Implementing Automated Trading Systems in the Swedish Financial Industry: Establishing a Framework for Successful Diffusion

Master Thesis within Business Administration

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Key words: Innovation, Diffusion, Implementation, Automated Trading System (ATS), Technical Trading, High Frequency Trading (HFT), Direct Market Access (DMA), Competence-sharing, Complexity of Implementation, Successful Diffusion: A Framework.

Purpose: Our main purpose is to explore, describe and analyze the organizational conduct when implementing automated trading systems (ATS) in companies, investigate the organizational challenges arising from this, and the effects these have on a successful diffusion. As the extent of implementing ATS in the Swedish financial industry has not been explored to any greater extent, it is therefore also imperative to explore this; which will be seen as a secondary purpose to this article.

Background: The study is based on innovation and diffusion theories, as well as those of power structures and organization. Further, an explanation of ATS and its dynamics is provided and discussed to facilitate a definition of the term.

Method: The research has been carried out as an exploratory, descriptive and analytical qualitative study. We have conducted case studies of 7 companies that are implementing, or evaluating the implementation, of ATS. The data was collected through interviews.

Conclusion: The majority of the case companies are in the clarifying and routinizing stages of the innovation process. What is found unique with ATS is that it can be implemented partly. The dimensions found central to a smooth diffusion in the companies are the required level of competence-sharing and complexity of implementation.

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IMPLEMENTING AUTOMATED TRADING SYSTEMS IN THE SWEDISH FINANCIAL INDUSTRY: ESTABLISHING A FRAMEWORK FOR SUCCESSFUL DIFFUSION

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The Swedish financial industry is undergoing significant changes with the implementation of Automated Trading Systems (ATS). This study explores, describes and analyzes the degree of ATS implementation in the financial industry in Sweden and the organizational conduct in the companies. This is investigated by conducting case studies in 7 companies. The main findings of the study is that ATS can be implemented partly, the degree of implementing ATS in the Swedish financial industry is in the clarifying and routinizing stages of the innovation process, and that the elements for a successful and smooth diffusion are the organizational- and operational structure in relation to the required level of competence-sharing and the complexity of implementing the innovation. Based on the findings, a framework for successful diffusion is presented.

INTRODUCTION AND PURPOSE

The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers’ goods, the new methods of production or transportation, the new markets,… [This process] incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. (Schumpeter, 1942 p.83)

We have seen it before, many industries have suffered from the destructive power of new innovations; typewriters were replaced by computers, VHS-players were replaced by DVD-players and so on. Innovation is an ongoing process and affects every business in the long-run. The creative destruction is seen as leading the market forward with attainable benefits on the consumer side. However the effects of the new innovative products or services on the supply side are not always only beneficial. New innovative processes, products and services reshape and restructure organizations often with more efficient conducts decreasing resource commitment or employees needed (Rothwell,
Innovations are often, among governments, the industrial sector and researchers, seen as a key factor for new employment opportunities and leading the country’s economy closer to its optimal level (Carlbom, 2008). This implies that innovations are perceived as only bringing positive effects. In addition, organizations often possess a pro-innovation bias by neglecting to see the downsides of an innovation and hence not rejecting or discontinuing development even if it maybe should be done (Rogers, 2003). The effects of innovations are perceived differently based on perspective; for instance, an increase in effectiveness often results in increased profitability which is found positive among shareholders. However, it also implies a decrease in resource commitment and employees needed (Rothwell, 1994). These kinds of effects might affect individual departments and business units within companies negatively. This implies an inherent resistance towards the adoption and diffusion of the innovation among employees who find their employment or work tasks at risk.

Therefore, one could question if the negative impacts the innovation has on the employees and departments who actually implement the innovation creates an added resistance, thereby lowering the efficiency of the diffusion. The effects of replacement in the way of creative destruction (Schumpeter, 1942) could conform to this kind of reasoning since new processes and innovativeness lead to organizational uncertainties and anxieties among the employees (Mintzberg, 1973).

The outcome of such effects could have a large impact on the success of innovations of the “destructive” kind since employees might defend their previous processes and systematically neglect to use the new products or services. This by using not only their formal powers but also their informal (network centrality) positions in the organizations (Astley & Sachdeva, 1984). Effects of this kind could also increase the risk of power struggles between the employees implementing the innovation and the management deciding on the adoption of the same.

One industry that has been affected less by ‘creative destruction’ is the financial industry (the radical innovation of digitalized transactions aside), where the fundamental structure of trading has remained mainly the same over the years. However, with the developments in computer technology, statistical modeling has paved the way for fully automatic ‘computerized trading systems’ referred to as ‘automated trading systems’ that could identify trends and act upon them. The benefits attainable from such systems are those of lowering risk as well as increasing yields and returns. In the United States technical trading systems have been used since the 1970’s (eTurn, 2010); although they have not yet been able to replace traders and brokers since the systems have not been reliable in their collection of information. Nevertheless, with the advancements in computer technology and internet, the systems are today able to react within minimal time frames on market changes with purely rational and statistical measures as a base for action (eTurn, 2010; Forex, 2010). The success story of systems such as Pan
Capital's, who experienced a profit margin of 84 percent in 2008 (Pan Capital, 2009), has increased interest in the Swedish financial industry to adopt automated trading systems.

The impact of such an innovation relates to the issues and implications of creative destruction, as well as raising the question of differences in the reception of it between the managerial apex and the employees, i.e. organizational uncertainty. The entry of automated trading systems in the financial industry in Sweden is for that reason interesting to investigate further in order to gain an understanding of the organizational implications and their impact on a successful diffusion of the innovation. Our main purpose is therefore to explore, describe and analyze the organizational conduct when implementing automated trading systems in companies, investigate the organizational challenges arising from this, and the effects these have on a successful diffusion. Further, as the extent of implementing ATS in the Swedish financial industry has not been explored to any greater extent, it is therefore also imperative to explore this; which will be seen as a secondary purpose to this article.

AUTOMATED TRADING SYSTEMS AND THE FINANCIAL INDUSTRY IN SWEDEN

To be able to trade on the Swedish stock exchange, every investor has to go through one of the members of the stock exchange. These members are securities institutions who are licensed by the Swedish Financial Supervisory Authority. These financial intermediaries consist of banks, insurance companies and fund management companies to mention a few. Today most of the dealings in equity trading on the stock market are made through digitalized transaction systems, belonging to the stock exchange or a trading institution. The currency, bond and spot markets are experiencing similar developments and are becoming increasingly digitalized as well (Sveriges Riksbank, 2009).

The more and more digitalized market places and the introduction of Direct Market Access¹ (DMA) are paving way for the use of Automated Trading Systems (ATS). DMA has been present in the US since the late 1990's where the firms have enjoyed success in algorithms and ATS-systems (Safarik, 2006), a fact that has invited the Swedish financial industry to follow. In 2008, there were 534 companies that were

¹ Direct Market Access – DMA tools permit buy-side traders to access liquidity pools and multiple execution venues directly, without intervention from a broker’s trading desk. (Schmerken, 2005)
publicly traded in Sweden; with 263 of these listed on the Swedish stock exchange NASDAQ OMX with a combined equity value of SEK 2,239 billion. (Sveriges Riksbank, 2009). However, institutions are today able to be active on several markets simultaneously including First North, Nordic Growth Market (NGM), Aktietorget, and most importantly, several international marketplaces.

Concerning the automated trading systems, it is hard to settle for one uniform definition of what the systems are. In the market today there is an array of different systems available, ranging from simple systems based on volume weighted average price (VWAP) to more sophisticated high frequency trading (HFT) systems (Kendall, 2007; The Economist, 2009). It is also important to distinguish between proprietary trading [on the behalf of the institutions] and broking [on the behalf of customers]. This since brokers are capable of optimizing the buy and sell prices of an order, and be facilitated by swing trade benefits, while proprietary trading is actually able to be fully automated.

VWAP systems are designed to have the least amount of impact on the market, as the systems spread the orders throughout the day. With VWAP, the order is divided into a number of smaller orders, an approach used to minimize risk through ‘averaging’ the entire order. Another benefit of VWAP is that it identifies optimal selling and buying points over the day (Kendall, 2007). As for the more advanced HFT systems, they are intended “…to use clever algorithms and super-fast computers to detect and exploit market movements” (The Economist, 2009, p.64). These systems are able to execute up to as much as 1,000 trades per second. Due to these extreme speeds, the systems are able to send out a stream of quotes to the market which are swiftly cancelled until they elicit a response; this in order to identify how much an investor is willing to pay for a stock, and the system can then buy or short the stock before the investor and sell it to them a fraction of a second later at a tiny profit (The Economist, 2009).

What unifies the VWAP, HFT and other automated systems is that these trading systems are intended to trade autonomously and base their decisions on rational grounds. What this implies is that the trading will not be affected by human emotions but strictly be based on the developments in the market. The systems are built around algorithms which bases their decisions on a given set of variables that will reflect the patterns in the market (Dempster & Leemans, 2006).

In the past however, the systems have experienced problems since they have not always functioned as intended. Many of the problems in these cases can be related to the human factor. If variables are entered incorrectly in the equation, the system will trade based on flawed information which will generate unexpected outcomes. Brokers, being risk averse, have therefore instead chosen to rely on their own judgment which is considered the safer alternative (Dempster & Leemans, 2006). However, with the rapid development in technology the systems are improving constantly and many financial
institutions are considering adopting the systems. The aforementioned triumph of companies such as Pan Capital has left other companies longing for the same success.

THEORETICAL FRAMEWORK

In discussing implementation of radical new innovations there is bound to be an existing system that is rendered obsolete as proclaimed by Schumpeter (1942). With the introduction of the innovation issues arise relating to both the innovation itself, the human capital as well as to the organizational structure (Dewett et al., 2007). The success of the new innovation, and its diffusion in the organization, is largely an effect of the employees and the markets willingness to adopt the innovation (Klein & Sorra, 1996). Adoption in this context refers to decision to make use of the innovation in the organization and implementing it. For the automated trading systems discussed in this article this would correspond to companies incorporating the system in their organization. There are however issues apart from the actual implementation that occurs when the innovation is discontinuous. Since not every individual will benefit from the new innovation there is bound to be a power struggle arising somewhere in the innovation process.

Diffusion

Diffusion is “the process in which innovation is communicated through certain channels over time among members of a social system” (Rogers, 2003 p.5). Diffusion is a specific kind of communication in the sense that it refers to the process whereby individuals create and share messages of information with one another. The message in this case needs to consist of a new idea, not necessarily new to the world but new within that particular social system (Rogers, 2003). Newness is a recurring concept when trying to define innovation (Gopalakrishnan & Damanpour, 1997); and this is also one of the factors that differentiate diffusion from communication. Diffusion can also be described as a kind of social change in the sense that these new ideas leads to consequences which change the structure and function of the social system (Rogers, 2003). The change that diffusion brings can have both positive and negative effects for the organization and the individuals residing within. Individuals within the intraorganizational environment, which makes up the social system, will therefore have different opinions on the innovation. This in turn means that innovations are seldom diffused instantly since individuals in the organizations differ in their willingness to adopt innovations. Some individuals welcome the change while others are set in their ways and resist the change even after most others have accepted it (Watson, 1971).
From the many previous studies that have been trying to define how adoption of new innovations occurs it has become apparent that over time the adoption among individuals follows an S-shaped curve (Rogers, 2003). A successful diffusion is characterized by a sharper and shorter curve as the innovation is adopted by more individuals during a shorter period of time (Cool, Dierickx & Szulanski, 1997). For managers it is therefore pertinent to understand the diffusion process, as this provides them with the possibility to make the curve sharper and shorter (Rogers, 2002). From the intraorganizational perspective, which is the focal point of this article, this corresponds to managing the aforementioned human, innovation and organizational challenges arising from the diffusion process (Dewett et al., 2007). As managers face most of their challenges during the implementation stage (Barker & Frolick, 2003) this is also where they have the greatest ability to influence the diffusion process.

**Deciding to adopt an innovation, the role of change agents and champions**

Most of the past innovation-literature has neglected to distinguish between innovation-generating firms and innovation-adopting firms (Damanpour & Wischnevksy, 2006). In this article we make the distinction between the two and the focus will be on the innovation-adopters. The innovation-adopting firms’ success relies on their capability to manage the process of selecting and implementing innovations (Damanpour & Wischnevksy, 2006). Despite not always being the initiators of change in organizations, the decision for adopting and communicating a new innovation in a firm is most often made by top management (Tushman & Romanelli, 1985). In many cases top management assigns one manager the responsibility for implementing the innovation, a change agent. In the intraorganizational environment the change agent’s role is to communicate and make sense of the innovation for the employees (Weick, 1995). To avoid resistance towards the new innovation, the change agent also needs the trust of employees (Oreg, 2006). In addition to gaining the trust of employees, the change agent assigned to handle the project also has to make the correct choice in how to convince the employees to take part in the transition that implementation implies. It should not be operated as a selling job to the employees in the sense that the manager is trying to convey a final product to the employees. This automatically creates a barrier for the users in integration of the innovation since they are faced with the innovation at the introductory phase (Leonard-Barton & Kraus, 1985). The managers should instead operate the implementation as an internal marketing effort and include the users in the development. This way they will have an easier job to convince the employees of the perks residing in the innovation since they are involved already in the design phase (Leonard-Barton & Kraus, 1985).

Another contributing factor for the successful diffusion is the presence of champions in the organization (Greenhalgh, Robert, MacFarlane, Bate & Kyriakidou,
Champions are individuals who adopt the innovation as their own and generate support for it from other people in the organization (Markham, 1998). As the success of an innovation is based on the users’ and the markets willingness to adopt the innovation (Klein & Sorra, 1996), the change agent needs a charismatic individual, a champion, to support the innovation and make sure it comes to use in the organization. The champion can be utilized to gain the trust of the employees and help them overcome the resistance they have towards the innovation (Rogers, 2003). In order to increase adoption, the champion too needs to have authority in the organization and be able to mobilize the resources necessary for implementation (Leonard-Barton & Kraus, 1985).

**The Innovation Adoption Process**

Regarding the actual adoption and implementation of the innovation, organizations normally follow a set of stages called the innovation process (Fig. 1) (Rogers, 2003). The innovation process consists of two major stages, initiation and implementation, where the initiation stages are related to the planning effort that precedes the decision to adopt the innovation. At the decision point the organization makes the decision to either adopt or reject the innovation. Adoption in this sense is an active decision to make full use of the innovation in the firm and is followed by the implementation stage (Rogers, 2003). During the implementation stage most of the diffusion effort takes place and it is also here most of the challenges occur as a result of the adoption of the innovation (Barker & Frolick, 2003).

**Figure 1 - The Innovation Process**

What distinguishes the implementation phase is that it is a transition period between the decision to adopt and the routine use of the innovation (Klein & Sorra, 1996). It is also during this phase that the innovation is being put to use in the organization (Rogers, 2003). Many times the innovation might need some modifications to fit into the adopting organization; e.g. if the innovation is software based it might need to be able to communicate with other computer systems (Dewett et al., 2007). Adding to this, the reverse process can occur in the sense that not only the innovation is redefined
but the organization is also shaped and restructured by the innovation since the fit is rarely perfect from the start (Van de Ven, 1986). This *redefining* and *restructuring* does however not necessarily mean that the implementation will be successful; it only establishes a greater “fit” with the organization (Dewett et al., 2007). The diffusion of the innovation in the organization still has to be managed carefully and might need *clarification* as the message becomes more widespread. As previously mentioned, since the new ideas are usually not readily accepted by all individuals in the organization (Watson, 1971) the positive effects will have to be communicated to improve acceptance. After successfully persuading the resenting individuals, the implementation stage reaches the final stage in the process where the innovation loses its identity and is *routinized* in the organization (Rogers, 2003).

**The role of power structures to successful implementation**

Adding to Rogers’ (2003) innovation process, power structures relating to the formal (hierarchical level) and informal (network position) comes into play during the implementation phase (Astley & Sachdeva, 1984). This dependent on both mentioned matters since top management inherit decision rights, but nevertheless lower level employees’ carries out the orders of implementation and thus makes the management dependent upon them (Mechanic, 1962). The, from innovativeness in companies, emerging uncertainty could result in protective behavior from the employees (Mintzberg, 1972). This in turn could lead them to underperform in new products or services to undermine its success if it could threaten their own success. The implementation of innovations is often, from a human resource perspective, divided into two categories; the technological discontinuities that are competence destroying or competence enhancing (Tushman & Andersson, 1986). Competence destroying is one of the underlying assumptions for the protectionism since new technology could make the value added by an employee obsolete. It has also been shown that these kinds of technological discontinuities i.e. innovations often are initiated by new firms and the competence enhancing are initiated by existing firms (Tushman & Andersson, 1986). This fact conforms to the situation of established actors trying to implement automated trading systems in Sweden, however contradicting the idea of instead implementing competence *enhancing* innovations. This contradiction further clarifies the relevance of investigating power struggles that might occur as an act of protectionism and its effect on a successful diffusion.

These dynamics are making the success of implementation and diffusion dependent on the whole work-force interdepartmentally, i.e. both managerial level as well as department level employees. An example of a power struggle that could occur is that of lower level employees using their informal power in cases when the formal power can not be used, or when it is used but found ineffective. Other factors that also enhance
the power of lower level employees are those of expertise and effort as well as interest in the subject area of the decision (Mechanic, 1962). Looking closer at the power structures per se Brass and Burkhardt (1993) defines them in organizations as divided into two categories; macro level (group level, researched by organizational sociologists) and micro level (personal level, researched by organizational psychologists). The macro level refers to departmental structures whilst micro level refers to individual’s position in the organization. For this study the latter is of more interest due to risks of informal structures overshadowing formal structures, thereby creating power struggles and imbalances in the distribution of decision rights and exercised power between individual employees (Krackhardt, 1989). The organizational uncertainties due to new technologies are differing depending on the firm’s fundamental characteristics, e.g. being coordinated by structure or culture (Allaire & Firsirotu, 1985). The differences is often in degree of control and power by management, where a more culturally driven organization’s management experiences low to moderate control whereas a more structurally process driven organization’s management enjoys higher degrees of control and power.

METHOD AND DATA

As competition grows fiercer new innovative ways of differentiating oneself comes about. In the financial industry one of the hottest buzzwords is the automated trading systems (ATS), which has caught the attention of many players in the industry. Few however have fully implemented such systems and therefore most companies are still getting accustomed to the new technology.

To grasp what benefits and challenges firms in the industry experience with this new innovation, we have identified a number of firms that are currently implementing such systems. The implementation of the systems is an ongoing effort in the companies and it is carried out over an extended period of time. Because of this, our aim is to build an understanding of the companies’ journey from the first time the innovation was recognized until the present state. The research has been carried out as an exploratory, descriptive and analytical qualitative study since the research on ATS in Sweden is quite limited. The qualitative approach was also chosen since it is the most appropriate method to grasp the time perspective of the implementation (Bryman & Bell, 2007; Saunders, Lewis & Thornhill, 2007).

For our research approach, we have chosen to conduct multiple case studies (Yin, 2009). The companies in the study have either already adopted an automated trading system or are currently evaluating a system. In identifying suitable cases 14 companies were approached, whereof 3 firms did not implement ATS on a sufficient level to be included, 2 companies were found not to be based in Sweden, 1 declined to participate, and the remaining 8 companies were investigated further. Following the
interviews an additional case company was removed from our sample as the data from this case was seen as uncertain and unreliable. Subsequently, 7 companies were included in the analysis.

By agreement the companies as well as the individuals interviewed will be kept anonymous and efforts have been made to minimize the identifiable facts without lowering the richness of the data. The research has been carried out in line with the guidelines of ICC/ESOMAR (2008). The individuals and companies will however be given numbers and titles for the reader to be able to differentiate them from one another.

The individuals interviewed are part of the decision making entity within the company or directly affected by the new system. The interviews were carried out with managers, middle-managers and traders at different levels in the organizations. Questions were asked regarding the process of implementing the innovation in the organization, perceptions of the new innovation, its effect on the individuals themselves and future expectations for the innovation. These questions along with a list of interviewees are to be found in the Appendices.

IMPLEMENTING AUTOMATED TRADING SYSTEMS: THE CASES

In the following part the findings from the 7 case companies will be presented and at the end a summary of the empirical findings can be found.

Company 1

Company 1 currently uses two kinds of automated systems in their organization, one that trades for the company itself (proprietary) and one that is used to assist the brokers in trading for the company's customers (broking). The first algorithm-based trading used in the organization was derived from proprietary trading and it was implemented in 2004-2005. This system has mainly been self-developed with great influence from traders at lower levels in the organization. It should be noted though that prior to being fully implemented in the organization, top management had to approve the system.

As for the trading that is aimed at customers, the system used for these purposes tries to identify the highest selling points and lowest buying points in a swing-trade.\(^2\)

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\(^2\) Swing trading – A strategy that involves two- or five-day market cycles and identifies high and low points in short-term cycles: and flags key points for moving in and out of stock positions based on specific chart pattern signals. (Thomsett, 2007, p.1)
pattern. This system was implemented at the end of 2007 and once again the demand for such a product came from lower levels in the organization. In addition to the demand for automated systems within the organization, the customers themselves also requested functions of such kind to optimize the trading on their behalf. This system was not self-developed and the decision to implement this system came about as a consensus in the organization, and this too was approved from top management prior to further development. It should also be noted that employees had attended trade shows where similar systems were sold and were inspired by this. To improve the competence in these systems, Company 1 has also obtained competences by acquiring another firm.

The development of the innovation has been within the traditional operational structure in the organization although specific forms of the compliance managers and the traders have played major roles. Compliance has played a central role with great influence by setting the rules and codes of conduct for the developed processes even though management has set the frames for how the project should be developed.

The use of ATS has had some opponents in the organization since the implementation of such systems has brought more complicated work tasks with it. It could be seen as a competing entity to the organization but then more for the internal trading than the trading offered to customers. However Company 1 views the technology more as a complement in the work process as it has saved time for the traders and helped optimize the results for the departments in their trading.

**Company 2**

Company 2 has been using ATS more and more during the later half of the 2000’s, mainly as a result from continuous evaluation and optimization of their trading processes. This optimization is in line with their target of best execution, adaption to MiFid\(^3\) regulations and also the synergies that could be won between front office and back office/compliance. The initiation of ATS actually has its origin in 2002 when the company hired competence in the field of Direct Market Access (DMA), including competence of optimizing pre-trade and post-trade calculations, e.g. reasonable order durations, pricing or swing trading. These indicators in the automated trading systems protect the company’s customers against ‘bad’ trading.

The systems have also been introduced as a result of the increasing number of market places that one could be active on, and consequently the increased need to localize and document satisfactory best pricing. This is done by comparing the algorithm

\(^3\) Markets in financial instruments directive (European Commission, 2010)
optimum with the actual performance on trade conducted. The implementation of automated trading systems in the organization has been induced in a special grouping used in the company. This group meets on a quarterly basis and includes departments, outsourcing partners and concerned actors to maintain a complete outlook on the business and market situation.

The question of responsibilities involved in the implementation is based upon allocation of controller points throughout the company, which is the main basis of responsibility structure. It could be said that there exists a process flow between operational, compliance and legal departments that eventually also would involve front desk. In the case of automated trading systems compliance and the connection to back office plays a central role, as well as the IT department, which has been involved to a higher degree than in previous projects. The key is that the use of the system has the ability to be tailor-made for specific departments with certain functionalities, which is one of the success factors of the innovation for Company 2. The initiative to develop the automated trading systems in the company was a twofold one, coming from both from department as well as management. However, the middle managers could be seen as having a larger role in nursing the project forward. The involvement in the development process has been very high throughout the company; the development however has mostly taken place on departmental level, nevertheless with constant information flows to management. Also, the organization has experienced a low level of resistance as there reigns a consensus that the financial industry is competitive and ‘collateral casualties’ e.g. if workload would result in lay-offs, are to be viewed as a normality.

Further, to this point the process has also been characterized by the positive notion that the automated systems could increase payouts from incentive systems for the employees. However, it is important to understand that the automated systems are mainly used on short-term optimization and that long-term e.g. fund managing, is still based on fundamental analysis.

Company 3

Company 3 has used ATS for approximately 2 years, this including both the department’s request for the innovation as well as the management’s decision of adoption. This implies that the initiative of implementing this innovation came from lower levels in the organization at least in the case of proprietary trading. The departmental side however states that the decision was based on dialogue and consensus in the organization. After the decision of adopting the innovation the department has enjoyed high independence in development. Interestingly, Company 3 has previously used the innovation on the broker side in the way of smart order routing; but the department has for several reasons regressed back to not using it. However, if they (the brokers) were to take up ATS again, the department has the decision rights to do so. Management’s role
in the implementation processes is that if a department signals initiation or decides upon implementation, a new product development group is formed and consulted. The aforementioned group involves legal, compliance, IT, management/administration and of course other concerned departments/individuals. The members of this group all have a say before the final decision is made and the product, derivative or innovation is adopted.

The organizational structuring when implementing ATS does not differ from the traditional responsibility allocation in the company. The same goes for information flows downstream as well as upstream where all considered parts are informed, however there is no information strategy involving all employees. On a departmental level it is seen as a normal business decision with no alterations in the distribution of decision rights, apart from the previously mentioned development group, which also can be assigned some specific responsibilities of development or diffusion. motivating the employees to introduce this has not been a problem either, as it often, at least on the broker side, could enhance performance and increase efficiency in work tasks. Also on the proprietary side the implementation of ATS have both sales and efficiency benefits. However, Company 4 consistently works with improving the systems, as they have to combat the increase in competition leading to lower margins and increased pressure to be faster in order to reap the benefits of arbitrage trades before the competitors systems. This in combination with an increasing number of non-transaction fee’s (NTF’s) and presence on different markets requires an ongoing development process to maintain a competitive advantage of using ATS in the business model.

**Company 4**

The system used in Company 4 first came about because of a request from top management to develop a new equity fund. Decisions about the criteria and functions of this new product, was handled by a small group of 4 individuals in the organization where the Head of Equity was a major driving force. As the group was interested in the automated trading they searched the market and consequently selected an external developer to design a system to trade for them. This new system was first tested out during the summer of 2009 and thereafter launched to the market during the fall of the same year. The system used in Company 4 is designed to trade with an array of the company’s funds. Signals for when to change funds are given from the external allocator and the switch is then performed on site. Because of this, the development of the system is also handled externally but employees at Company 4 are able to provide input based on their needs. The trading strategy used is developed by Company 4 but in some cases the external developer has wanted to make alterations to this strategy. They have then asked Company 4 for permission and if they have approved of this, the modifications have been made.
As for the attitudes towards the innovation, most members of the organization have been happy with the new system. The management at Company 4 has received positive feedback both from brokers as well as customers and the demand from customers has even exceeded initial expectations. Further, Company 4 views the innovation more as a complement to the regular product portfolio and only sees positive effects with implementing this innovation. Rather than replacing employees the managers believe that the product will be able to increase the workforce as more customers are attracted to the company’s products. Regarding expectations for the future development of the innovation, the managers do not see any need to add another product in the foreseeable future. A possible development of the current product could be to put more efforts during a downward facing market than the current product does. In pure speculative manners, the managers mention that a possible way to go is to release a specialized version of the innovation focused on ethical funds in order to diversify the products from one another.

Company 5

Company 5 currently uses two sets of semi-automated system for their trading. The trading is solely done for customers and the company offers an array of equity funds with different strategies to their name. Company 5 has been using their systems since 2004-2005 and has continuously developed them since then. The systems used in the company were obtained from an external developer and the traders have then applied their trading strategy to the systems. A fully automated system has been tested both in a trial environment as well as a full scale strategy for one of the equity funds. The managers at Company 5 view the automated systems more as a complement to their regular funds than a replacing technology. According to the managers the systems still needs to be supervised since it trades solely based on the input in the systems. Therefore the slightest error in the input could generate unexpected outcomes which could be very costly. As previously mentioned the managers view the automated systems as a complement and a time-saving gadget which could increase efficiency in the trading. As the organization is expanding, the automated systems could increase productivity and thereby helping to increase the amount of funds offered by the firm.

As the system has been developed the communication has been relatively open and the employees have been able to influence in what direction the development of the system should go. However, the main developers of the solution have been the top-managers. As the employees consistently use the system for the trading they are often the ones that discover potential improvements to the strategy. One of the employees, who entered a bit later in the development process, also mentions that the organizational structure often required that all employees were on board with any major changes in the system. In cases where top managers wanted to implement changes that
the employees were not on board with discussions were held, and if top management were not able to convince the employees the suggestion was dropped. Other times when smaller changes were made top managers could inform the employees after the change had been made.

As for the expectations for the future development of the automated systems, one of the top managers do not really see any benefits at the moment with changing from the semi-automated system to a fully automated one. As previously mentioned the members of the organization view the technology more as a complement or a productivity enhancer but are still cautious due to the aforementioned need for supervision.

**Company 6**

Company 6 has made use of such systems or coding for a couple of years, but clearly states that there are differences between for instance primitive ATS such as VWAP and more complex automated trading systems, even if both could fall into the definition of ATS. Further, Company 6 also differentiates between proprietary trading and broking on the customer’s behalf. The innovation is considered most beneficial in market making and arbitrage, but nevertheless a good foundation to base best execution strategies upon, in both new and existing products. The innovation itself is to a large extent seen as a result of the increase in High Frequency Trading in the market, and Company 6 was early innovators of such systems and the use of algorithms in Sweden.

The direction of initiative for introducing such functions was clearly upstream throughout the company starting with requests from customers on the broker side or forwarded asset management. The company has a clearly stated mission of being customer responsive and was therefore very fast in deciding upon evaluating and adopting such an innovation. The demand for such a service has to a high extent been requested by foreign investors who want to minimize their risk on other markets than their ‘home market’ and/or gain time benefits⁴. In the development group for ATS, compliance has been included to maintain and ensure a high level of conformity to the MiFid regulations. The same group also included department heads, IT, traders and management, which is standard in the company to maintain responsiveness interdepartmentally. Further, the organization is to be seen as hierarchical. The company also emphasizes that in their case there is nothing called ‘fully automated

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⁴ Time benefits – To be active in different time zones e.g. Los Angeles and Stockholm simultaneously with certain order durations facilitated by DMA and automated trading systems (Head of Sales Trading, Company 6, personal communication 2010-05-14).
trading systems’. This, since in 99 percent of the cases orders are based on algorithmic calculations, but the order itself is executed by a trader. The system that Company 6 uses could therefore be seen as a ‘semiautomatic trading system’. They raise an important point that the future of automated trading systems is becoming more and more competitive, especially for proprietary trading, market makers and arbitrage. Therefore the increasing number of useful platforms and systems will eventually lead to lower and lower margins where the fastest time slicing\(^5\) system is dominant.

**Company 7**

Company 7 currently evaluates implementing an automated trading system, which they claim will most likely be an automated system with a manual handling i.e. where the final order is made out by trader, based on ATS recommendation. Company 7 is planning on developing a clear strategy, and the updating of parameters and variables will be performed manually. The implementation process of such innovations is evaluated parallel to the ongoing business, mostly on the market makers side of trading. Regarding the use of ATS on the broker side, Company 7 finds the use of them incompatible with the business concept as well as restrained by their organizational platform and size. In addition to this, the broker interviewed does not recognize the need for ATS; nevertheless the view is that the decision to implement such tools should come from higher levels in the organization.

Further the perspective of incompatibility with Company 7’s business model is shared on middle manager-level as well. However, returning to the parallel process of evaluating algorithm use in market making, Company 7 will form and utilize a development task force which will include risk, compliance as well as legal managers. Since the innovation is IT-based, representatives from this department will have to be included as well. The final decision of implementing the innovation into their business concepts or product portfolio will be taken by the management group. In developing this IT will most likely present a suggested structure which will then be checked by the business side (front office), compliance and risk departments, and thereafter begin to be implemented. As for back office, they will only be included on a secondary basis.

However, Company 7 clarifies that the innovation will act as a complement for them. Additionally, they stress that the situation in the financial industry today is turning more towards companies choosing a niche strategy, and here the automated trading systems and use of ATS can come to play a major part.

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\(^5\) Time slice – Time-Weighted Average Price helps the trader to execute orders with the use of the average price over a specific time, thereby allowing traders to time-slice a trade over a certain period of time (Kendall, 2007).
A Summary of the Cases

The table below is a summary of what characterizes the different case companies. The different aspects that have been considered relates to both the characterizing features of the innovation itself as well as what the respective organizational structures look like. The latter is divided as organizational structure (the company in large), operational structure (work structure for the innovation) and what direction the initiative for adopting the innovation came from. The bracketed X’s are used when the company could fall into two categories or when the information is not available.

Table 1 – The Case Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
<th>6</th>
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<tr>
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<td>X</td>
<td>X</td>
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<tr>
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<tr>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>Bottom/Up</td>
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<td></td>
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<tr>
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</tr>
<tr>
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<td>X</td>
<td>(X)</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
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<tr>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Purchased</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td><strong>Areas of Use</strong></td>
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</tr>
<tr>
<td>Proprietary Trade</td>
<td>X</td>
<td>X</td>
<td></td>
<td>(X)</td>
<td></td>
<td></td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>(X)</td>
</tr>
<tr>
<td>Fund</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</table>

From the table it can easily be derived which companies have made use of ATS in proprietary trading, broking or fund managing. However, case groupings will not be distinguished by differences in these three categories. Instead, the source of the innovation, as well as the organizational- and operational structure will define what the grouping will look like; this will be discussed further in the analysis. Regarding the source of the innovation, most companies have developed the systems by themselves with the exception for Company 1 (technology and competence partly acquired externally) and Company 4 (outsourcing). Concerning the organizational structure, the
hierarchical structure dominates which in most cases is combined with the use of a task force. The aspect with the most differences is that of direction of initiative for the innovation. In 4 out of 7 cases the initiative has come from management and implemented downwards in the organization.

DEGREE OF ATS IMPLEMENTATION IN THE SWEDISH FINANCIAL INDUSTRY

In defining the degree to which the systems have been implemented in the companies, there are three distinct stages apparent from Roger’s (2003) innovation process [Fig.1]. The three stages are redefining and restructuring [1], clarifying [2], and routinizing [3].

Figure 2 - The Degree of ATS Implementation

When looking at our adapted innovation process model (Rogers, 2003) [Fig.2], all but Company 7 are currently in the implementation stages with Company 1 having come the farthest in developing the systems closely followed by Company 2 and 3. Company 1 is currently using the innovation on a routinized basis and therefore do not perceive the system as an innovation but rather a tool like any other in their daily trading. Since the innovation on the broker side was acquired externally Company 1 had to put a lot of effort in clarifying the relationship between the organization and the innovation for this system. This, since they needed to unite the two and distribute the knowledge among the users of the innovation in the organization.

In the case of Company 3 parts of the innovation has reached the routinizing stage [3] while other elements are still being adapted and clarified [2] to fit the organization better. We believe that this could be something that characterizes the ATS systems as companies can choose to implement them partially while still developing the other parts. Another evidence of this is the use of algorithms in semi-automated systems.
such as the one used by Company 5 and Company 6. While using the semi-automated systems routinely [3] the fully automated systems are redefined and restructured [1] to fit the organization. Regarding Company 2, the systems have been used on a routine [3] basis in the trading department, however lately spill-over effects from the innovation is still creating benefits in other departments. Even though the innovation itself might be routinized [3], the organization therefore still experiences reshaping [1] and clarifying [2] as an effect of the implementation in other departments. An example of this in Company 2 is the digitalized reporting system to their back office which was added recently, while the innovation itself has been used in the organization since 2002. This is in line with the findings of Van de Ven (1986), who states that the innovation rarely fits perfectly from the start which often results in reshaping the organization to optimize the fit with the innovation.

Company 4 has the shortest time frame for moving from adoption to routinizing, this as they bought their system and added it to their product portfolio. The reason for this is that the development of their innovation has largely taken place in another company. The process of redefining the innovation was to a great extent also handled externally, in contrast to most of the other case companies.

In regards to the implementation ATS in the Swedish financial industry, the innovation can not be stated as having reached the routinizing stage. However, as previously mentioned the innovation is characterized by the ability to implement parts of the innovation; and the case companies are today making use of different elements to certain extents. There is a consensus among some of the companies that ATS is divided into two main uses; proprietary trading and broking. With the majority of the companies still discovering spill-over effects of the innovation or redefining the innovation itself (and the market for it), the innovation can be placed in the clarifying [2] stage of Roger’s (2003) model. The companies are today trying to explore how the innovation will fit into their present business portfolio, and determine whether it will be a complement or a discontinuous technology.
COMPARATIVE CASE ANALYSIS

In looking at the characteristics and similarities in between cases the companies are divided into three clear case groupings and one stand-alone case.

Table 2 – Comparative Case Analysis

<table>
<thead>
<tr>
<th>Company</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

**Company in large Organizational Structure**
- Flat: X X
- Hierarchical: X

**ATS Implementation**
- Direction of Initiative
  - Top/Down: X X X X
  - Bottom/Up: X X X

**Operational Structure**
- Traditional: X
- Task Force: X X X (X)

**Development ATS**
- Developed in-house: X X X X
- Purchased: X
- Outsourced: X

**Areas of Use**
- Proprietary Trade: X X X
- Broking: X X X (X)
- Fund: X X X

Company 1

Company 1, being the organization that have come the farthest in the development, is also different from the other cases in that they are using a combination of in-house development and external acquiring of technology and competence. The innovation is self-developed on the proprietary side whereas the broker side was acquired externally. The main reason for this is the lack of utilizing in-house competence for developing such a system and Company 1 found it more effective to acquire the competence externally. The trading department as well as the broking department has
been involved to a high degree and more importantly initiated the discussion whether or not this innovation should be adopted and implemented. This, as they had competence enough to identify and understand the benefits in having such a system. Consequently competence has come to play a central role in the case of implementing ATS in Company 1.

Typical Case 1: The hierarchical, bottom-up, in-house developer

Case Grouping 1 consists of Company 3 and Company 6, both using self-developed automated trading systems, as well as being identical when comparing organizational-, operational structure and direction of initiative. Like Company 1, competence on departmental level has been central to how the implementation process has played out. This is also one of the reasons why the two case companies have experienced a bottom-up flow of initiative for adopting and implementing the innovation. Case Grouping 1 is also characterized by not using the traditional formal power structure when developing this innovation, but rather utilizing the informal power and network positions in the organization (Astley & Sachdeva, 1984). More importantly, they merge these employees into work groups i.e. task forces which utilize the distribution and sharing of competence regarding the innovation to key employees in the organization. However, despite coming to an understanding relatively quickly of how the innovation should work in the organization, the hierarchical structure in the organizations has slowed the implementation process.

The reason for Company 1 not belonging to Typical Case 1 is that they have not made use of a task force in the development of the innovation. Had this been the case, the task force might have been a facilitating factor for developing an ATS system for the broking department in Company 1.

Typical Case 2: The flat, top-down, in-house developer

Case Grouping 2 consists of Company 2 and Company 5, and this grouping is characterized by flat organizations with close cooperation in between departments and employees. This implies that one does not necessarily follow the chain of command in the organizational structure, but could contact the concerned employee directly without going through mediating managers. Further, the initiative for the innovation originates from top management as a result of Company 5 having a niche strategy of using such products only; and Company 2 deciding on implementation after continuously evaluating best execution, where they found that ATS would further improve their trading.

The line of command in the organizations is well-defined despite having a flat organizational structure. The information flow in the companies is very open and most if not all parties are involved in the decision-making. The companies in Case Grouping 2 utilize a task force in the development of the innovation similar to Case Grouping 1.
However, unlike those companies the implementation has been rapid as a result of the flat organizational structure. Company 2 has come the farthest of all the case companies in implementing the ATS systems in the intraorganizational environment e.g. automated flows between front office and back office.

Typical Case 3: The outsourcer

Case Grouping 3 consists of Company 4 and Company 7, and is characterized by a hierarchical structure. The decision-making has been top-down, as top management has requested such systems in the organizations. In trying to develop an ATS system, the companies have both made use of a task force, involving the concerned parties in the development. However, due to a lack of in-house competence in developing such systems the only option has been to purchase or outsource the innovation.

Company 4 was able to identify an external developer who could meet the demand for ATS systems in the company and among their customers. The implementation of the innovation has been very rapid in the organization since it has been handled as a new sub-product to an existing portfolio. This might differ from the implementation to be carried out in Company 7 since the implementation will most likely bring about organizational changes and it has also been implied that the company will extend their business portfolio. These aforementioned differences are mainly what set the two companies apart.

Further, Company 7 lacks the history of using automated trading systems that characterizes many of the other case companies. There is also a lack of interest for such systems in the trading department. This might lead to power struggles in the organization when later on implementing the systems, also confirmed by a notion of traditionalism in the organization. Despite this, top management in Company 7 is currently evaluating the use of ATS, however parallel to their existing business (expanding their business portfolio).

A Comparison of Diffusion in the Typical Cases

Regarding what degree of implementation the case companies show within the case groupings, there are vast differences. However, in the aspect of how smooth the diffusion process has been, the organizational- and operational structure are found central, and consequently further confirming the case groupings used. In investigating the differences between the typical cases; the case companies with a flat organizational structure (Typical Case 2) are characterized by a high degree of integration between departments, while the others case companies are not. This is clearly exemplified by Company 2 who has an interdepartmental ATS connecting front-office, middle-office and back-office. Typical Case 1 shows results of the opposite, and has experienced a poor fit between the departments currently using the innovation, and other concerned
departments. This is due to a more complex organizational structure where hierarchical ways of communication has slowed and impaired the diffusion process. Interestingly, Typical Case 3 is using a hierarchical structure but despite this, Company 4 has reached the routinizing stage quickly. This is most likely due to them not operating their ATS themselves, but outsourcing it to an external partner.

The outsourcing leads up to the second concept found central to a successful diffusion: competence. More precisely, this refers to the level of competence required across the organization to effectively use the innovation. In order to share the competence effectively across the organization the case companies have made use of task forces. The task forces have come to involve departments and employees to whom the insight and competence needs to be distributed. All of the typical case groups have used task forces, leaving Company 1 as the exception. The case companies in Typical Case 3 are surprisingly making use of this despite their lack of direct competence in ATS. The most interesting case in this respect is Company 1, who already has the competence in-house since using ATS on the proprietary side, but nevertheless had to purchase their ATS on the broking side. This could reasonably be an effect of them being the only case company using the traditional operational structure instead of a task force in the implementation of ATS. This suggests that they might very well have been able to develop this in-house, by utilizing the competence they already had in ATS through the use of a task force.

Before summarizing the success factors of diffusion the roles of competence, and organizational structure in relation to direction of initiative will be discussed. In short, Typical Case 3 shows that a lack of specific competence in ATS has led Company 4 to acquire their ATS by outsourcing the innovation. The outsourcing has meant that the development of the innovation has taken place externally, which has facilitated Company 4's innovation process. This does however not necessarily mean that they have skipped all the stages in Rogers (2003) innovation process, but rather the redefining and restructuring stage [1] which was dealt with by the external developer. The other stages such as the agenda setting, matching and clarifying the innovation to the organization have been dealt with internally, but the outsourcing has enabled Company 4 to reach the routinizing stage quickly. Another issue related to in-house competence is the distribution of this, and the effect it has on direction of initiative in the organization. A higher competence on the departmental level enables a bottom-up direction of initiative; something apparent in Company 1 and Typical Case 1.

Interestingly, the case companies that are utilizing a flat organizational structure have used a top-down direction of initiative regarding ATS. This could be due to top management working close enough with the departmental level to understand their needs and hence are able to present the innovation before the departments request it. This situation is apparent in Typical Case 2, where both case companies have flat
organizational structures and have a top-down direction of initiative in implementing ATS.

**Successful diffusion: a framework**

Based on the findings and analysis, we have developed a framework (Fig.3) in which organizational characteristics will provide the foundation for a successful diffusion of a new innovation, in this case exemplified by ATS. The following model is intended to be a diagnostic tool of assessing new innovations and the optimization of their diffusion. The two dimensions found most central are the *complexity of implementation* and the *required level of competence-sharing*, both defined as either high or low.

**Figure 3 – A Framework for Successful Diffusion**

The framework assess if the innovation requires the use of a task force or if it is sufficient enough to use the traditional operational structure. This is determined by the level of competence-sharing required to be able to implement the innovation effectively. On the other axis it is assessed if the innovation requires the company to make use of a flat or hierarchical organizational structure. This is determined by how complex the implementation of the innovation is; e.g. how many departments will have to be involved. If the complexity is found to be high, a flat organizational structure is to be preferred, whereas if low the hierarchical structure is sufficient.
CONCLUSION AND DISCUSSION

Since the research in the implementation of automated trading systems (ATS) in Sweden is very limited, the first part of this article has been devoted to mapping the degree of ATS implementation in the Swedish financial industry. Based on our findings, we have come to the conclusion that a majority of the companies are in the clarifying and routinizing stages of the innovation process (Fig.1). What is found unique with ATS is that it is not a case of ‘all or nothing’, but the innovation can be implemented partly.

Following the mapping, a categorization of the organizational conduct in implementing ATS in the companies has been made, with the outcome of three typical cases and one stand-alone case company. The diffusion, and the smoothness of diffusion, has been assessed among these typical case groups, and compared with the operational-, and organizational structure, as well as the challenges arising from this has been investigated. From the cases, a set of factors for successful implementation and diffusion has been identified.

These learning’s and dimensions have been developed to a generalizable framework (Fig. 3) that could be used on other innovations and the diffusion of these. The two dimensions found central are: the required level of competence-sharing and the complexity of implementing the innovation. The tools that can be used to facilitate the diffusion are the use of task forces and flat organizational structure depending on the innovation. These could be exemplified by a multifaceted innovation such as ATS, which involves front-office, back-office, compliance and legal as well as requiring a high level of competence and insight for a successful diffusion. In less multifaceted innovations instead the use of a hierarchical organizational structure and a traditional operational structure could be seen as sufficient enough to smoothly diffuse the innovation.

However, it could be of interest to test and apply the framework in future studies in other industries than the financial industry, as well as other settings than Sweden.

MANAGERIAL IMPLICATIONS

To further evaluate and test the framework, as well as evaluate the case companies’ conduct of diffusion, the companies have been placed in the framework. Based on their performance, recommendations of how to improve the diffusion process will be given. As seen below, the case companies are mostly placed in the task force with hierarchical structure quadrant, with some exceptions.
Primarily, the innovation itself needs to be assessed against the framework, where ATS could be placed in the upper-right quadrant as since it involves several departments (compliance, legal, back-office, and front-office) and a high required level of competence shared between departments to be used effectively.

An important point to be made is that as Company 4 has outsourced their development, their complexity of implementation has been very low; the same applies to the required level of competence-sharing. Company 4 is an outperformer in terms of the framework as they have made use of a task force despite not having the need for it. Therefore the outsourcing, in their case, has facilitated the diffusion. However, it has left Company 4 without any in-house competence as well as low control of the future development of the innovation.

If identifying underperforming case companies, Typical Case 1 (Company 3 and Company 6) has experienced a slow diffusion process. This mainly due to the high complexity of implementation in the case of ATS, while the case companies from Typical Case 1 utilizes a hierarchical organizational structure. The companies would have enjoyed a smoother diffusion of the innovation, if to a higher extent stressing and utilizing a flat organizational structure. Typical Case 2 (Company 2 and Company 5) has experienced the smoothest diffusion of ATS of all the case companies, with the exception of the outsourcing case which is to be seen as an ‘outlier’. This, since Company 4 does not fully implement ATS in the organization but rather in their product portfolio. The companies in Typical Case 2 have both made use of a task force in a flat organizational structure which have facilitated their diffusion process.
Company 1 has, despite being the leader in implementing ATS in several departments and markets, been situated in the lower-left quadrant. This has resulted in a prolonged diffusion process exemplified by their implementation of ATS on the proprietary side in 2004, while the broker side reached the routinizing stage in late 2007. This confirms the suitability of the framework since their diffusion process has been impaired due to the innovations complexity of implementation together with the requirement of a high level competence-sharing.

ACKNOWLEDGMENTS

The researchers would hereby wish to express their gratitude towards researcher Clas Wahlbin, professor emeritus at Jönköping University, Sweden, for his most useful support and feedback, helping us to reach our aspirations. Further, we are thankful to the participating managers and employees from the case companies for their time and insight; without your contribution this study would not have been possible.
REFERENCES


## APPENDICES

### List of Interviewees

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<thead>
<tr>
<th>Role</th>
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**Interviews discarded from analysis**

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</tr>
<tr>
<td>Head of Trading</td>
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</tr>
</tbody>
</table>
Interview Guide

Managers
- How far along are you in the process
- Developments up until this point
- Initiative and signals
- Who are currently discussing/ has been discussing what you’ve come up with
- Information flow downwards + reactions
- Which individuals possessed decision rights
- Which individuals were not included
- Responsibility allocation – Who/How Networking processes
- Which individuals were extra engaged in this
- Does this differentiate from your traditional organizational structure
- Future – Expectations, problems, advantages, consequences

Head of Back-Office
- How have you experienced the process
- Developments up until this point
- Initiative and signals
- What has been your involvement in the process
- To what extent/influence
- How open has the information flow been from the top and bottom (perceived) and top/down (sent)
- What has characterized your role as information mediator
- How has responsibility been distributed in the organization
- How do you motivate employees that oppose this
- Questioning decisions – How, influential power
- Has there been employees ‘rooting’ for the implementation of ATS
- Have there been any opposer’s
- Distinguishing traits for this innovation (implementation/organization)
- Future/Expectations – consequences for you and the firm

Trader
- How have you experienced the process
- Developments up until this point
- Have you felt involved in the process
- To what extent have you been informed about this – enough
- Has your opinion been considered
- How and have you been able to influence, and how will you be able to influence this in the future
- Has there been employees ‘rooting’ for the implementation of ATS
- Opponents
- Have you or will you be involved in the further developments of this innovation
- Future/Expectations – consequences for you and the firm