5 6 7 [Quite a lot]

49. To what extent having sold to prestigious customers help in selling new products to other customers at a higher profit or in large a number?

[Not at all] 1 2 3 4 5 6 7 [Quite a lot]

In your industry (of NP and similar products), how far firms—your as well as other competing firms—use the Internet or World Wide Web as a distribution channel

[CMT1 - To Sell]
50. to sell new products:
[Not at all] 1 2 3 4 5 6 7 [Very extensively]

[CMT2 - To Provide Sample/Demo]
51. to distribute new product sample or demo:
[Not at all] 1 2 3 4 5 6 7 [Very extensively]

[CMT3 - To Distribute product updates]
52. to provide patches or product updates:
[Not at all] 1 2 3 4 5 6 7 [Very extensively]

[CMT4 - To provide customer support]
53. to provide customer support:
[Not at all] 1 2 3 4 5 6 7 [Very extensively]
Appendix VII: Survey Invitation Text

[Date]

[Name of Firm]
[Attention: the CEO]

Invitation to participate in a survey of **Swedish New Software Products**.

Dear [CEO],

We (three Swedish university researchers) request your firm to participate in a Web-based survey of new Swedish software products. Soon you are going to get an email containing an URL of the survey. It takes about 20-25 minutes to do the survey. Questions focus on the business aspects of the software product and not on the technical aspects. You (the CEO) or a New Product Manager could ideally answer the survey questions. To appreciate your firm’s interest and time, we will send an Executive summary and a full-text Research Report to the respondent’s email address.

Survey URL:
(Note: This URL will be included in our email.)

Most new software products fail in the market; but why? Unfortunately there is no known scientific study of new software products which could give an objective answer. This research is an attempt towards understanding the challenges of software product development. Findings of this study should provide few useable guidelines so that managers could take informed decisions about their new software products. These guidelines should help CEOs and new product managers like you

- in selecting appropriate new product ideas,
- in taking “go/no go” decisions for ongoing product development projects, and
- in managing new products over their product life cycles.

To collect data for this research, we are conducting this survey of Swedish software products, first of its kind in Sweden. Your participation will increase the validity of research findings and you will receive our research reports containing lessons from the Swedish software products industry. Your absolute anonymity is assured. No analysis will be done at a firm-level. Even the respondent’s email will be stored in a separate database, separate from all other responses. Respondents email will be used only to email our research reports and thereafter the database will be destroyed.
Thanking you in advance for your participation,

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3. Lennart Bogg, Senior Lecturer, Email: lennart.bogg@mdh.se
   Tel: +46-16-15 37 46

*Please call or email Sanjay if you did not get our email by tomorrow or if you have any question about this survey or the research project.
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