A Dynamic Resource Allocation Framework for IT Consultancies

Master thesis within Information Technology and Management

Authors: Anders Västfält, Matthias Erll

Tutor: Ulf Larsson

Jönköping June 2011
Abstract

This Master thesis provides a framework for analysis of the resource planning and allocation processes within an IT consultant firm. The aim is, to identify information, which can be reflected in an information system.

The framework has been developed using multi-grounded theory method, considering theories from the areas of information systems design, project business performance, enterprise planning, and project planning. Based on a main process view and hypothesized information requirements, the dynamic processes of sales, project resource planning, miscellaneous activity planning, project portfolio planning, resource allocation and general management are discussed, along with their underlying concepts.

A case study has been conducted, to test the validity of the framework and to evaluate its applicability. The findings are compared and contrasted to our frame of reference during analysis. From a reflection on the analysis, changes are proposed to the firm under study, as well as our framework.
# Table of Contents

1 Introduction .................................................................................... 1
  1.1 Background .................................................................................. 1
    1.1.1 The role of IT consultancies ...................................................... 1
    1.1.2 Project business ....................................................................... 1
    1.1.3 Performance of an IT consultancy ........................................... 2
    1.1.4 Implications for sales and resource planning ......................... 4
  1.2 Problem formulation ..................................................................... 5
  1.3 Research questions and purpose of the study .................................. 5
  1.4 Delimitations ................................................................................ 6
  1.5 Outline .......................................................................................... 6

2 Methodology ..................................................................................... 7
  2.1 Philosophy of research ................................................................... 7
  2.2 Research design and research process .............................................. 8
    2.2.1 Exploratory research design ....................................................... 8
    2.2.2 Qualitative research approach .................................................. 8
    2.2.3 Synthesis of inductive and deductive research approach .......... 9
  2.3 Theory building and analysis strategy ............................................. 9
    2.3.1 Multi-grounded theory ............................................................. 9
    2.3.2 Development of the framework ............................................... 10
    2.3.3 Analysis and application of the model ..................................... 11
  2.4 Case study ..................................................................................... 11
    2.4.1 Case study approach ............................................................... 11
    2.4.2 Interpretive case study ............................................................. 12
    2.4.3 Single-case study ..................................................................... 12
  2.5 Data collection ................................................................................ 13
    2.5.1 Interviews ................................................................................ 13
    2.5.2 Semi-structured interviews ...................................................... 14
    2.5.3 Case selection .......................................................................... 14
  2.6 Research credibility ......................................................................... 14
    2.6.1 Internal validity ....................................................................... 14
    2.6.2 Reliability ................................................................................ 15
    2.6.3 Generalizability / external validity ......................................... 15

3 Theoretical framework ...................................................................... 17
  3.1 Information systems design ............................................................. 17
    3.1.1 Theorizing within information systems development ............... 17
    3.1.2 Organization and information system support ......................... 19
    3.1.3 Specification of requirements and design ................................. 20
  3.2 Project business performance ......................................................... 20
    3.2.1 Business performance of service providing companies ............ 21
    3.2.2 Project business models ......................................................... 21
    3.2.3 Learning perspective ............................................................... 23
  3.3 Enterprise planning ........................................................................ 24
    3.3.1 ERP systems .......................................................................... 24
3.3.2 Sales and operations planning .............................................................. 24
3.3.3 Implications for service and project business ................................ 25

3.4 Project planning ....................................................................................... 26
  3.4.1 IT project perspectives ........................................................................ 26
  3.4.2 Multi-project organizations ................................................................. 27
  3.4.3 Multiple project management and resource planning ......................... 27
  3.4.4 Project portfolios ................................................................................. 29
  3.4.5 Project management information systems and standardization ........... 31

3.5 Process view of IT consulting ................................................................. 32
  3.5.1 Basic phase model ................................................................................. 32
  3.5.2 Phases of a governance theory framework ........................................... 33
  3.5.3 IT consultancy processes ..................................................................... 34

3.6 Framework of dynamic resource allocation ............................................ 35
  3.6.1 Requirements for coordinating consulting processes ......................... 35
  3.6.2 Definition of base concepts .................................................................. 39
  3.6.3 Definition of information concepts ..................................................... 41
  3.6.4 Design of processes and dynamics ..................................................... 44

4 Case study .................................................................................................. 58
  4.1 Case study description ............................................................................. 58
  4.2 Findings ................................................................................................... 59
    4.2.1 General information ............................................................................. 60
    4.2.2 Sales .................................................................................................... 60
    4.2.3 Team Leaders ..................................................................................... 62
    4.2.4 Project Managers ................................................................................ 63
    4.2.5 Management ....................................................................................... 65
    4.2.6 Solution Architect .............................................................................. 66
  4.3 Analysis and discussion ......................................................................... 68
    4.3.1 Sales .................................................................................................... 68
    4.3.2 Project Portfolio Planning ................................................................. 69
    4.3.3 Project Resource Planning ................................................................. 71
    4.3.4 Miscellaneous Activity Planning ....................................................... 72
    4.3.5 Resource Allocation .......................................................................... 73
    4.3.6 General management ........................................................................ 75
  4.4 Reflection and evaluation ..................................................................... 76
    4.4.1 Considerations for the firm's information system .............................. 76
    4.4.2 Evaluation of the framework ............................................................. 80

5 Conclusions ............................................................................................... 83
  5.1 Results of the study .............................................................................. 83
  5.2 Reflection on research methods ............................................................ 84
  5.3 Suggestions for further research ........................................................... 84

List of references ....................................................................................... 85
I Introduction

In this thesis, we develop a framework for analyzing the processes related to resource allocation at an information technology (IT) consultancy. Within this first chapter, we discuss the problem background and motivate our interest in this research. Based on these initial insights, we specify the purpose of the study, the research questions, and delimitations to the scope. Finally, a brief outline of this thesis is given.

1.1 Background

In order to facilitate a common understanding of the problem area and the subject matter of our research, we introduce the scope of business for IT consultant companies and describe the nature of project business. Furthermore, we highlight challenges arising from the business environment of an IT consultancy and their implications for its planning activities.

1.1.1 The role of IT consultancies

While formerly IT use in organizations was originally supporting single business functions (e.g. accounting), IT has meanwhile turned into a strategic element of business. This means that technology does no longer only reflect usage in certain business functions, but the overall business strategy (Chan & Reich, 2007). It can also lever new business opportunities and be a source of competitive advantage. Therefore, besides the fact that IT is mostly inevitable, its strategic application seems to have a positive impact on firm performance (Brynjolfsson & Hitt, 1998).

As technology has evolved, so has the complexity in managing it. New developments in information technology and their adoption in companies often require a high effort in learning for potential users. This does not only apply to new hardware, such as mainframes or storage systems, but equally to complex software systems like enterprise systems and platforms. Furthermore, strategical meaning of IT has pushed forward the development of managerial frameworks (e.g. IT Infrastructure Library – ITIL) and other standards (Galup, Dattero, Quan, & Conger, 2009), which are not always straight-forward to apply for practitioners in the business environment (Freedman, 2004).

Organizational learning and organizational change is often facilitated with help of external consultants, and the interrelation between business and technological objectives has created the need for professionals with understanding of both (Bloomfield & Danieli, 1995). IT consultancies support this by offering professional technical services in combination with managerial support (Freedman, 2004). Within the field of IT services, IT consultancies are characterized as intermediaries, transferring technology and knowledge to potential users (Bardhan, Demirkan, Kannan, Kauffman, & Sougstad, 2010).

1.1.2 Project business

Projects are essential to the business of IT consultancies (Luo & Liberatore, 2009). A project is, based on the definition by the Project Management Institute (2004), a temporary effort for creating a unique result by performing planned, incremental
steps towards achieving a certain main goal. Projects typically are assigned with limited time and resource boundaries. In most instances of projects in the business environment, multiple projects are carried out at the same time, in concurrency of the available resources. The activities of managing this set of projects and coordinating the different needs in between are referred to, in different paradigms, as multi-project management (e.g. Aritua, Smith, & Bower, 2009), programme management (e.g. Turner & Speiser, 1992), or project portfolio management (e.g. Platje, Seidel, & Wadman, 1994).

Although research on projects is commonly carried out in business environments, projects are not by definition limited to this. Therefore, the term of project business is not entirely self-explanatory, but has been defined by Artto and Wikström (2005) as follows: “Project business is the part of business that relates directly or indirectly to projects, with a purpose to achieve objectives of a firm or several firms.” Under this definition, projects of organizational change are an example for project business, when they achieve strategical goals. However, this broad definition, although not explicitly making reference to it, also covers client-consultant relationships, where projects are a widely-adopted form of work organization (Hyväri, 2006; Wikström, Artto, Kujala, & Söderlund, 2010). The objectives of the involved firms are twofold: The client possibly has internal, strategical goals, or is exposed to external pressure to adapt to environmental changes; the consultancy firm is aiming to provide paid services for assistance to achievement of client objectives, possibly with the benefit of its own growth and development (Luo & Liberatore, 2009).

1.1.3 Performance of an IT consultancy

As also indicated by Galup et al. (2009), IT services differ from other types of services in various aspects, which have an impact on the management of business performance. In the following, we describe the most apparent characteristics. Since the nature and business model of IT consultancies is not frequently discussed explicitly in literature, our descriptions are complemented with information from various sources. These include personal professional experience from working with IT consultancies, conversations with consultants outside of this study, and coherent information from IT consultancy firm websites.

1.1.3.1 Firm competences and staff skills

While many IT companies act as product manufacturers or vendors, the consultancy aspect lies within providing solutions to complex, and often unstructured, incompletely defined problems (Creplet, Dupouet, Kern, Mehnampazir, & Munier, 2001; Artto, Wikström, Hellström, & Kujala, 2008; Luo & Liberatore, 2009). More precisely, IT consultancies offer a variety of expert services for certain technologies and related areas in management, which are either new to their clients, or where the clients do not keep sufficient staff for satisfying their own needs.

In order to remain competitive in providing these expert services, the IT consultancy firm needs highly skilled employees within the field it is engaging in. Naturally, specialized personnel is rare and consequently rather expensive in comparison to
lower-skill services. Therefore, how employees spend their time is an extremely important factor for the company’s overall performance.

Due to the rare human resources, a service company with a highly skilled workforce also faces the challenge of limitations to scalability. Even if sales activities could yield more incoming orders, they might not be possible to perform, because the employees are already overloaded with work. Growth has to be controlled moderately, since new qualified employees, if possible to find, are expensive to hire and increase fixed cost also during a period of low incoming orders.

1.1.3.2 Rapid change in technology

The cycles of technological developments are becoming shorter, which increases the difficulty of companies to adapt to these changes. As a technology-related service provider, an IT consultancy obviously cannot afford to lag behind. Technological changes and the resulting necessity of re-orientation and market entry barriers apply to the single firm as well as to its competitors. Therefore, the latter could gain predominant expertise in the field and make it difficult to regain competitiveness.

Furthermore, technological change does not only provide new market potential; it also has an impact on existing business relationships. Since the consulting clients are also exposed to this change, which requires them to revise their IT strategies over time, they will review their commitments to current IT projects. This means that a client might no longer require services for a particular technology, but instead seeks external assistance for implementing another one. A common example is that a software vendor announces the end-of-life for a business software application, which motivates the customer to move to a newer release or even a new vendor, and consequently, requires adoption of the IT consultant as a solution provider.

Therefore, the above-mentioned skills within the companies have to be constantly developed. While employees need a certain expertise in a field in order for the firm to establish a competence, knowledge also has to be diversified for recognizing new trends and opportunities (Cohen & Levinthal, 1990). When new technologies are adopted, employees need time to practise and build their knowledge.

1.1.3.3 Organizational structure with project orientation

While consultant work is typically organized in projects, IT consultancies also provide additional technical services without direct relation to any ongoing project. This includes well-defined tasks, repetitive in their character, such as the installation of software systems and also smaller, short-noticed services. The latter could be an expert intervention, for example an urgent fix for a critical software error, but also client support and advice in the fields of technical competence. These supplemental, planned or unplanned activities are summarized as maintenance and support. Furthermore, like in most other organizations, there are internal administration tasks, such as accounting.

This variety of activities is reflected in the organizational structure. The Project Management Institute (2004) describes different degrees of structural project orientation (see also Hyväri, 2006): Purely functional structures are the classic approach, as
dividing the organization into teams with clear hierarchies with functional managers led by a chief executive. Members of such functional departments can be involved in projects, but all project coordination is handled by the department managers together. At the other end of the spectrum, the *projectized* structure (Hyväri, 2006: ‘project team’ structure), all resources are involved in project work, coordinated by project managers. There are still chief executives, but no functional managers present. In between these extremes, coordination responsibilities shift gradually. Within *weak matrix* structures (Hyväri, 2006: ‘functional matrix’), the staff involved in a project coordinates the project, possibly led by a part-time project manager. In *balanced matrix* structures, a dedicated (full-time) project manager is in place, but remains part of a functional department, whereas in a *strong matrix* structure (Hyväri, 2006: ‘project matrix’), the project manager is part of a separate organizational unit, led by a manager of project managers. Combinations of such structural forms can also exist as *composite* organizations.

For project-oriented firms, strong matrix and projectized structures are likely to be most efficient (Hyväri, 2006) and common practice in IT consultancies. These companies usually have several different competence departments with specific expertise. An IT consultancy firm can for example have technological competence departments (in analogy to ‘functions’). Such a competence, for instance, can be software development (sometimes also particular platforms) or business application-oriented (e.g. customer relationship management, enterprise resource planning). Each competence department needs a management structure, which is typically handled by (competence) team leaders with personnel responsibility. Project managers might either be part of the competence teams (i.e. weak matrix structure) or focus solely on project management tasks (i.e. strong matrix structure). In addition, an IT consultant firm might have a dedicated department for more general functions, such as sales, human resources, or accounting (i.e. composite, with functional or weak matrix). However, this can also be organized within the existing project team or matrix structure (i.e. more towards balanced or strong matrix). Therefore, resource planning of an IT consultancy can be quite complex. Resources have to be balanced between different needs of multiple projects, and planned as well as unplanned maintenance and support services.

### 1.1.4 Implications for sales and resource planning

In summary, resource planning in an IT consultancy is subject to the following main characteristic challenges:

1. shortage of resources, due to the limited availability of qualified staff and limits to firm growth;
2. short technology cycles, and consequently high competition and changing customer commitment;
3. complex coordination of resource demand between project structure and competence team structure.

Generally, a resource planning information system could help to coordinate different demands and allocate necessary resources for different assignments. Whereas in
a manufacturing business, enterprise resource planning (ERP) systems provide various functions for planning different types or activities and resources (Klaus, Rosemann, & Gable, 2000), in the service area, the focus lies on human resources. For better support of the project business, project management information systems (PMIS) have been developed to more specifically support project planning (Project Management Institute, 2004).

However, while an ERP system or PMIS could be the basis for efficient resource planning in known projects, it does not consider important strategic elements. First of all, there is an unresolved interdependence with sales activities: While mid- to long-term resource planning might be able to benefit from information about future incoming orders, sales could also focus its activities on business areas with lower utilization. Prioritization of potential, new and existing assignments should also be addressed. In manufacturing, this connection is known in the field of sales and operations planning (S&OP) (Olhager, Rudberg, & Wikner, 2001), but does not discuss service business models. Moreover, additional variables such as staff training and education, and other activities with strategical significance are not taken into consideration to an extent appropriate for a knowledge- and skill-intensive firm.

1.2 Problem formulation

Previous studies in the area of IT services focus on business value for the ‘user’ group, usually a firm, which is the client from the consultant’s perspective. While it is self-evident that a successful service business has to take clients’ needs into consideration, we would like to focus on the managerial issues of the consultancy. The reason for this is, that we feel this field has not been explored sufficiently.

Due to the outlined conditions, an IT consultancy has to balance resources between different activities wisely. Whereas most studies within ERP or human resource planning (HRP) systems focus on planning with a certain degree of known resources and assignments, we would like to take a more holistic view on coordination between the different information systems affecting business performance. As mentioned, sales and operations planning are known concepts within the field of manufacturing, but apparently its applicability and adaption to the service field, more precisely to a heavily project-oriented environment of consulting business, has not been tested.

1.3 Research questions and purpose of the study

The purpose of our study is, to provide a framework for analysis of the IT consultant business, which could be used for generating information needs, to be reflected in an information system. This system should support the dynamic interdependency of sales, project planning, maintenance, and resource allocation, while taking strategic variables into account. Consequently, we intend to answer the following research questions:

1. How can the information needed within dynamic processes of sales, maintenance, project planning, and resource allocation be analyzed?

2. How can this analysis be applied to practice, to improve the information system of an IT consultancy?
1.4 Delimitations

In this research, we do not directly address the different techniques of project management, including planning techniques, any more than appropriate for building and testing our framework. Instead, we focus on information and its reflection in an information system, supporting the general tasks of project planning and resource coordination throughout the organization, but remaining open for the various techniques used by individual project managers. The same applies to strategical considerations: We do not intend to define, which variables should be controlled for optimized business performance. Instead we analyze, which impact they have on the information system requirements.

Rather than providing a concrete suggestion for implementing or developing an information system for sales, project planning, maintenance, and resource allocation, our intention is to conceptualize a general view of how a coordination between these functions could be achieved more efficiently. The expected result of our research is therefore not primarily the draft of an information system itself, but rather a framework for analyzing the information need therein. While this framework is being tested in practice, it can be refined, and yield a conceptual view for an information system.

Finally, it would certainly be desirable to take a macro perspective, and study factors for most beneficial planning practices between consultants and various clients. However, this would drastically increase complexity of the resulting framework, with many currently unknown variables. Therefore, we find it appropriate to first explore the quite under-researched field of IT consultancies.

1.5 Outline

The structure of this thesis is organized in five main chapters. In the first chapter, we have identified implications of dynamic resource allocation in IT consultancies and stated the purpose of our study, the research questions and its delimitations. In the second chapter, we argue for the choice of research design and research approach, which have been used in the process of answering our research questions, to establish creditability of the study. In chapter three, we introduce the reader to the theories, which are used throughout this study and form the building blocks in the development of our frame of reference. In chapter four, we describe the process of applying our framework and review findings from the case study. From its analysis, discussion, evaluation, and reflection we are also bringing forward improvements to the firm, which was subject to the case study, and our framework. In the concluding chapter five, answers to our research questions are presented, as well as a reflection on our research methodology, and suggestions for further research.
2 Methodology

The purpose of this chapter is, to outline the research process and describe techniques and methods used therein. First, we briefly discuss the philosophy of research in context of our study. Subsequently, the chosen research design and research process are discussed, before describing the main strategy, which was pursued during theory building and analysis of resource planning and allocation processes. Furthermore, our choice of a case study approach is motivated, and data collection methods are reviewed. Finally, we discuss potential creditability issues of our study in regard of the methods used.

2.1 Philosophy of research

Two major scientific research approaches can be identified: positivism and interpretivism. Positivism is often related to terms such as empiricism, objectivism, “the scientific method”, and naturalism (Marsh & Furlong, 2002). The positivistic researcher should place emphasis on explanation and not on understanding. Therefore, knowledge must be possible to try empirically, and explanations should be given in terms of cause-effect. The researcher must be objective, i.e. not be influenced by non-scientific values (Wallén, 1996).

“Interpretivism is a term given to a contrasting epistemology to positivism. The fundamental differences resides in the fact that social reality has a meaning for human beings and therefore human action is meaningful” (Bryman, 2004). Several scholars perceive positivism and interpretivism as opposites: Positivists seek objectivity while interpretivists believe in subjectivity (Grix, 2004; Saunders, Lewis, & Thornhill, 2007). Interpretivists stress the environment’s meaning of the phenomenons under study. Theory can help us to understand the social world by describing and interpreting how people act in everyday life (Neuman, 2000). According to Grix (2004), many interpretivists are not aiming for testing a theory in the field, but rather at building theory from the data, for example by using the grounded theory strategy.

Interpretive results and statements are commonly expected to be vague rather than precise, and explanations are often open-ended. The world is socially constructed through interactions of individuals, where researchers have a complex and complicated part to play in the social reality under study (Berger & Luckmann, 1966). Objective and value-free analysis is impossible, since individuals each have their own personal and subjective point of view – opinions, attitudes and values. Interpretivists in general do not strive to establish causal explanation in the social world, as in this paradigm emphasis is on understanding rather than explanation.

Our research in particular requires understanding individual needs in their real-life settings, in order to analyze the current situation and make justified suggestions for improvements. Therefore, we are using an interpretative research approach to analyze the dynamic processes related to resource allocation.
2.2 Research design and research process

Arguments for choice of using an exploratory research design and the use of a qualitative research approach are motivated in this section. The use of a synthesis between inductive and deductive research approach is discussed as an introduction to a more detailed view on our theory building strategy within section 2.3.1.

2.2.1 Exploratory research design

An exploratory research design aims to observe what is happening, to seek new insights, and to ask questions, for seeing the subject under study from a new perspective. The most important skills needed in an exploratory research, according to Ghauri and Grønhaug (2005), are the ability to observe, obtain information, and build explanation, that can be put into theory.

The approach taken by the researcher is often investigative when the problem is unstructured and therefore, demands a high degree of flexibility. When the research problem is unstructured and poorly understood, an exploratory and qualitative research design is often most appropriate (Ghauri & Grønhaug, 2005).

As pointed out in the background, the dynamics of resource planning and allocation in the field of IT consultancies has been subject to little research, and there is no established approach. The business environment itself has to be analyzed, and the clarification and structuring of the research problem is part of the research process. Therefore, an exploratory research design is most suitable for our research.

2.2.2 Qualitative research approach

Qualitative research is sometimes subject to criticism, stating that quantitative methods are more ‘scientific’ and thereby better than qualitative. Ghauri and Grønhaug (2005) argue that methods are not better or more scientific only because they are quantitative. It rather depends on the research problem and the purpose of the study, which methods and techniques should be used (Jankowicz, 1991). If previous insights are less significant, and the research is in the essence of discovery, a qualitative research design can facilitate learning and therefore be the most suitable approach.

In qualitative research, the researchers’ skills and experience play an important role in the analysis of data. Some skills needed, summarized by Van Maanen (1983) and Strauss and Corbin (1990) for qualitative research are: thinking abstractly, being able to critically analyzing situations, recognizing and avoiding biases, obtaining valid and reliable information, having theoretical and social sensitivity and the ability to keep analytical distance, while at the same time utilizing past experience, and having a smart sense of observation and interaction.

In exploratory research, qualitative research is commonly perceived as most appropriate (Ghauri & Grønhaug, 2005). Qualitative researchers tend to work in an interpretive philosophical position, using methods for data collection, which are flexible and sensible to social context. It usually involves in-depth investigation of knowledge, for example through observations and interviewing. It explores attitudes,
behavior, and experiences, in an attempt to get an in-depth opinion from the interviewee (Dawson, 2002). The researcher in qualitative research is not detached from the object of study, and therefore more emphasis has to be put on ethical considerations. Common criticism of this type of study is that the studies are often small-scale and not generalizable beyond the case of research. In addition, lack of objectivity (personal bias) could influence the results.

### 2.2.3 Synthesis of inductive and deductive research approach

Induction refers to development of theory by a process, in which conclusions are drawn from empirical findings. Theories are generated and built through the conclusions, based on analysis and interaction with the empirical findings. The researcher looks for patterns and relationships in the data. Inductive research is usually, but not exclusively, related to the interpretive research and qualitative research design. The goal is often to be able to generalize the findings to a wider context. Deductive research is used, when the research aims at using existing theory to test a hypothesis. Relevant data is collected and concluding its analysis, the hypothesis might be confirmed or discarded.

Grix (2004) argues that most research uses both induction and deduction, as there is a necessary interplay between ideas and evidence in each research process. This research uses both inductive and deductive methods in a synthesis, using multi-grounded theory methodology, as described in section 2.3.1.

### 2.3 Theory building and analysis strategy

In this section we describe the use of multi-grounded theory, which guided the development of our framework in section 3.6 and analysis of the dynamics of resource planning and allocation. Furthermore, an analysis strategy for the use of this framework in practice is presented.

#### 2.3.1 Multi-grounded theory

*Grounded theory* (GT) is a qualitative research methodology with the objective to construct theory grounded in data (Strauss & Corbin, 1990). *Multi-grounded theory* (MGT) is based on grounded theory, but also uses established theory when generating new theory (Goldkuhl & Cronholm, 2003). As shown in figure 2-1, MGT uses both, an inductive and deductive research approach in a synthesis.

![Figure 2-1 Multi-grounded theory as a dialectical synthesis between inductivism (GT) and deductivism (Goldkuhl & Cronholm, 2003, p.4)](image-url)
The main strength of GT is that it imposes an established, strictly inductive way to generate theory from empirical data, without categorizing previously existing theories. However, Cronholm (2005) claims that “theory development should aim at knowledge integration and synthesis”. In this notion, existing theory can be compared to empirical findings, but also be set aside other theories.

According to Goldkuhl and Cronholm (2003), the development of MGT comprises activities of theory construction, empirical grounding, and reflection. Our resulting research process, similar to the application by Lind and Goldkuhl (2005), can be described in the following steps:

1. Initial empirical studies
2. Specification of the research interest
3. Development of a theoretical framework
4. Empirical validation

The initial empirical studies have allowed for an insight into the field of study. Consequently, they narrowed down the preliminary evaluation for applicability of other research to particular conditions of IT consultancies, as presented in chapter 1. As existing theories have appeared to not be tested in this environment, the research purpose and research problem have been specified.

Within the subsequent development of our theoretical framework in chapter 3, applicable theories are discussed and brought into the context of the research problem. During this process, a frame of reference is constructed (section 3.6 – Framework of dynamic resource allocation). The latter is then empirically validated by applying it to a case study in chapter 4. While this reference serves as a guide for data collection and analysis of the findings, it can also be used for further development of the framework and empirical grounding (section 4.4.2 – Evaluation of the framework).

### 2.3.2 Development of the framework

Within our exploratory study, the structure of the frame of reference is not self-explanatory by the problem formulation or choice of methods. The research questions put forward in section 1.3 concern methodical issues in theory building, data collection, and analysis, which need discussion in the theoretical framework. Therefore, the expected outline is initially discussed in section 3.1 (Information systems design). Mainly, it advocates for structuring the frame of reference into hypothesized information system requirements (meta-requirements), and an information system design (meta-design) fulfilling these requirements.

Subsequently, relevant theories are discussed in sections 3.2 to 3.5. The relevancy has been determined by different aspects: For performance and process considerations, existing research should highlight the objectives of the business, and allow for an abstract and generalizable view on how it operates. However, there is also available organizational and information systems research, which covers partial aspects of our research problem. Therefore, we also discuss their suggested solutions and related concerns brought up by other scholars. Based on the extracted findings, our frame of reference is constructed and presented in section 3.6.
2.3.3 Analysis and application of the model

Since the aim of this research is also to apply the constructed theory, the latter should be suitable for both data collection and analysis of findings. Besides the aforementioned division into meta-requirements and meta-design, the design proposes concepts and process models to support this.

The case study (as further discussed in section 2.4) has two roles in our research: The first one is to validate or deny the framework, whether it serves its purpose or needs refinements. Secondly, if the framework allows for justified assumptions on a best-practice, recommendations can be given for information system improvements to the firm under study.

In order to serve these purposes, data collection should be conducted in a way that the information requirements from practice can be matched with the theorized meta-requirements (section 3.6.1) in regards to the appropriate roles and consequently either be confirmed or disconfirmed. Moreover, the planning processes of the meta-design (section 3.6.4) should be possible to identify, along with their elements, namely

- steps (subprocesses),
- roles,
- information requirements,
- information received,
- and information provided to other processes.

Furthermore, it should be possible to relate the underlying concepts (section 3.6.2 and section 3.6.3) to our theoretical definition.

During analysis (section 4.3), the findings (section 4.2) are discussed in comparison to our theoretical reference. Finally, results are reflected on and developed into justified proposals for changes, in the organization under study or to our frame of reference (section 4.4).

2.4 Case study

In this section we argue for the choice of using an interpretive single-case study for our empirical work. First we describe the nature of using a case study approach, thereafter we elaborate on the interpretive case study philosophy, and finally explain the benefits and implications of conducting a single-case study.

2.4.1 Case study approach

Case studies are often performed in context of descriptive and exploratory research designs, but can also be used for other areas (Yin, 2009). This approach is most often applied when doing an in-depth study of one or a few situations in real-life settings. It can be used to gain “new insights” (Eisenhardt, 1989) and “rich insights” (Walsham, 2006). Often there are too many variables to take into consideration,
which makes experiments and survey methods inappropriate. Furthermore, such variables are difficult to quantify, especially in social context (Yin, 2009).

A case study approach can be equally used for building or testing theory. Case studies allow the researcher to be flexible in the data collection, and take advantage of the specific situation to improve the result (Eisenhardt, 1989). It often involves data collection through multiple sources such as verbal reports, personal interviews and observation as primary data sources. Some case study methods also gather data through financial reports, archives, budgets, including market and competition reports etc. In this study, we rely on personal interviews for gaining the knowledge needed to validate the applicability of our framework. We also intend to use the findings for proposing potential improvements for an information system using the framework.

Case studies are often time consuming and the path from data to theoretical contribution is usually complicated. In addition, case study research is commonly considered to have little scientific generalization, which is discussed further in section 2.6.3.

2.4.2 Interpretive case study

As mentioned in section 2.1, we are using an interpretive research approach. For interpretive studies, it is essential to apply them to a practical context (Walsham, 2006). When conducting an interpretive case study, it is important to decide on the level of involvement. In this thesis we aim to be at the neutral observers end of the spectrum. Specifically, this means we have no particular interest in the company under analysis, we are not receiving any money, and have not done any previous work for the company. On the other end of the spectrum is the full action researcher, who tries to direct the research and change things in the way that she or he feels to be most fitting. It can give great access to people and data, and the involved people often get a positive attitude towards the researcher because they see the researcher as someone who wants to contribute to their organization. One disadvantage of close involvement is however, that it can be very time-consuming. If the researcher is perceived to have vested interest, it can also lead to less openness and honesty from the surrounding. Moreover, there is a risk that the researcher gets too involved and adopts the view of people within the situation, losing the neutral view (Walsham, 2006).

2.4.3 Single-case study

A single-case study is appropriate for many different occasions. It is for example useful for critical cases, where the aim is to test an established theory. The case is said to be critical if it meets the essential conditions to confirm, challenge, or extend the theory. Single-case studies are also suitable when a case is of extreme or unique character. Finally, a single-case study is useful as a first step in exploratory research, prior to a more complete study, or development of a research area (Yin, 2009). In this research, a single-case research approach is used because prior studies showed limited applicability. The exploratory study is suitable for testing our frame of reference, evaluate it, and find potential improvements therein.
The interpretive approach, as mentioned, aims to gain ‘rich insights’ and focuses on understanding the subject under study. The choice of one case study instead of multiple is partly due to this chosen approach. The study needs to fit within the preferred scale and scope. By doing a single-case study, we are able to go more in depth, than it would have been possible with multiple case studies, due to time constraints.

2.5 Data collection

Methods for acquisition of data and notations for codifying them should aim at not reducing effectiveness and usability of the results (Kennedy & Mahapatra, 1975). Within this section, we discuss the data collection by interviews for a case study and describe the use in our research.

2.5.1 Interviews

For data acquisition, best results can be achieved by directly interacting with the environment under research (Watson & Frolick, 1993; Hughes & Wood-Harper, 1999). Interviewing is the main technique for qualitative researchers to gain multiple insights and realities of a case. To a large extent, the subject under study has been or is being observed by others. It is often of great value to ask open-ended questions, allowing for the interviewees to present their own perspective, which hopefully results in additional findings. According to Stake (1995) there are two principles of a case study: to obtain the description, and to gather interpretations of others. Each interviewee has unique experiences and stories to tell. It is however easy to fail to ask the right questions in an interview. Therefore, it is important to plan in advance on how to structure and conduct the interview.

Yin (2009) points to a number of important factors to take into consideration for an investigator in a case study:

- Ask good questions
- Be adaptive and flexible
- Have a firm grasp of the issues being studied
- Be unbiased by perceived notions

The purpose is not to get simple ‘yes’ or ‘no’ answers. The formulation of the questions aims to yield rich and useful responses. It is important for the researcher to listen carefully, take notes, and stay focused. Sometimes it can be good to reassure that findings were heard and understood correctly. We have decided not to use a recording device during our interviews. Recorders should only be used, according to Walsham (2006), when there are plans to transcript the interviews. Walsham (2006) and Stake (1995) both argue that rather than a tape recorder, which can make the interviewee nervous and less open, it is better to listen, take notes, and ask for clarification. In exploratory and interpretive research it is more important to obtain a holistic picture rather than specific words. It is however essential to summarize the notes into a coherent text shortly after the interview has been conducted (Stake, 1995).

13
The quality of questions is based on the understanding of the subject being studied. It is important that researchers use their own understanding of the subject for being able to ask appropriate follow-up questions, which can lead to a more in-depth understanding of the studied environment (Yin, 2009).

2.5.2 Semi-structured interviews

The semi-structured interview technique is the most popular one, when researchers want to acquire specific information, which can be compared and contrasted with insights gained from other interviews (Dawson, 2002). The interviews however are not following any specific prearranged order, allowing flexibility, so that important but unexpected information can be considered and enhance the findings. For this type of interview, the researcher should have a small number of questions in mind (suggested maximum: 10 – Grix, 2004). A list of specific questions ensures continuity. In some studies the questions are updated and revised after each interview to include more issues, which have arisen as a result thereof. This is for instance often applied when doing grounded theory research (Dawson, 2002).

There is no ‘best’ method or practice for documenting the results of information systems research, especially when the research design is of an exploratory character. While there is no lack of established methods for codifying knowledge, their applicability at this stage is questionable. Conceptual modeling can be used to visualize acquired knowledge on the domain (Wand, Monarchi, Parsons, & Woo, 1995; Melão & Pidd, 2000) and enhance communication during analysis (Topi & Ramesh, 2002). Further, this could be useful as a pre-step for later refinement into ontologies or class structures and system implementation (Hadar & Soffer, 2006; Parsons & Wand, 2008). In our case, we have chosen to use the outlines of the frame of reference for constructing our research questions. During the interviews, the responses have been written down in key words and sentences, using no particular categorization, in order to avoid a preliminary interpretation.

2.5.3 Case selection

We have chosen to do a case study at a given IT consultancy firm because we intended to match our findings in theory to a practical situation. Grix (2004) argues that one of the most common problems students have with interviews is, to access individuals and companies. Since we were given access to an IT consultancy firm for studying their resource allocation system, it was a good possibility to explore the area more in depth. At the same time, it can generally provide ideas for additional considerations and allow for a preliminary evaluation of usefulness of our theoretical framework. For the IT consultancy, the benefit can emerge from a neutral and justified external opinion, as it can give hints for improvements.

2.6 Research credibility

2.6.1 Internal validity

Internal validity is mainly related to explanatory research, when a researcher tries to explain the cause-effect (causal relationship) between two or more variables. However, in the development and validation of a framework using multi-grounded theory,
Cronholm (2005) suggests three grounding processes to three kinds of validity claims: theoretical, empirical, and internal validity. In order to establish theoretical validity, the framework is built upon relevant established theory, concepts, and categorizations. Furthermore, internal validity is addressed by presenting the framework in coherent descriptions and illustrations and highlighting the consistency with aforementioned theory. Finally, empirical validity is supported by using our framework within empirical studies, as structuring, comparing, and contrasting it to the findings from the case study interviews. In addition, our notes from interview responses were sent back to each interviewee, in order to verify their contents.

2.6.2 Reliability

Reliability usually means ‘stability’ of a measure (Ghauri & Grønhaug, 2005). If the study would be conducted once again, the same result and conclusion should be achieved. The focus is on explaining the procedure of the case study for other researchers or even ourselves to follow the line of action. One common way to handle the reliability problem is to prepare practical steps and conduct the study, as it was someone observing the progress (Yin, 2009).

The data collection was performed in semi-structured interviews, which means in addition to the pre-defined questions, modified and further questions where asked. Depending on the researchers’ previous knowledge in the subject and of the business environment, these questions could come out very differently. When conducting an interview, the researcher will likely obtain different answers each time. Although each individual interview might vary if the study was replicated, we believe the holistic view on the situation to be similar. Our extensive framework can significantly help the researcher to get an overview and a common understanding of the study.

2.6.3 Generalizability / external validity

A. S. Lee (1989) has identified four problems when it comes to generalization of case studies in the area of information systems. The first problem is *making controlled observations*. In contrast to laboratory research in natural science and statistical experiments, a case study is by its nature not as rigid and controlled. A case study often has more variables and data points, making it inapplicable to use statistical control. Instead of statistical generalization, Yin (2009) argues that for case studies, analytical generalization is more appropriate. In the spirit of analytical generalization, we use our framework for comparing our empirical findings to the case study. The purpose of the framework is, to support analysis of the dynamic processes of sales, maintenance, project planning, and resource allocation in IT consultancy firms. However, even though the results of the first case study are confirming its applicability, it needs to be tested on more case studies.

The second problem is *making controlled deductions*. One problem of a case study with a qualitative approach is that the researcher will obtain an enormous amount of information and needs to sort out what is important and relevant to analyze. In the deduction of information there is a risk, that the individual researcher will influence the findings too much. Prior to our case study, we had developed a frame of reference, helping us to ask relevant questions and to categorize the findings. To
avoid unsuitable deduction, we were very careful in the selection of findings. As mentioned in section 2.6.1, we also sent the summary of each interview back to the interviewee for their confirmation, that we have interpreted them in the right way. In addition, these summaries are included in Appendix B and can be verified against the findings from section 4.2.

The third problem is allowing for replicability, which also relates to section 2.6.2 (Reliability). In natural science it is rather easy to replicate a study while for business and information systems cases it is impossible to replicate the same configuration of individuals, groups, social structure, hardware, software etc. The case study company has asked to be anonymous; therefore it will be impossible to replicate the study. However, we provide a case study description for helping readers to understand the specific setting.

The fourth problem is allowing for generalizability. Since the setting is difficult to replicate in a real-world case study, it is very sensitive to changes, and it might be difficult to extend the findings to other settings. In our research we are only using one case study, which is not a strong base for generalization. However, as mentioned above, we do not aim for statistical generalization, but rather focus on evaluating how our framework can be used for IT consultancies. Our study is a first successful step to generalization, but more research has to be done using our framework for establishing the framework in theory and allowing for generalization.
3 Theoretical framework

Within this chapter, we outline the expectations on the structure of the framework, arising from the use of information systems theory in organizational context. Afterwards, we discuss existing theories in the areas of project business performance, enterprise planning, and project planning, which concern principles in our study, and highlight their applicable elements. Additionally, we present a preliminary process model of IT consultancies, which emphasizes the coordination needs. Finally, a new framework is constructed, to guide empirical studies in data collection and analysis. The components of this chapter and their relation to one another are illustrated in figure 3-1.

![Figure 3-1 Structure of the theoretical framework](image)

3.1 Information systems design

The purpose of our study (section 1.3) is to create a framework, whose application on an observed organization should yield an information system. The main process governing this research has been discussed in section 2.3.1. Complementary to the method, existing theories can be used to describe the expected outline of the frame of reference, guided by rules for developing information systems within organizational context. These established approaches are initially discussed in this section.

3.1.1 Theorizing within information systems development

Within the study of Nunamaker Jr, Chen, and Purdin (1990), information system development itself is described as a research method, where the process comprises
theory building, development of the system, experimental use, and analysis of the outcomes. Whereas this method encompasses the entire life cycle of a single system development, other theories focus on hypothesized solutions to classes of problems, rather than concrete situations, but similarly, theories for design of information systems are derived from complementary use of design science and natural science activities.

Natural science aims at describing observations and theorizing on them, while design science activities are guided by a prescriptive intention, as they result in constructs, models, or other creations. While the former is establishing knowledge on context and behavior, the latter provides for influencing, typically improving, certain aspects of the environment under research (March & Smith, 1995).

Walls, Widmeyer, and El Sawy (1992) elaborate, how system design theories are composite theories, which integrate various types of explanatory or predictive, natural-science-based theory with the prescriptive and normative theory. While building design theory, explanation is used to justify, whereas prediction can be used for verification and determining if the theory meets its goals. Further, Walls et al. (1992) bring forward a formal definition, which lays down components for the interrelated aspects of the design product and the design process of an information system design theory, shown in table 3-1:

| Design product and design process complement one another. Whereas the product component describes the nature of the problem and the proposed solution, the process component describes the artifact creation. Within the design product, meta-requirements specify not only the requirements of a single problem, but a variety of objectives, abstracted to a common class. Similarly, the meta-design is a hypothesized abstract solution to this class of objectives. For both the design and the process component, kernel theories are a set of existing theories, which the meta-design is based on and justified with. Testable hypotheses of each component are provided for verification, if the created meta-design or the process to generate it is serving its purpose. Kernel theories of both the design product and design process are based on natural or social science, whereas the meta-requirements, design method, and other hypothesized elements are artificial.

Consequently following this formal definition, there could be a quite complex interrelation of different natural and social science theories. As demonstrated within a specific system design theory for emergent knowledge processes by Markus, Majchrzak, and Gasser (2002), such kernel theories can also be derived and practiced theories. Therefore, the meta-requirements and motivations for development of other systems can influence the creation of a new meta-design.

Although our goal is not the complete implementation of a new information system, there is a need for evaluation of the framework and its applicability. Throughout various literature, artifacts in information technology could be perceived as tools (e.g. productivity, information processing), proxy (e.g. diffusion, capital), ensemble (considering the interrelation with social systems, e.g. projects, structures), computational (e.g. algorithms) or nominal (i.e. without reference to particular technologies) (Orlikowski & Lacono, 2001).
Table 3-1 Components of an Information System Design Theory (ISDT) (Walls et al., 1992, p.43)

<table>
<thead>
<tr>
<th>Design Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Meta-requirements</td>
</tr>
<tr>
<td>2. Meta-design</td>
</tr>
<tr>
<td>3. Kernel theories</td>
</tr>
<tr>
<td>4. Testable design product hypotheses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Design method</td>
</tr>
<tr>
<td>2. Kernel theories</td>
</tr>
<tr>
<td>3. Testable design process hypotheses</td>
</tr>
</tbody>
</table>

3.1.2 Organization and information system support

The previously reviewed literature (e.g. Nunamaker Jr et al., 1990, Markus et al., 2002) suggests system development or implementation as a solution to a particular problem. However, organizational systems support can reasonably be expected to raise a variety of different challenges. Thus, more comprehensive directions in research have been studied, on how to achieve information support of organizational structures.

Linking the business goals and strategies to use of information technology has led to the concept of strategic alignment (Chan & Reich, 2007). The idea underlying this concept, as described by Henderson and Venkatraman (1999), is that the business strategy and IT strategy should be linked. Whereas IT can support many business functions, it can also be the driver of new business activities, especially on opportunities new technologies have to offer. While the business strategy is supported by the organizational structure, the IT strategy is reflected in the IT infrastructure. This view can moreover be adapted to the development of systems (Hevner, March, Park, & Ram, 2004).

However, the alignment view should also be complemented with views on the business as a social system. For example, especially in knowledge-intensive environments the focus is shifted on the aspect of information sharing and the potential IT support therein (S. Lee & Leifer, 1992). Approaches towards this objective are taken by the soft systems methodology (Checkland, 2000) and its enhancements, such as the soft systems dynamics methodology (Paucar-Caceres & Rodriguez-Ulloa, 2007), which
can be applied to reflect on unstructured observed problems. Instead of a formal
description of the information systems support of business functions, the approach
aims for a description of views from different perspectives.

The implication we see for our study is that rather than focusing on the link
between business and information strategy, it can be more appropriate to look at
at the organization as a social system, where information is exchanged between
and processed by different parties. These parties have different views on their
requirements. Some of these activities are possibly already supported by information
systems, others might be desirable to support them, whereas especially in small
organizations, it might be more efficient to perform these manually. Therefore, we
look at information systems as embedded entities in the organization.

3.1.3 Specification of requirements and design

The frame of reference, which is being developed and tested within this study is
not going to yield a complete system theory comprising all elements put forward by
Walls et al. (1992). Neither is any existing theory complete (Walls et al., 1992).

The terms of meta-design and meta-requirements express the condition, that the
results should be universally applicable to a certain degree. In our framework, the
meta-requirements are gathered from apparent characteristics of IT consultancies,
which have been described in the background (section 1.1.1), as well as fields which are
directly related. They should therefore apply to IT consultancies mainly based on the
business activities as mentioned. The meta-design in return should be complemented
with existing theories or best-practices, which can reasonably be related due to their
emerging problems corresponding with the meta-requirements. A design hypothesis
is not directly specified, but instead applicability of the resulting requirements and
design is preliminarily tested in a case study.

Since meta-requirements are gathered from several sources of research areas, they
are merged in common language terms, rather than providing a full specification.
Clarification of the implied concepts is therefore part of the meta-design. Furthermore,
in absence of one neutral point of view, the meta-requirements are described from
different perspectives. The meta-design, in terms of Orlikowski and Lacono (2001),
represents a nominal information system, where information is exchanged, decisions
are made, and actions are performed. However, due to the complexity of the system
under analysis and the purpose of broad applicability, specification detail is limited.

3.2 Project business performance

In section 1.1.2, we have outlined the definition of project business. In order to
determine what the main success factors in project business are and how performance
can be measured or improved, the specific characteristics of this business have to
be further analyzed. Therefore, we review literature on performance measurement
of service business in general, the additional implications for project business, and
long-term considerations – the perspective of organizational learning.
3.2.1 Business performance of service providing companies

For evaluating its competitiveness and financial health, service businesses can only to a limited extent apply principles and best-practices. Due to the variety in nature of service types, it is particularly difficult to select reliable performance measures by which services can be managed. Usually, a service business should therefore rely on internal benchmarks, which provide the best comparability if well-defined (Harmon, Hensel, & Lukes, 2006).

A very basic key performance indicator (KPI), applicable to virtually any firm, is the total generated financial turnover. More abstractly, service providing firms aim to maximize the amount of activities, which are performed and paid for by the customer. The challenges of increasing the turnover can be associated with market orientation and customer value considerations of the service firm (Slater & Narver, 1995). In case of shortage in resources, the turnover could be maximized by giving the most profitable activities higher priority. Without a doubt, indirect influences, such as customer dissatisfaction or consequences of contractual breach, have to be taken into consideration.

Businesses generally also monitor efficiency measures for staying profitable. Within the service business, the impact on profitability depends on the contracting model. According to Roels, Karmarkar, and Carr (2010), so-called collaborative services firms (including consulting and IT outsourcing) contract with clients in the following modes to produce a specified desired result:

1. “Fixed-fee”, which specifies fixed payments in the contract;
2. “Time-and-materials”, which in addition to a fixed fee, specifies a variable payment determined by time effort;
3. “Performance-based”, which includes the previous two, but in addition entitles the service provider to a share of the benefits.

These different modes of contracting change incentives and motivations by the actors involved, as also highlighted by Roels et al. (2010): In the fixed-fee mode, the service provider tries to produce the result with the least amount of resources. In the time-and-materials case, it is mainly in the customers interest, to get the most business value out of the paid service, while the service provider tries to supply as many paid activities as possible. Consequently, the efficiency-measuring KPI is not only reflected in the profitability, but also more detailed, how many hours of the total labor time can be debited to the customer.

3.2.2 Project business models

Firms involved in project business can operate in various ways, creating value for the supplier, the customer, and their environment (Wikström et al., 2010). Since there is no direct reference for IT consultancies, we attempt to categorize the observable business models with existing frameworks, which have been applied to other project business research.

Within project business, it is quite common to deliver goods or services within an initial project and provide additional services. IT consultancies’ offerings are often
referred to as solutions. According to Kujala, Artto, Aaltonen, and Turkulainen (2010), “a solution offered by a project firm is defined as including both a project component and an after-sales service component.” They suggest that business models should not be analyzed on firm level, but specifically for every solution offered, since a project-based firm can have multiple business models (as also demonstrated by Wikström et al., 2010). From reviews in literature, they identify four main types of service business models for solution providers of project and after-sales service activities:

1. Basic installed base services
2. Customer support services
3. Operations and maintenance outsourcing
4. Life-cycle solutions

Although the empirical work by Kujala et al. (2010) is based on a power plant supplier, and not every IT consultancy reflects all of such business models, the framework can be related to commonly offered IT solutions as well: Basic installed base services refer to typical after-sales activities, such as set-up and maintenance of implemented systems and infrastructure and product-based customer support. Customer support services are not product-oriented, but provide general professional services, for instance an IT help desk. Operations and maintenance outsourcing can be observed on ‘software as a service’ (SaaS) offerings, where companies choose not to operate some of their information systems themselves, but instead contract for all necessary activities. Life-cycle solutions is not directly related to one product, but instead a combination of products (e.g. hardware or software) and services (e.g. implementation in the organization and subsequent maintenance), which together form the delivery to the customer. In the latter case, a long-term business relationship is formed between customer and supplier.

The role of additional services in project business is further explained by Artto, Wikström, et al. (2008). They identify six impact types, which contribute to the overall business performance in various ways:

1. Customer entry
2. Customer value
3. Competitive advantage
4. Delivery efficiency
5. Service business
6. Innovation and learning

The magnitude of these impact types varies throughout the performance of the project delivery. Although Artto, Wikström, et al. (2008) do not specifically include IT consultancies in their analysis, some implications are equally applicable as to other technical services explored therein: Customer entry is mostly affected by initial consulting and collaborative development of the initial design, project scope, and boundaries definition. If client need specifications are vague or uncertain, they
have to be refined and estimated for feasibility in this process. Therefore, such activities are also referred to as ‘consultative selling’. Consequently, services are mainly important at the beginning of projects, but can further be critical at later stages for maintaining subsequent business with the same customer. Customer value is improved by supporting the customer in optimally using the provided solution. These services, such as training, support, and maintenance, are relevant during project performance, but also after the project has finished. A competitive advantage for the project business can be achieved, when the collaborative process of offering, for example the consultative selling, leads to better solutions than offered by other suppliers. In addition, high quality of later project activities, such as quick response rates on support requests, are likely to establish long-term relationships between suppliers and customers. Impacts on delivery efficiency, at least to the scope of our study, is hardly applicable to IT consultancies, since it is mainly related to supply chains and service centralization. The impact on service business is possibly most apparent, since providing services itself supports the project business (as also discussed in context of the framework of Kujala et al., 2010). At the same time, projects can lead to more demand of services by the customer. This can take place under any of the service contract modes discussed in section 3.2.1 and in any stage of a project. Finally, impacts on innovation and learning are particularly important in consultancy and technical services in every stage of project performance. Existing competences, technical or business-related, can be developed further in the process of practice. In new projects with different customer requirements, new skills can be acquired.

3.2.3 Learning perspective

A more detailed view on innovation and learning as an influence on project business performance is taken by Cohen and Levinthal (1990): They argue that similar to the individual level, where a balance between expertise and diversity in knowledge is useful, there should also be a balance between overlapping and diverse knowledge on organizational level. Besides the direct benefits of internal research and development efforts to develop knowledge and skills, this also improves the ability to perceive business opportunities and facilitates innovation and learning from the environment.

Specifically for IT consultants, Luo and Liberatore (2009) show that project performance has a positive impact on knowledge acquisition and business development. This means that the better a project is being conducted in terms of meeting time, budget, and quality (product and process) objectives, the more consultants are likely to acquire future projects or other engagements, but also increase the variety and depth of knowledge in the field. This project performance in return can indirectly be positively influenced by improving coordination between client and consultants.

As a result, an IT consultant firm should frequently dedicate a defined amount of employees working time for internal research and development, particularly for getting familiar with new technologies. At the same time, the firm also benefits when assigning workers with less developed skills in a competence area to challenging but not time-critical client tasks. This builds up further knowledge, and therefore improves the efficiency over time. It does not mean that preference should always be given to staff with lower skills in a particular competence, since clients would
likely not accept paying for the temporary lower efficiency, and consequently, this would result in a conflict with the business model. Nevertheless, IT consultancies can benefit from ensuring a certain involvement of these employees.

3.3 Enterprise planning

Any company has to somehow keep track of their available and used resources. The organizational activities in fulfilling this function can generally referred to as enterprise resource planning (ERP). Often, this term is used synonymously with the ERP (information) systems, which are implemented in a firm to support these activities. However, since we wish to maintain the holistic view on the organization with and without its IT infrastructure, those two terms should be kept apart. Within this section, we discuss the basic implications of ERP and ERP systems, as well as the extensions and links, which can be made to the project business environment.

3.3.1 ERP systems

While the term of enterprise resource planning might suggest a focus on planning activities, ERP systems as they are developed and implemented are “packaged software solutions[, which] seek to integrate the complete range of a business’s processes and functions in order to present a holistic view of the business from a single information and IT architecture” (Klaus et al., 2000). The planning aspect has evolved from originally materials resource planning into systems with accounting and extended planning functions, such as production and sales forecasting (Klaus et al., 2000; Davenport, 1998).

Research on the use of these information systems has shown that implementation is often subject to problems. One major reason, as pointed out by Davenport (1998), is the misadjustment between the business practice and the technological representation of the activities therein. Rather than a lack of basic functionality, the process integration is often a problem. The size of the company can also be a relevant factor for suitability of the product or package, or methods of implementation projects (Muscatello, Small, & Chen, 2003).

Possibly, the focus on process performance along with general pressure to keep up with trends has in some cases led to negligence of the actual purpose and benefits of the system. As Holsapple and Sena (2005) point out, firms should consider their ERP systems as decision-support, rather than solely a technical reflection of business activities. Information derived from the data can be used for planning activities in various parts of the business. For example, existing information from historical and current resource requirements and utilization can be applied to improve reliability of forecasts. Such forecasts in return can be taken into consideration when planning for available capacities.

3.3.2 Sales and operations planning

Another potential decision-support application is the coordination of sales with other planning activities. Definitions of sales and operations (S&OP) are quite diverse (Grimson & Pyke, 2007). For example, in the terms of Olhager et al. (2001), “Sales and operations planning (S&OP) is the long-term planning of production levels
relative to sales within the framework of a manufacturing planning and control system.” While this definition is strictly limited to manufacturing firms, Jain (2005) offers a more broad definition: “S&OP is a re-engineered process which emphasizes the alignment of demand, supply, budget and strategic goals to improve efficiency, and optimize profit and growth.”

In many studies, the promise of S&OP in practice is to receive most updated information on production schedules during sales and marketing efforts and to optimize the supply chain (Grimson & Pyke, 2007). Within the last years, scheduling and forecasting have been significantly enhanced with information systems (Wallace, 2006), for example through scenario techniques (Schlegel & Murray, 2010). The terms supply and demand, often used in S&OP research, still suggest a focus on manufacturing, but there are hints that some aspects can be transferred towards other industries.

The new link of sales coordination with project operations by Cooper and Budd (2007) can also be concluded, when abstracting from the above-quoted broader definition of S&OP: For optimizing sales planning and coordinating with other parts of the organization, sales should be informed about ongoing activities in order to know, which markets to focus on and within what time boundaries specific customer demands can be fulfilled, before taking an order. The suggested approach of Cooper and Budd (2007) comprises several phases, where first the focus of market is chosen based on the available critical project factor capacities and complemented with strategic considerations (market segment size, firm competencies, win ratio). Afterwards, the selection of projects is guided by a sales funnel, towards further leads and qualified prospects. Within the final steps of sales, a bidding pool is maintained, where projects are negotiated, evaluated by their profitability, then contracted or discarded, and scheduled for performance. Each step is linked to the previous one through a feedback loop. Mainly, sales activity is further determined by projects being closed after the project performance has been completed. This concept implies that sales is constantly aware of the current workload and available capacity in different competences, and adjusts marketing activities and contract negotiations accordingly.

3.3.3 Implications for service and project business

Although ERP systems and related studies are applied in services and project businesses, their purpose and benefits only to a limited extent address the specific nature of these. While some ERP system vendors are now offering components suitable for particular industries (Klaus et al., 2000), which can also include service, application towards service-specific issues is still low. Service companies implementing ERP systems mainly use the financial features, and efforts to integrate project management have been made, but links to customer relationship and sales activities are still at a rudimentary stage (Botta-Genoulaz & Millet, 2006). Like many other disciplines that service business comprises, differences in IT alignment to the business have not been subject to much research (Chesbrough & Spohrer, 2006).

When reviewing the article by Wright and Mechling (2002), the reason does not seem to lie in a lack of relevance: While forecasting and resource utilization are among the
most important challenges, issues typically associated with supply chain management are rated the least common. Therefore, we are approaching the study by focusing on resource planning and allocation of project environments, and evaluate at what point there is an interrelation with sales on the broad definition in section 3.3.2 (Sales and operations planning).

Cooper and Budd (2007) address most of the relevant issues, although the principles and terminology cannot always be transferred to services. The suggested project scheduling and operation does take different sources of uncertainty into account, but does not consider that shifts in resource availability of one project could possibly be transferred to other projects. For example, delays caused by the client might render it useful for project operations to reschedule other activities not related to the same project. This especially becomes relevant if overall workload is distributed between project tasks and more fragmented, not directly project-related activities.

Therefore, rescheduling of projects and assignment of resources should take place more frequently. Consequently, project operation should be aware of ongoing sales activities, along with the preliminary project boundaries (i.e. time and budget) and stage of negotiations (i.e. probability to contract), in order to adjust the resource allocations and decide on resource acquisition. Furthermore, a certain degree of flexibility should be provided in resource allocation by reserving ‘slack’ time.

### 3.4 Project planning

Within the preliminary characterization in section 1.1.1, we have identified the planning and coordination of various projects as one of the main challenges of IT consultancies. Therefore, we review the relevant concepts of project planning, the approaches towards coordinating multiple projects, and the information systems which have been developed for use in project management.

#### 3.4.1 IT project perspectives

The field of project management, including planning, control, and review, has been extensively investigated and also been subject to standardization efforts (Project Management Institute, 2004). Kolltvæit, Karlsen, and Gronhaug (2007) point out that directions in research are various due to the many disciplines in practice and science, which project management comprises. Within their work, they group existing literature on the subject into six perspective groups of Task, Leadership, System, Stakeholder, Transaction, and Business. The research shows that the task perspective (i.e. concerning the scope and goals, and planning activities), which once used to be the most dominant perspective, receives less attention in today’s research, whereas the leadership, but also the business perspective (i.e. strategic decisions, investments, etc.) is on the rise. Moreover, some literature suggests to combine several perspectives into an objective-oriented approach, such as Palmer (1987).

Further, a more narrow field of information technology (IT) or information systems (IS) project management has been established (Hartman & Ashrafi, 2002; McManus & Wood-Harp, 2003; Fuller, Valacich, & George, 2008). Generally, there is a broad variety of tested and standardized techniques, how project management of different types of information technological changes should be performed.
However, existing literature on project management, even the business perspective, hardly ever refers to the project as a business practice itself. They usually approach the subject from the internal project management point of view and not from an IT consultant firm. Other literature reviews do acknowledge the need for research in more business areas than the “traditional” (Carden & Egan, 2008), but only few researchers have studied the implications for planning and resource allocation in this type of business structure. Nevertheless, existing research can be adapted to our study purpose.

3.4.2 Multi-project organizations

Since project management is obviously not just an internal institution of a consultant company, but offered as a service, the company has to handle several clients at the same time. The challenges arising from this are analyzed within the field of multi-project management.

Gareis (2004, 1991) builds upon the idea of projects as a general management paradigm for a firm, a project-oriented company. According to this view, multi-project management is an approach to carry out multiple, concurrent projects, to deal with unique, complex tasks of different volume. Although the research is mainly focused on internal projects, the emerging organizational structure and necessity of communication of the different objectives of the project network throughout the company can also be applied to the management of projects with external clients.

The multi-project organization (MPO), as highly dynamic and flexible and therefore hard to control, is brought up by Geraldi (2008). Within her paper, a conceptual framework is developed for defining an organizational fit of different projects to the firm size and complexity. Thus, there has to be a correlation between the complexity of projects performed and the organizational flexibility. This view is enhanced by Canonico and Söderlund (2010), focusing on managerial control systems of MPOs. Their study shows indications, that an interactive control mechanism, which is based on discussion and information sharing among several project managers, is most suitable in projects with shared objectives and high external participation.

3.4.3 Multiple project management and resource planning

As suggested in section 3.4.1, techniques of project management concerned with its tasks are less in focus of contemporary standard literature. However, particular issues of task assignments and conflicts of resource allocation are subject to some studies. Zika-Viktorsson, Sundström, and Engwall (2006) investigated that overload of work is a very common problem within projects in general, even in the construction business, which is a typical project environment with external project ownership. Another relevant observation is, that the perceived magnitude on this overload was less on just the fact, that many projects were conducted in parallel, but “lack of opportunities for recuperation”.

While there are risks of multi-project operation, it also has its benefits, aside from the fact that it is inevitable due to the nature of consulting business. For the individual, the variety of experience can increase motivation; within a single project, other projects provide a learning opportunity; and for the organizations
involved, the benefit can evolve from enrichment of the social network (Mortensen, Woolley, & O'Leary, 2007). Still, this highlights the importance of cooperation and communication in resource planning. Conflicts between the objectives of functional control (department), single project management, and the project sponsorship (client or general management) cannot be entirely avoided, but reduced, especially in environments with high uncertainty (Laslo & Goldberg, 2008).

As steps towards technical solutions, scholars have proposed simulation approaches (e.g. Laslo & Goldberg, 2008, Araúzo, Pajares, & Lopez-Paredes, 2010). However, they require that the structure of the company is known, and roles of the processes are well-defined. In addition, studies on resource allocation behavior suggest that there are more ‘soft’ challenges to be addressed. For example, Engwall and Jerbrant (2003) show the behavior of project managers to over-allocate resources under high uncertainty, and therefore create more shortages on other projects. Reasons for these symptoms are, which we find well applicable for our study field, that resource needs change throughout the life cycles of various projects and projects seem to acquire the most qualified resources first, making them unavailable to others. Such phenomenons should be taken into consideration when analyzing resource allocation systems, since they can be inferior to highly developed techniques of near-optimal resource planning.

It is apparent that under high uncertainty, projects cannot define their resource needs statically during preliminary or initial planning, but need frequent updating. We argue for introducing flexible levels of resource allocation. Hans, Herroelen, Leus, and Wullink (2007) propose a hierarchical planning approach, as shown in figure 3-2, which divides scheduling and resource allocation into three levels: strategical, tactical, and operational. These are applied to three functional areas: technological planning, capacity planning, and material coordination. Within the capacity function for example, this leads to the functional areas of strategic resource planning, project selection & rough-cut capacity planning, and resource-constrained project scheduling. Strategic resource planning concerns firm-level activities, and therefore also control of available resources. On the tactical level, project selection and rough-cut capacity planning provide an outline of the resources needed, but should maintain flexibility for selection of internal resources or possibly acquisition of external capacities. Finally, resource-constrained project scheduling assigns resources and performs detailed scheduling. In combination with the other planning functions, this leads to detailed scheduling and resource allocation.

The framework provided by Hans et al. (2007) involves functional areas likely not applicable, and the control on all levels might exceed a practical degree of complexity for IT consultancies. Nonetheless, it seems reasonable that stages of resource allocation should be introduced. Immediate assignment of the best suited experts to a project might not always be necessary, and the firm could also benefit from assigning less experienced staff members (see section 3.2.3). Therefore, these possibilities should remain open, until the actual performance of tasks requires the allocation of these resources. This could be achieved by assigning needed competences and time-boundaries, rather than specific employees.

In order to facilitate this, workload and capacities need to be known among all
projects within the organization. Project initiators, which could be sales or project managers, have to be aware which competences are present and to what extent they are occupied with other activities – in simultaneous projects or other firm activities. They also should be given a possibility for communicating plans for potential projects. Decision makers on resource allocation, which in case of an IT consultancy can be competence team or department leaders, need to make the available capacity known, become aware of the resource needs, and assign staff appropriately. Furthermore, the actual allocation of resources should be subject to a negotiation process between different interests of the actors involved, in case conflicts arise.

### 3.4.4 Project portfolios

Beside the resource allocation conflicts, it is also obvious that capacities are limited to a certain maximum. Therefore, decisions need to be made which projects are prioritized, postponed, or not conducted at all. Firms adopting this approach consequently, by negotiating decisions with the groups involved and putting dedicated responsible in place, such as portfolio boards and managers, tend to be more successful in dealing with the multiple challenges (Dietrich, Järvenpää, Karjalainen, & Artto, 2002).

Platje et al. (1994) give a practical description of how project portfolios and their planning can be implemented: In a single project, a planning cycle is divided into the steps action, plan, do, check, and action again (see also Project Management Institute, 2004). The initial action is the beginning of the project, where objectives and boundaries are set as the basis for the first project plan. The plan is then developed and authorized. Do refers to the performance according to project plan, and the check activity is the evaluation, if the project goals have been achieved according to the plan. The following action is either corrective by the results of that evaluation or reflects further actions according to the plan (see figure 3-3).

The same concept of a planning cycle can be transferred to project portfolios: The initial action is setting priorities, objectives, and boundaries in negotiation of multiple projects. During the plan activity, a portfolio team constituted of department managers and project managers decides on the resource allocation and sequence
of projects. *Do* means that project managers and team members follow the plan of their individual projects. The *check* and *action* activities are analogous to the single project cycle, as the achievement of goals for the portfolio plan is evaluated and corrected if necessary. The resulting interrelated processes are illustrated in figure 3-4.

![Project management cycle](image)

Figure 3-3 Project management cycle (adapted from Project Management Institute, 2004, p.39)

![Planning process in multiproject organization](image)

Figure 3-4 Planning process in multiproject organization (example – Platje et al., 1994, p.102)

This planning cycle by Platje et al. (1994) has the advantage, that its concept is neutral to size of the company and internal vs. external project ownership. The overall business goals in this scheme are an abstract entity, which have to be defined and prioritized by the individual firm management. However, as indicated by Turner,
Ledwith, and Kelly (2010), in practice the extent, to which this concept is applied and to which degree it is formalized, differs significantly with organizational size, corporate culture, and possibly also national culture.

3.4.5 Project management information systems and standardization

Besides enterprise resource planning, information systems have also been developed specifically for the needs of project environments and multi-project operations. Available applications include for instance stand-alone single-project management systems (e.g. Microsoft Office Project), more sophisticated collaborative systems (e.g. Project.net, Microsoft Project Server), and ERP-integrated systems (e.g. SAP PS module). The role of this type of information systems, outlining the field of project management information systems (PMIS), lately also has received more attention in research and standardization efforts, in analogy to the established Project Management Body of Knowledge (PMBOK) by the Project Management Institute (2004).

Based on single-project PMIS, Turner and Speiser (1992) have already brought forward information systems requirements, which better reflect the needs of multiple-project environments as a programme-management information system. They define the basic modules of each the planning and the control system. The project elements, which need to be planned (scope, organization, quality, time, and cost), are identical to the ‘traditional’ single-project approach (see also Project Management Institute, 2004). However, within planning and control, some responsibilities are transferred from the (single) project manager to other management groups: Time schedulers break down the project objectives and work, and set the times at which activities are to be performed. They also control if the objectives have been met. Capacity planners maintain a master project schedule and the impact matrix, in order to decide in what order and priority projects are being performed to meet the organization’s capabilities, and balance availability and usage of resources. People schedulers schedule and perform the allocation of resources by assigning individuals to the defined work.

Complementary to this modular view, a more detailed information model for multi-project operations has been proposed (Ahlemann, 2007; Ahlemann & Riempp, 2008; Ahlemann, 2009). Results were taken over into the existing German industrial norm for project management DIN 69901-4 and will possibly influence an upcoming revised international standard for project management ISO 21500 (American National Standards Institute, 2010).

Raymond and Bergeron (2008) have found that the use of PMIS can have a direct positive impact on project planning and control, especially in meeting time and budget restrictions, as well as project objectives. Although their study also indicates that PMIS are particularly often used in the IT industry, this does not directly allow for assumptions on business performance improvements for an IT consultancy. While in their survey, the most frequently perceived highest improvement was within planning and monitoring of activities, improvement on resource allocation was the least frequently observed phenomenon. An implementation of a PMIS might
nevertheless support the planning activities significantly, but it does not consider the complexity of separate negotiation with multiple clients.

Approaches reflecting the dynamics of the negotiation processes between different actors – within the firm and various clients – in technical solutions for portfolio planning and resource allocation (e.g. Araúzo et al., 2010) are heavily dependent on formalization of the information input. The aforementioned standardization efforts in fact do not only assist project management practice, but they also facilitate this formalization process. Planning and control of activities for instance requires that project tasks along with their required time and their dependencies on one another are known. The work breakdown structure (WBS), which is commonly a part of project scope management (Project Management Institute, 2004), assists this routine by dividing the project into smaller subprojects with deliverables, and finally into several levels of work packages. Although the Project Management Institute (2004) stipulates no general definition on the size of the smallest work package, it should be “manageable”. It can therefore be seen as an assignable observable task with expected outcomes. Another example of this formalization are the various scheduling and time constraint options, which are provided in many PMIS (e.g. discussed on MS Project by Harris, 2011).

It seems appropriate to assume that an organization practicing multi-project management is relating to these concepts. We can however not assume that these concepts are implemented in an information system. This reinforces our position to maintain a nominal view on the information system requirements within the planning processes, where a detailed review of the information models and existing software applications would be outside the scope of our study. Nevertheless, the outlined requirements can serve as a basis for identifying different underlying concepts of the information required during project planning. Once the information requirements and planning processes have been specified, the available information models partially can be used for implementation at a later time.

### 3.5 Process view of IT consulting

In lack of a reference model or best-practices for information system requirements, we attempt to get insights from a simplified process view of the consulting business. There are more detailed reference process models available, for example a consulting process of a small business (Bruckman & Iman, 1980). However, our main focus is not on the client-consultant interaction. Instead, we attempt to capture the processes which are relevant for planning. The two models discussed further do not contradict one another or Bruckman and Iman (1980) and can complement this view.

#### 3.5.1 Basic phase model

A basic phase model has been used by Nikolova, Reihlen, and Schlapfner (2009) for analyzing the interaction between clients and consultants, and could be adapted for disseminating the different needs and interests of actors in the consulting firm. The scheme consists of the following main components:

- Acquiring projects
• Consulting practices
• Communicating results
• Coordinating expectations

The first three components constitute a process, whereas the latter is conducted in parallel with those. *Acquiring projects* describes the sales activities of general marketing efforts and convincing potential customers of the consulting firm's competence. During *Consulting practices*, consultants are working together with the client to analyze the situation, suggest solutions, and assist in implementing them. This sums up the main part of the project, until results are delivered. Finally, *Communicating results* is the act of presenting the solutions, as suggested or implemented to different audiences. During a project, consultants are coordinating expectations between themselves, several internal stakeholders, and the clients' actors.

### 3.5.2 Phases of a governance theory framework

Niehaves, Klose, and Becker (2006) provide a more detailed phase model, which comprises the following phases:

1. Pre-Project System Analysis
2. Project Initialization
3. Problem Analysis
4. Solution to the Problem
5. Solution Implementation
6. Project Close
7. Post-Project System Analysis and Design

Within the *Pre-Project System Analysis*, the current situation is analyzed for specifying the project boundaries in preparation to contracting. Depending on the degree of required expertise, project managers and competence team members could be involved in this step. *Project Initialization* describes the activities of contract negotiation and the 'launch' of the project. Actors involved are a sales representative and typically leading representatives of the client. Further actors from the consultancy can be present. The steps of *Problem Analysis*, *Solution to the Problem*, and *Solution Implementation* are activities of intensive interaction between consultant project managers, other consultancy staff, and various client representatives. During *Project Close* and *Post-Project System Analysis and Design*, the project results are evaluated and documented.
3.5.3 IT consultancy processes

The aforementioned phase models, combined with further knowledge on other business activities of an IT consultancy firm, can be combined to a model of main processes, shown in figure 3-5. In the following, these processes are discussed.

In extension to the activities summarized by Nikolova et al. (2009) as acquiring projects, it is likely to be common practice at consultant companies, that earlier business relationships provide a reference, and therefore customers decide to contract without major marketing efforts. This step is not further referred to by Niehaves et al. (2006).

The Pre-project analysis and Project Initialization phases, as described by Niehaves et al. (2006), are mostly consistent with actions of Acquiring projects by Nikolova et al. (2009), where the outlines of the project are defined and negotiated with the client. Within this phase, preliminary project planning activities take place. Therefore, we can assume that mainly sales, project managers, and competence team members will participate.

What Niehaves et al. (2006) refer to as Problem Analysis, Solution to the Problem, and Solution Implementation, is corresponding with Consulting practices of Nikolova et al. (2009). This is the critical point, where efficiency of the consultant work affects the business performance, as described in section 3.2.1. It involves several iterations of planning and performance. Therefore, project managers and other consultancy staff will frequently interact with each other, monitor the progress, and readjust plans as necessary.

The phase of Communicating results, as described by Nikolova et al. (2009), and further divided into Project Close and Post-Project System Analysis and Design by Niehaves et al. (2006), are not discussed in more depth here. These phases are arguably essential for evaluating the project outcomes and communicating them to the client, but more important in context of the relationship view, which is the
emphasis of both quoted studies. They are not likely to have any other implications for resource planning and allocation than aforementioned consulting practices.

In parallel to the first three phases, the process of Coordinating expectations, as outlined by Nikolova et al. (2009) and encapsulated in all phases of the framework by Niehaves et al. (2006), has a different emphasis in our study: Rather than negotiating the process and outcome between consultants and clients, a system of internal interests of the multi-project organization is assumed. The parties involved in this negotiation are sales, project management, departments or competence teams (represented by a team manager), and the general management. This process is yet to be defined further.

Finally, it should not be forgotten that an IT consultant business, within its area of expert competence, also contracts for reoccurring activities or has to perform additional tasks for clients without direct reference to a project. These will furthermore be referred to as maintenance and support (see section 1.1.3.3 – Organizational structure with project orientation). They should not be confused with the differentiation by Nikolova et al. (2009) between exploitive and explorative consulting, which merely expresses the degree to which projects are based on established standard routines. In fact, we do not consider this set of fragmented activities as projects at all, since their repetitive character or unplanned occurrence contradicts the definition of project work (e.g. Project Management Institute, 2004). Nevertheless, they are a relevant factor in resource planning and allocation. The same applies to internal activities, which are not part of any project. These can involve staff training, fragmented internal research and development, or administration routines. General management decisions are reflected in a separate process.

3.6 Framework of dynamic resource allocation

As discussed in section 3.2.1, it is difficult to define performance measures without provided comparability to existing situations (Harmon et al., 2006); therefore, an optimization with information system support has to be subject to the particular business. However, from the previous theories, we summarize the applicable parts on the IT consultant firm and define a preliminary set of meta-requirements of information. Further, we define apparent ambiguous concepts from the meta-requirements and suggest a meta-design. These elements, as also illustrated in figure 3-6, constitute our frame of reference, which can be refined during further studies, but also help to find potential for improvement in the organizations it is applied to.

3.6.1 Requirements for coordinating consulting processes

Within the following section, we describe the anticipated meta-requirements for an IT consultant company for performing the processes as outlined in section 3.5.3. Since we cannot presume if the organization has a dedicated group of planners for each function, we consider them a collaborative system of the main internal stakeholders of these processes and their coordination. The information needs of these different parties are summarized in table 3-2 and explained further in the following paragraphs. Within this table, the Focus column points out the assumed scope of interest of the role, and the Information column contains a common-language description of the
information needed to perform business processes. If there are particular features of this information, they are listed in the Aspects column.

Since our emphasis is on information exchange between the different stakeholder groups, information assumed to be acquired by the corresponding party internally is not mentioned. The same applies to information, where we cannot reasonably assume that it is exchanged. For example, employee competences and skills can be assumed as known within the team.

3.6.1.1 Sales information requirements

Without prior reference of sales activity in an IT consultancy, reasonable assumptions have to be made based on relevant aspects of S&OP (section 3.3.2), single project and portfolio management (section 3.4.4), and the acquisition process (section 3.5.3). In variation to this, the interest of sales can be assumed to mainly lie within maximizing turnover, which is realized by acquisition of new customers or convincing known clients of new projects, and contracting for most profitable projects. Of course, on a long-term view, this has to be balanced with other firm interests for not being at the sole expense of company benefits and customer satisfaction.

In order to know at what point in time projects should be scheduled, updated information on current activities’ workload and available capacity is necessary. Workload and capacity are assumed to be specific to certain competences. For deciding if ongoing projects can be rescheduled, indicators for flexibility should be given for the workload. Due to their ambiguity, the above-stated concepts require further definition.

3.6.1.2 Project management information requirements

The main objective of project managers is, to complete their projects within time and budget boundaries, which have been set in a contract with the client. Furthermore,
Table 3-2 Summarized information needs by different actors

<table>
<thead>
<tr>
<th>Focus</th>
<th>Information</th>
<th>Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>all activities</td>
<td>workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td>capacity</td>
</tr>
<tr>
<td></td>
<td>assigned projects</td>
<td>boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>budget</td>
</tr>
<tr>
<td></td>
<td>deviations</td>
<td>goals / results</td>
</tr>
<tr>
<td>Project management</td>
<td>previous projects</td>
<td>deviations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>budget</td>
</tr>
<tr>
<td></td>
<td>all activities</td>
<td>capacity</td>
</tr>
<tr>
<td></td>
<td>other activities</td>
<td>workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flexibility</td>
</tr>
<tr>
<td></td>
<td>potential projects</td>
<td>boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>budget</td>
</tr>
<tr>
<td></td>
<td>probability</td>
<td></td>
</tr>
<tr>
<td>Team management</td>
<td>current projects</td>
<td>workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time boundaries</td>
</tr>
<tr>
<td></td>
<td>potential projects</td>
<td>workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time boundaries</td>
</tr>
<tr>
<td></td>
<td>miscellaneous external activities</td>
<td>workload</td>
</tr>
<tr>
<td>General management</td>
<td>current, potential, &amp; previous projects</td>
<td>workload</td>
</tr>
<tr>
<td></td>
<td>miscellaneous external activities</td>
<td>workload</td>
</tr>
<tr>
<td></td>
<td>all activities</td>
<td>capacity</td>
</tr>
<tr>
<td></td>
<td>internal activities</td>
<td>defined targets</td>
</tr>
<tr>
<td></td>
<td>current &amp; previous projects</td>
<td>deviations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>budget</td>
</tr>
</tbody>
</table>
they are usually responsible for negotiating adjustments of time, budget, and human resources with the client (Laslo & Goldberg, 2008).

Information needs can mainly be derived from the single-project planning process (Platje et al., 1994; Project Management Institute, 2004), as also briefly described in section 3.4.4 (Project portfolios): In the beginning of the project, goals have to be clearly formulated, along with other defined boundaries of time and budget. In order to achieve realistic planning however, sales and project managers should perform the initial negotiation together. Like sales, the project manager then needs information about available staff and competences in order to compose the project team. Whereas particular team assignment is negotiated with a competence team representative, addressing the appropriate team presupposes information on available capacity and competences. In cooperation with the project team, the project manager then defines detailed tasks, controls the performance, and checks if the task objectives have been achieved according to plan. Therefore, continuous information on deviations from the plan, regarding results vs. goals, time, and budget, is necessary. Additionally, information on outcomes of other previous projects in terms of results vs. goals, as well as budget and time deviations, could be helpful for improving planning accuracy.

In order to support portfolio planning (as introduced in section 3.4.4), a project manager additionally could make use of information on other activities, which can be projects currently conducted by other project managers or for example maintenance, concerning the workload on different competence teams. Additionally, information on flexibility of this workload would help when adjusting plans of own projects. Furthermore, regarding further potential engagements in projects currently under negotiation, boundaries of goals, time and budget should be communicated, as well as the probability that the project will be launched.

3.6.1.3 Team management information requirements

Team or department leaders are formally responsible for the staff, which becomes engaged in projects and all other firm activities. Alternatively, the planning might be delegated to a coordinator. Project managers negotiate with the team representative, which human resources are made available to a project. Therefore, the latter rely on information about oncoming workload and time boundaries. In order to prevent too high workload in a particular team, flexibility should also be estimated for setting priorities appropriately. Similar to project managers, team leaders should be aware of potential projects, along with their implied workload and time boundaries, and their probability to launch.

Additionally, miscellaneous workload outside of project business has to be planned. This can include miscellaneous external activities, such as long-term maintenance, short-term after-sales service, and fragmented urgent requests from clients or project managers. Since the team planning responsible ultimately has to account for all working capacity, internal activities have to be taken into consideration. Whereas some of them might be known and inevitable, such as administration routines, targets should be defined for internal research and development and qualification measures.
3.6.1.4 General management information requirements

As previously mentioned, it is difficult to specify performance indicators without prior reference. However, some key figures can be derived from accumulation of other parties and the discussion of the business performance (section 3.2.1). Management should therefore be informed on total workload for current, potential, and completed projects over set time periods. Moreover, current information on capacity within different competences should be available. In order to determine, how much time is spent on internal vs. external activities, the reported workload should further be divided into groups by miscellaneous external activities (e.g. maintenance, support), by administration, by internal research and development, and by staff qualification. Finally, it should be monitored in which frequency and intensity there have been deviations from project goals, time or budget boundaries for current and previous projects in order to make justified strategic decisions concerning staffing, qualification, and the firm’s process and organization structure.

3.6.2 Definition of base concepts

In order to describe the information to be exchanged within planning, ambiguous terms from the previous section 3.6.1 are discussed and defined in this section. They are used as underlying concepts for providing the information concepts, prior to presenting the process design.

3.6.2.1 Competence and skill level

The differentiation of competence is necessary, for appointing team members with tasks appropriately. What we refer to as competence, more narrow in comparison to common concepts (e.g. Cohen & Levinthal, 1990), is personal knowledge in a certain domain, providing a set of capabilities or expertise within IT, such as database administration (product-specific or -independent) or development in a particular programming language.

From the discussion in section 3.2.3 (Learning perspective), we also take into consideration that personal experience of employees in a particular competence field improves their performance over time, which we refer to as skill level. More precisely, we refer to the personal efficiency, in which the tasks are being performed, and not the effectiveness. Therefore, we assume employees with the same competence but different skill level, to be capable of ultimately performing the same task, but at different paces. This concept also implies that each employee has a set of multiple competences.

Skill levels are likely to be developed further and rise over time. While we expect it to be difficult to quantify skill levels, we might only find it necessary to point out relative differences as far as necessary for determining, who should handle time-critical tasks. This notion creates a more intuitive perceivable view, but also reduces the risk of ethically questionable personal efficiency measures.
3.6.2.2 Projects and project portfolio

In our case of an IT consultancy, projects are usually client projects in terms of the definition by the Project Management Institute (2004) and the process sketched out in section 3.5.3, but also internal projects are possible and taken into consideration during resource planning. Although project resource limits could be expressed in other ways than a financial budget, this is typically the delimitation as negotiated with the client. Another potential limitation are human resources, which is the main issue of the coordination activities.

The project portfolio (see section 3.4.4) is a managed set of projects, which are being planned and conducted simultaneously. Projects, which are partially or completely planned, but not sure to be performed, are referred to as potential projects. There can be multiple portfolios in a firm.

3.6.2.3 Tasks and activities

The total workload of a project should be divided into smaller units more suitable for planning. By the definition of the Project Management Institute (2004), single project time management does not include activities, which do not lie in the project scope. While this is quite straightforward for a project manager, we wish to maintain a holistic view on the organization along with maintenance, support, and all other activities. Therefore, we use a more abstract concept of tasks (also related to Platje et al., 1994) with less specifics of project management, although there are similarities to the above-mentioned definition:

Tasks and objectives are complementary and hierarchical elements. That means, a task is planned to achieve a defined set of objectives in- or outside of a project. It is divided into more concrete subobjectives and subtasks for more planning accuracy and better understanding. Performance of a (sub)task has one or more dependencies on other tasks, constraints, and workload for a certain competence.

The smallest subtask should be performed with specified prerequisites by a definite group or individual, where a further break down step would not be beneficial for planning purposes. This could also be seen in analogy to the work breakdown structure of the Project Management Institute (2004). However, decomposition into work packages is a highly variable and detailed issue of project management, which lies outside our scope of analysis. Thus, when we discuss task assignment and performance, we consider the smallest useful unit as given.

3.6.2.4 Priorities, time constraints, and flexibility

We could consider projects as a whole and tasks (inside or outside of projects) to have a defined priority, which expresses a general sense of urgency. Constraints, as also used in project time management (Project Management Institute, 2004), could be used in addition to define certain frame conditions to be fulfilled.

Constraints can be expressed in many different ways. As examples which are commonly used in PMIS, a task could be directed to start not before a certain date (e.g. project kick-off), not end before a certain date (deadline), reoccur at least in a certain frequency (e.g. meetings, training), or not start before the end of another
certain task (see e.g. Harris, 2011). Additionally, constraints can also stipulate monetary boundaries (budget).

However, if there are many combined constraints, unreflected fulfilment of all such conditions can limit planning capability more than intended. For example, moving a task beyond a deadline for the benefit of progress on another project for the same client would possibly only be a matter of discussion with the customer. Therefore, although it is difficult to quantify violations of such ‘soft’ constraints, it should be done as far as possible to facilitate prioritization. The sequential dependency of one task on another can also be a constraint, but ‘hard’, as it cannot be resolved without changing the contents of the task.

In our meta-design, we suggest different concepts for different purposes. Every project and task, where appropriate and feasible, should be assigned constraints, but with three varying settings:

- constraints, which have either a priority, or quantification on violation;
- constraints, which are not directly quantified or prioritized, but instead consider the dependency of another task;
- constraints, which are not prioritized or quantified; instead the priority is expressed for the task.

Constraints of once-occurring tasks should either be quantified or be assigned a priority level (e.g. “critical”, “high”, “normal”, “low”). A constraint for reoccurring events is usually impossible to quantify on violation, since missing out on fulfilment often has no direct severe consequences (e.g. staff training can be rescheduled). Therefore, instead the task itself should be assigned with a priority, which expresses the meaning and urgency for the firm (e.g. “strategic”, “critical”, “normal”). For reducing complexity, a task with further dependent tasks should not directly ‘inherit’ quantification and priorities of those; however, the decision-maker should be made aware of critical dependencies.

It should be expected that the assignments of such constraints is still quite difficult. Aforementioned appropriateness and feasibility are vague criteria, and should be seen in context of usefulness of this information during planning processes. As it would exceed the scope of our study, we do not specify where each constraint type should be used. Furthermore, such constraints should be based on realistic and justified estimates.

3.6.3 Definition of information concepts

Our hypothesized information exchanged between processes can be quite detailed. Therefore, we propose more comprehensive information concepts, partially based on the above-stated base concepts, for use in our model. In absence of specific reference, some of these may only describe rough outlines.
3.6.3.1 Objectives and main tasks

The communication of objectives, as stipulated in our hypothesized process, includes a rough description of work to be performed and preliminary constraints of the necessary tasks (as defined above) to achieve them. These constraints include desired time or priority, and budget limitations, if applicable. It is implied that objectives are subject to negotiation with the recipient before tasks are specified.

Main tasks are considered on an intermediate level between a project and a ‘workable’ task. They should be comprehensive enough to allow for preliminary flexible planning, but sufficiently detailed for facilitating estimations on constraints and competence needs. When main tasks are communicated, their work description as well as these constraints and competence needs are implied to be included.

3.6.3.2 Competence needs and competence availability

As explained in the base concept above, every employee is considered to have certain competences and skill levels. For ease of reading, skill levels are not mentioned explicitly in the process descriptions and maps. When a planning instance specifies competence needs, this means that the competences and skill levels for achieving an objective or completing a (main) task are estimated. This estimation includes the amount of time needed and the constraints of the task, however not the task description itself.

As the complementary concept, competence availability is the accumulated competence and skill a planning instance has access to. It does not stipulate a direct assignment of a particular person; in fact, it is its purpose to avoid this. This means, when an instance reports the competence availability to another one, it confirms that the other one can have access to some resource with the specified competence and skill level under given time and constraints.

3.6.3.3 Resource needs and resource availability

When tasks are planned more precisely, they are assigned a resource, i.e. a person, to perform them. For this purpose, a planning instance will specify resource needs, which in fact coincide with the competence needs as defined above. However, rather than only ensuring if such competence can be provided, a specification for resource needs results in the allocation of a specific person.

This allocation is expressed, when reporting the resource availability. It assures the requesting instance that the specific person will be able to perform for the amount of time and under the constraints given.

3.6.3.4 Workload and capacity

Workload is the amount of working time within a certain time interval (e.g. one week). This includes previous tasks and tasks currently under performance, but also future tasks. In other words, it is the total amount of time made available, as competence or resource. Similarly, the capacity is the total amount of time, which could be available within the same time interval.
When they are reported, we imply that both values are categorized. However, we can make only few assumptions about the particular categorization as suitable for the recipient (i.e. general management). We at least consider total working time, time paid for by customers (see section 3.2.1 – Business performance of service providing companies), and a division by main firm competences as straightforward categories.

3.6.3.5 Initiation (of a project)

In our hypothesized process, projects are first integrated into a portfolio and later initiated. Initiation means the instruction to commence planning of a particular project and communicating all project-specific information, i.e. at least the objectives, and if available also main tasks.

3.6.3.6 Deviations

When the actual performance differs from plans in terms of time, budget, or other constraints, this may affect other planning instances or firm performance. Therefore, these deviations are reported. However, we do not further make assumptions in which form.

3.6.3.7 Potential

By potential, we mean sales’ information on potential engagements (projects, maintenance, etc.), which can be useful for consideration in planning processes. This should at least include anticipated competence needs (including preliminary time boundaries) and expected revenue. The latter might not only be in direct financial form, but also involve strategic meaning. It should be quantified (e.g. in terms of expected successor projects’ revenues) in order to allow comparison. As the certainty of this information can be assumed to be increasing throughout a sales process, the probability of an agreement should also be estimated.

3.6.3.8 Marketing decisions

We consider marketing decisions as directives, which competences should preferably be pursued for selling. Possibly, this could also give instructions which clients have strategic importance.

3.6.3.9 R&D and team development

Based on the discussion in section 3.2.3 (Learning perspective), we assume that a certain amount of time in an interval (e.g. one week) is reserved for firm-internal research and development. Additionally, team development time can be used to build competences on an individual level. We consider the communication of research & development (R&D) and team development as the directive to a planning instance, to plan these activities and have them performed.
3.6.3.10 Impact on competence needs

Planning and performance within one process might affect the future oncoming tasks and therefore the competence needs of another. Where this is predictable (as of section 3.2.2 – *Project business models*), the estimated changes in competence needs of the recipient are provided.

3.6.3.11 Need for rescheduling / renegotiation

Reporting need for rescheduling to another instance means, to instruct the recipient to reschedule its tasks according to changed competence needs, e.g. due to deviations of this or another project. Similarly, such deviations might make it necessary to rearrange commercial matters with a client, which is expressed by the need for renegotiation.

3.6.4 Design of processes and dynamics

Combining the insights from a basic consulting process, as outlined in section 3.5.3, with the discussed fields of theory, we can refine the process map to more detailed processes, which take coordination into account. These dynamic processes are

- *sales*,
- *project resource planning*,
- *miscellaneous resource planning*,
- *project portfolio planning*,
- *resource allocation*,
- and *general management*.

The sales process is mainly derived from the different stages of consulting, and complemented with the principles of sales and operations planning as proposed in section 3.3. Project resource planning, project portfolio planning, and their interrelation are built upon the insights of section 3.4.4. Miscellaneous resource planning comprises the planning of maintenance/support and additional project-unrelated activities, whereas we assume this to be a planning process in analogy to project resource planning and project portfolio planning. Resource allocation is the planning process, which decouples the assignment of resources from the aforementioned processes, as indicated in section 3.4.3. The general management process is partially hypothesized from the other processes, reflecting some of the aspects brought forward in section 3.2. In addition, the client is considered as an external process, but only to illustrate the influence. Therefore, the client receives no information in any of the processes.

Within the following section, we describe the processes and proposed information exchange therein, based on the meta-requirements and aforementioned theories, forming a nominal information system (see section 3.1). These processes can exist in multiple instances at the firm and run simultaneously.
Each process is divided into subprocesses, which are performed by certain roles rather than definite actors, but possible role assignments are discussed. Some subprocesses have information requirements, as defined in section 3.6.1, sometimes embedded in the aforementioned concepts. Subprocesses also yield output information which is forwarded to other instances. External information flow, which is not directly synchronized with the process under discussion, are shown in some cases to facilitate understanding. It is not defined how exactly decisions are made within subprocesses, since this cannot be generalized; it is only specified which information it is based on. Furthermore, information transferred within the process (work) flow is implicit. Process maps are shown in the notation explained in figure 3-7 and using roles listed in table 3-3.

![Figure 3-7 Notation for process maps](image)

### Table 3-3 Roles in processes

<table>
<thead>
<tr>
<th>Process(es)</th>
<th>Abbreviation / Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>S   Sales person</td>
</tr>
<tr>
<td>Project resource planning</td>
<td>PM  Project manager</td>
</tr>
<tr>
<td>Miscellaneous activity planning</td>
<td>MP  Miscellaneous activity planner</td>
</tr>
<tr>
<td>Project resource planning,</td>
<td>TM  Team member</td>
</tr>
<tr>
<td>Miscellaneous activity planning</td>
<td>(assigned resource)</td>
</tr>
<tr>
<td>Project portfolio planning</td>
<td>PP  Portfolio planner</td>
</tr>
<tr>
<td>Resource allocation</td>
<td>RA  Resource allocator</td>
</tr>
<tr>
<td>General management</td>
<td>GM  General manager</td>
</tr>
</tbody>
</table>

#### 3.6.4.1 Sales

Emerging from the concept of S&OP (section 3.3.2) and the consulting process (section 3.5.3), the sales main process can be seen as an iterative set of subprocesses. Namely, these are pre-consulting, preliminary planning, and negotiation, which eventually leads to an agreement with the client, or otherwise end of negotiations. Besides projects, this agreement may also be an outline agreement for regular maintenance and support services, as discussed in section 3.2.2 (Project business models). The resulting process is visualized in figure 3-8.
Another major field of sales activity is **marketing** for the entire firm or particular competences. Partially, focus on such competences is based on strategic marketing decisions by the general management. In addition, the workload within competence teams should constantly be monitored. If a competence team could handle more projects or maintenance and support services, marketing efforts should address these in order to maximize the amount of time, that employees are working for external engagements. Throughout the marketing efforts, sales informs project portfolio planning and miscellaneous activity planning about potential agreements.

Before contracting, clients cannot generally be assumed to know exactly which kind of IT solutions they are aiming for, when initially expressing their objectives. Therefore, the sales area comprises more activities beyond negotiating prices, service levels, etc. Such a pre-consulting service comprises analyzing the current situation and obtaining a realistic view on goals, time, and budget boundaries of a potential project or maintenance agreement. As some degree of expertise is necessary, sales may have to request (allocate) a person from a team. This person, possibly a project manager, technical expert, or a combination of these, can help sales in preliminary planning to reasonably estimate, which main tasks will have to be performed for achieving the client’s objectives. This also includes preliminary constraints and competence needs. If such estimations cannot be reasonably made, it should be delegated to project resource planning.

When the consultant firm is aware of the outline conditions and commences to **negotiation** with the client, it has to provide for the resources to be sufficient when needed by a project. Thus, information on the current capacity within competences has to be taken into account, as well as the engagements of other projects and maintenance activities. This ‘internal negotiation’, when and in use of which resources a project can be performed, takes place in a project portfolio planning process. We assume that sales reports the competence needs to this instance and obtains the competence availability from resource allocation. If currently known tasks suggest that the new project tasks cannot be accepted within the constraints set, negotiations have to aim at finding a compromise. This compromise can result in moving the time boundaries of existing projects, of the new project, or other various possibilities. If main tasks have been found to be inappropriate for meeting the objectives, pre-**consulting** to **negotiation** with the customer can be performed in several cycles. Moreover, changes in the project portfolio or deviations from existing project plans may now or later require renegotiation with the client. After each negotiation, project portfolio planning or miscellaneous activity planning receive updated information on the potential of an agreement.

Finally, when the IT consultant firm and the client have come to an **agreement** on a project, the project is integrated into the existing portfolio, and preliminary plans should be forwarded. Similarly, if the agreement is on maintenance and support, the change in competence needs is estimated and provided to miscellaneous activity planning.
Figure 3-8 Sales
Project Resource Planning

Project resource planning, as a part of overall project planning, begins with the pre-study (consultative selling) or with project initiation from the portfolio. Afterwards, recurring steps of planning, performance, and follow-up are conducted until the end of the project, as summarized in figure 3-9. In case of a pre-study, the resulting information is forwarded to sales for potential re-negotiation with the customer. The most information-intensive step therein is the actual planning.

Internal projects may for example occur due to directives from the general management for research and development activities in a particular field. External (client) projects are triggered by sales activity for pre-studies or the portfolio. Within the planning stage, a project team is composed from resources with the needed competences. In a pre-study, project managers and team members then collaboratively break down the project objectives into main tasks and estimate the time and constraints for performance. If a project has been initiated, known activities are further detailed and assigned to appropriate resources. The latter may have to be requested from the resource allocation. It is at the responsibility of the project managers to monitor that previously set project boundaries are kept in the plan and project administration (e.g. accounting, meetings) is considered. In case project managers have sufficient technical competences, they can participate in the task definition, and otherwise more act as moderators. If the project is already at or past the initiation stage (i.e. part of the portfolio), performance is taking place. Moreover, miscellaneous activity planning instances are informed if project activity might have an impact on future maintenance and support activities (e.g. due to elevated risks of system outages).

Throughout the planning, performance, and follow-up cycles, project managers need to make sure that allocated resources can actually perform the tasks, or that the task constraints are adjusted as necessary. This is subject to further planning and resource needs specification, and possibly negotiation with the resource allocation instance. In return, resource allocation provides information on availability of resources, and in case of shortages, requires project management to adjust plans. According to the concepts, the decision on requested competence is made based on the nature of the activity to be performed, whereas the demanded skill level is based on the perception if the task is time-critical.

During performance, project managers keep track of the progress of planned tasks within the set boundaries (goals, time, budget). In follow-up meetings with the team, the achievements are monitored. Tasks not performed as planned are possibly re-planned, and newly occurring tasks and responsibilities are made known to the resource allocation instance. Furthermore, deviations from the boundaries are reported to the general management and project portfolio planning. The latter also handles the case, where boundaries have to be changed (e.g. due to their impossibility of achievement). Over time, the adjustments due to deviations can also be used to improve the planning estimations.
Figure 3-9 Project resource planning
3.6.4.3 Miscellaneous Activity Planning

Miscellaneous activity planning comprises the activities necessary for preparing the various fragmented internal and external tasks which are not part of any project plan. External activities may be any of the business activities discussed in section 3.2.2, which in this case are summarized in maintenance and support. Internal activities are assumed additional activities, which are partially inevitable to occur in any organization, such as administration tasks. In analogy to other planning processes, this process is divided into the steps of activity planning, performance, and follow-up. The influences thereon, steps, and information flow are summarized in figure 3-10.

This area of planning is partially subject to high uncertainty. First of all, depending on their degree of urgency, tasks have to be performed quickly (e.g. in case of critical technical malfunctions) and without re-coordination with other planning instances. Therefore, planning on such tasks does actually not always take place explicitly. Moreover, after-sales service activity is subject to changes in technology. This change can be, but is not necessarily, indicated by potential sales or ongoing projects of existing clients migrating to newer systems.

Nevertheless, we do assume that at least a planning instance for such maintenance tasks exists, and it is handled by the team leader or coordinator. If direct requests from clients bypass the explicit planning, they have to be taken into account by further planning cycles, rescheduling other tasks as necessary.

Relevant tasks could for example arise from direct requests by clients or longer-term after-sales service agreements. Furthermore, they can be project-unrelated activities, such as reporting.

The nature of activity planning is, to determine which tasks are necessary within defined time intervals and which priority or constraints these tasks have. They are matched with resource availability from the resource allocation instance. Based on this, appropriate needs for resources within certain competences are assigned. However, assigning a specific person does not yet take place, but is instead forwarded to the resource allocation instance. Nevertheless, it is expected to be carried out by the team leader or a representative coordinator, and therefore might be handled by the same person.

After planning, the tasks are performed and followed. If tasks could not be completed according to plan, they have to be rescheduled. Furthermore, negotiations with resource allocation may require miscellaneous activity planning to revise plans.

3.6.4.4 Project Portfolio Planning

The project portfolio planning instance decides, which projects are being performed with the firm’s available competences, and at what time, according to the concept discussed in section 3.4.4. In analogy to the project planning process (see also Platje et al., 1994), it is performed in cycles of planning, performance, and follow-up, as summarized in figure 3-11.
For smaller projects, it may be more practical for sales to bypass the explicit portfolio planning. Additionally, extended maintenance and support activities, which reach an unexpected volume of workload, might occur and cause immediate change of competence availability. However, we do assume that all activity requiring project management involvement are at some point integrated in the portfolio. If bypassed, a project has to be integrated into the portfolio during later planning cycles.

For new projects within the negotiation phase, planning takes into account available information on project main tasks, including required competences and their constraints, and matches them to available capacity (i.e. competence availability). When aligning projects which cannot be conducted simultaneously, the potential, i.e. the probability to launch, as well as the expected revenue, is taken into account in addition to the constraints. Whereas the project outline data is provided by the sales instance, current information on capacities is given by the resource allocation process. Internal projects may also be brought into the portfolio by the general management. When a project is due to launch, the portfolio planning initiates it and makes all previously specified information (e.g. main tasks, constraints) available.

For existing projects in the portfolio, performance means that the individual projects are being performed according to their plan. The progress is constantly monitored in their cycle. If individual project time plans have to be changed, or earlier competence assignments have shown to be inappropriate, as indicated by deviations from project resource planning at follow-up, the portfolio has to be adjusted. In case of projects competing on competences, portfolio planning decides on the prioritization, based on the indications given in terms of (possibly quantified) constraints, revenue, or further dependencies.

Project portfolio planning is expected to be carried out by project managers, who are competing on resources. Due to the complexity, it is likely that team leaders or coordinators are also participating actively. Sales staff can be part of this process as well for representing the customers’ interest. In larger organizations however, the portfolio planning might be performed by a specialized team of portfolio planners, and not take all stakeholder parties into account directly.

3.6.4.5 Resource Allocation

Resource allocation has the responsibility of making resources available to planning instances. This means, to actually name a specific person to perform a task. In addition, the information on available competences is supplied to the project portfolio planning. Furthermore, this is the planning instance where conflicts in resource allocation or competence reservation are negotiated, as suggested in section 3.4.3. This process is outlined in figure 3-12.

For consistency, we consider a resource allocated, when its availability has been reported to another planning instance. It is up to the latter, to follow-up if tasks are actually being performed as planned. However, in case the assigned resource is attending to other tasks (e.g. urgent support activities instead of a project), we consider this a disallocation and following reallocation.
Figure 3.11 Project portfolio planning.
Assignable tasks can arise from any project (i.e. project resource planning), maintenance, support, and internal activities (i.e. miscellaneous activity planning), and a small sales pre-study. However, strictly personal tasks, such as training and specific administration (implicit) also have to be taken into account. Personal training decisions could for example arise from general management directives on team development. Depending on their priority, such tasks might be planned and deducted from the available resource or competence availability, before the latter is reported to other planning instances. Furthermore, information on the actual assigned workload of all tasks is reported to the general management, possibly divided into categories.

As soon as a previous planning instance (project resource planning, miscellaneous activity planning, or sales) has specified its resource needs in terms of competence, skill levels, and the constraints of tasks to be performed, the resource allocation instance assigns (i.e. allocates) resources as appropriate. If several specified resource needs are in conflict, the availability is subject to negotiation between the resource allocator and the other parties involved. In case of non-time-critical tasks (as indicated by the required skill level), a certain amount can be equally considered as qualification-relevant and therefore, be assigned to staff with lower skill levels (see section 3.2.3 – Learning perspective).

Similarly, project portfolio planning specifies competence needs for potential projects, projects yet to be initiated, or projects which had to be rescheduled. When competence availability is reported in return, these competences are reserved. Since there may be more than one portfolio instance requesting competences in a certain time interval, or future competence needs could collide with long-term plans of another instance, this can also be subject to negotiation.

Due to the personal character of this process, it is likely to be ultimately be performed by a team leader or coordinator. In larger organizations, it may be carried out on several levels and iterations. The decision on resource-competing tasks is made based on quantification of constraints or priorities. However, once resources have been granted to a different planning instance, they cannot simply be withdrawn. In case of such conflicts arising, the concerned parties are participating in a negotiation directly. These parties can be sales, project managers, if applicable portfolio managers, and team leaders or coordinators.

### 3.6.4.6 General Management

For the general management process, we can reasonably assume that decisions are made on a strategical level, less on tactical, and not on operational. Therefore, decisions are not made directly within the sales, planning, and allocation processes, but provide their main directives. Furthermore, general management monitors the overall firm performance based on considerations discussed in section 3.2.1. The process is summarized in figure 3-13.

The strategic decisions provided to the resource allocation instances are the amount of time, that should be dedicated to internal research & development (R&D) and team development (e.g. staff qualification measures). Achievement of these objectives can be obtained from the resource allocation instances, which provide information on workload within the various competences, categorized by projects (current, potential,
Figure 3-12 Resource allocation
and previous), the maintenance and support tasks, and internal (administration, R&D, qualification) tasks. Whereas the amount of workload needed for administration is also monitored, it cannot be assumed to be influenced directly, but rather by organizational decisions. The general management can also plan internal projects with their main tasks, and propose them to the portfolio. If such projects are complex, they might require a pre-study in a separate project.

Moreover, deviations on current and closed projects are monitored. However, decisions made based on this information and the conclusions thereof only partially have a direct impact on other planning instances. While general management could temporarily lower the qualification or internal project time quota to compensate for workload peaks, other strategic decisions such as the staffing of competence departments (e.g. in terms of annual growth) have delayed effects and cannot be considered in this model.

Finally, the general management also gives strategic direction to sales. The latter then adjusts marketing to particular competences or clients.
Figure 3-13 General management
4 Case study

In this chapter we introduce the background of our case study, and describe how it has been conducted. Afterwards, we present our findings and systematically analyze them in context of our frame of reference.

4.1 Case study description

Our case study was carried out at a medium-sized IT consultancy in Sweden. The company under investigation has experienced continuous strong growth, increasing in size from 30 employees in the year 2000 to more than 110 employees in 2011. The first initial contact with the company was taken with the firm’s quality manager. In two more meetings with the quality manager, a resource planner, and the human resource manager, the topic and outline of the study was discussed, and indications for the reflection of our research problem in practice were given. Moreover, we were presented an overview of the planning processes.

Afterwards, we were given the approval to hold interviews. Based on our frame of reference, we requested time with people with certain roles in the organization, which we felt could provide representative input for our study. These were namely

- sales,
- team managers,
- project managers,
- and the general management.

A list of candidates along with their role description was given to us, and it was up to us to contact them and set up meetings. Not all employees on the list were available, but everyone we got in contact with was able to set up a meeting with us.

In addition to these four positions, the first interviews highlighted the role of the solution architect, which was not part of our framework. Whereas the first impressions did not suggest that solution architects are a firm-specific role, it became apparent that they are participating in many planning activities, which we had originally associated with the other aforementioned roles. Therefore, we requested an additional meeting.

A few of the interviewees have more than one role in the organization, depending on projects they are involved in (e.g. project manager and solution architect). In this case, we asked the interviewees to provide us with information on one particular role and also only considered questions intended for this role.

In total, eight interviews have been conducted with each one person representing

- sales (2),
- team leaders (2),
- project managers (2),
general management (1),
and solution architecture (1).

The questions we intended to ask during all interviews are listed in Appendix A. Due to the semi-structured approach (see section 2.5.2) however, many of them were adapted or skipped throughout the interview. The first part of the questions was specific for each role, as they were aiming to understand working practices and planning activities from a different point of view (section A.1). Furthermore, for all roles, we were interested how their current work practices were already supported by existing information systems, and how this was facilitating planning (section A.2). Moreover, since the interviewees are mostly dealing with implementation and use of technical information systems within their business, we felt it was also appropriate to ask for their opinion on feasibility of supporting more working and planning functions with new or changed information systems (section A.3).

4.2 Findings

In this section, we present the findings of our case study. First, we review general information on the established planning procedures, which we received at an early stage of our study, before the interviews. This information was also consistently referred to by the interviewees. Afterwards, we describe our findings from the interviews divided by their aforementioned roles.

In case the interview responses (recapitulated individually in Appendix B) were in accordance with one another, they are summarized and taken for facts, or where more appropriate, presented as opinions from each perspective. If not consistent, the differences are discussed further. In all cases, the process-related questions yielded answers, which pointed towards desirable organizational change rather than information systems support. However, to avoid early interpretation, these findings are also included and reviewed if they can be related to information systems.

Due to the various nature of the answers, it was not possible to apply the originally planned structure to the responses. To facilitate understanding of the findings and their later use within the analysis, the different perspectives are categorized by

- objectives, role, and process description;
- problems and organizational change needs;
- information use and information needs.

Additionally, since the management interview included a number of information requirements concerning other departments, there is a further distinction between their own and firm-wide information aspects.
4.2.1 General information

The firm is divided into teams. Most of the teams are defined by their technological competence. Other teams are functional, such as marketing, management, and project managers, and there is one separate team in a remote location. Each team has a team leader. The team leader is not always handling resource planning, but instead leaving this to a team coordinator. Some of the competence teams are relatively large, so they are divided into sub-teams.

There are two sets of planning meetings. One is taking place once per week and the other one once per month. Every week, staff with coordinating functions inside the team (e.g. project leaders, sub-team leaders) meets to discuss the current total workload, and which resources are assigned to it. Later the same day, the team leaders, general management, and if applicable project managers meet to discuss tasks in ongoing projects, problems etc. The planning horizon in these meetings is two weeks. The second set of meetings is taking place once every month. It is conducted similarly as the weekly planning, but with a planning horizon of three months. Results of both meeting sets, regarding estimated workload, resource availability, and resource assignments are recorded in a spreadsheet. The precision of these records is limited, to allow flexibility; e.g. project workload is not detailed to the task level.

The terms of ‘project managers’ and ‘project leaders’ needed early clarification: While project managers form project teams, project leaders are part of a competence team. Their different roles and responsibilities are discussed within the following interview summaries. In most other cases, we were able to use the reference terminology (e.g. competences, skill levels) in communication with the interviewees.

4.2.2 Sales

4.2.2.1 Objectives, role, and process description

One sales person (S1) we interviewed works with new and existing customers, while the other sales person (S2) works only with existing customers. Both have expressed that sales efforts are not based on available resources. The focus is on customer orientation and maximizing turnover.

The sales process with new customers can be described as follows:

1. Prospect
2. Identify
3. Confirm
4. Qualified Offer (supported by pre-study & internal negotiations)
5. Acceptance
6. Transition
In case of known customers, steps prospect and identify are not present. When there is an outline agreement with the customer, the acceptance can be a simple request or confirmation.

After the first initial contact with a customer, sales takes a so-called “pre-sale person” to the client. S1 usually negotiates this pre-sale person with the team leader, while S2 goes directly to the specific pre-sale person S2 found appropriate. According to S1, it should usually be the team leaders, who have the responsibility to know the competences and resources of their team. Therefore, sales people are not supposed to organize a pre-sale person directly. Typically, there are between two and six meetings before an agreement can be made for new customers and two or three meetings for existing ones.

Customers have a varying degree of knowledge on problems and solutions, and therefore solution architects are often needed. After the first meetings with the client, S1 will once again negotiate with the concerned team leader for a solution architect; S2 attempts to approach one directly.

4.2.2.2 Problems and organizational change needs

S2 has pointed out that it is difficult to keep team leaders informed about new project launches. There is also no reliable information on resource availability to sales, as teams always seem to be busy. Solution architects are aware of the resource situation, but sales is not, which can cause allocation conflicts.

Both sales people express that there is a high dependency on, but shortage of solution architects, in the offering process. S1 says that the architects often agree to handle tasks, but do not actually have the time to perform them.

The sales process sometimes takes too long. S2 has experienced cases where customers lost interest in a new project. Both sales people agree that this is partially caused by this shortage of solution architects, but mainly the low priority of unpaid sales activity. S1 also sees a cause for the delay in the detail of specification demanded from the customer by solution architects. Sales instead wants to come to an agreement sooner.

Sales has the goal to get paid for as many pre-studies as possible, so they can involve more people in the process of identifying tasks, problems, and goals. However, some customers are unwilling to pay for offers, and therefore the risk for the consulting firm has to be minimized by limiting resources.

According to S2, 80–90 percent of the volume comes from existing customers, so it is important to focus on them and build strong relationships. Therefore, there should be project and delivery portfolios for each customer, maintained by teams of between two and five people. They should develop future plans and business cases for the customer on a wider solution basis. Meetings and follow-up should be at least once every three months. In addition, pre-sale people in the competence teams should be available to further sales activity, especially to new customers.
4.2.2.3 Information use and information needs

The information system use differs between the sales people. While S1 considers the CRM system very important, S2 would see a use for it, but not in its current state. S1 finds it useful to track contacts with various customers, but criticizes that this information is not complete, and therefore does not help when getting confronted by a client about other deliveries outside of sales’ range of view. S2 cannot fit the CRM system into the work flow, since there are many contacts with few customers, and it would take too much time to enter this information; a better integrated solution could help this. Both sales people generally agree that a CRM system can be a good source of knowledge about the customer and upcoming projects. Other tools used by S2 are a calendar application and spreadsheets to track the customer activity.

S1 notes that previous project information would be sufficient in summaries, what has been done for a customer. However, for time planning, it is not of much importance.

Information about time available of the solution architect would significantly help, according to both sales interviewees. The workload on different competence teams and skill levels of employees are not so important according to S1, because the team leaders already have good knowledge about that. S2 keeps a ‘CV-database’ of the people S2 is working with in projects to determine, who would be suitable for a project. There is also a company-wide database, but it is not updated frequently enough.

4.2.3 Team Leaders

4.2.3.1 Objectives, role, and process description

Team leaders have the goal to provide competence to the customer and other teams, and to develop it further. Their main activity is planning. In some cases, planning activities are performed by staff coordinators. Generally, there is a high degree of self-organization of individuals and where applicable the sub-teams.

The way of working and customer base is different from team to team. One team has a customer that stands for 70% of the workload. Another team has a more diverse customer base with approximately 40% maintenance and support, and at least 37% projects. The remaining time is dedicated to team development.

New projects can come from sales, but depending on the specific competence sub-team, a big portion of the new engagements is acquired directly by the team from the client. Each team has its own “project leader” working mostly within the scope of the team, in contrast to the project managers, who work cross-teams and with larger projects. The project leaders often take the role of a sales person when figuring out the needs of the existing customers. The team leader or coordinator prioritizes the projects within the team.

One team leader has expressed that sales has good knowledge about the team and available resources. However, the other team leader expressed the opposite, saying that sales does not really know what they can offer, but they have recently initiated efforts to fix that problem.
Often, project leaders and project managers request which person they need for a task and also approach them directly. If they ask the team leader or coordinator or in case of conflicting tasks, this can be negotiated. Furthermore, architects have different responsibilities and methods. Some of them act as project leaders and request resources, but in some cases also directly assign tasks.

4.2.3.2 Problems and organizational change needs

Both team leaders have stated concerns about the accuracy of planning over longer periods of time. Partially, the cause was seen in the shared availability of team members to both projects and maintenance/support. If a team member has to take over a maintenance task, the project might get delayed, sometimes without notice. In addition, one team leader pointed out that the plans of projects by the team-based project leaders are not updated frequently, when requirements and the project description have changed. The suggestion is that this should be done by the project leader or architect.

According to one of the team leaders, teams should cooperate more, to find common objectives. Several team-based managed projects could sometimes be merged to one larger project.

4.2.3.3 Information use and information needs

Team leaders feel they have sufficient information about the competences of their own team members, but could use more information on other teams. Partially, this is covered by a firm-wide competence database with CVs; however the information is not used often, since it is out of date and impractical to use. There has been a competence matrix, but it is also no longer updated. Nevertheless, both team leaders consider this information very important, and feel the organization, especially new employees, would benefit from more updated and organized information.

Although the team leaders are aware of the CRM-system, they only use it for new customers; it has a minor influence on planning. According to one of the team leaders, a working and easy-to-use CRM system would support the working process.

4.2.4 Project Managers

4.2.4.1 Objectives, role, and process description

Project managers are responsible for larger projects (usually 500+ hours) and often complex efforts requiring competences from different teams. Project management can also be provided as an external service.

Project managers form a team on their own. Their team leader negotiates, who is picking up projects from sales or other teams. When sales contacts the project manager for a new project, it can come at many different maturity levels, usually depending on the sales person’s knowledge in the field. It can range from very early in the process, set up project plan, activities, goals etc. to the handover of a running project. The latter is however not common.
4.2.4.2 Problems and organizational change needs

The project managers wish to be involved earlier in the sales process, as they would like earlier influence on the project, discuss time boundaries, and to some extent also the scope. The desired influence on activities differs between project managers. While one of them expressed that more influence on planning of documentation, implementation, and testing would be desirable, the other one feels that it can be up to the architect. However, direct contact with the customer would help to develop a common understanding of the project goals. As of now, project managers discuss priorities and scope with the customer and refer to sales for commercial issues.

Project management is highly dependent on solution architects. Partially, this is due to the latter’s expertise in technical definition and time estimation. They partially however take responsibilities of distributing tasks and monitoring. Team members performing tasks are also often not aware of higher-level objectives. If the architect becomes unavailable, the project manager cannot proceed. Moreover, this limits cooperation between teams. Currently, competence teams work by their own methods and tend to put a lower priority on support of cross-team projects.

One project manager sees sales as the owner of the whole delivery process, which should also determine priorities and flexibility of projects with the customer. Teams could act as resource pools, and solution architects could more act as senior developers. The other developers should however also have more information about the project goals.

4.2.4.3 Information use and information needs

Team leaders know about competence and skill levels within their teams; therefore, a competence database is neither used nor required by the project managers. Resource availability is only seen as critical, when it comes to solution architects. The project managers are often not notified, when tasks are not performed according to plan, for example because architects had to respond to urgent activities. Therefore, project managers feel they would benefit from more frequent information of architects’ activities.

For project planning, project managers generally use their own methods, and occasionally a few standard software tools (such as MS Project, but only for Gantt charts). There is no perceived need for further information system support in this function, although none of the interviewees expressed they would not make use of a more appropriate tool.

Regarding the CRM system, one interviewed project manager has not been aware it existed, and the other one sees little use in it. In the latter case, this is due to the high amount of information, which is not suitable for the manager. Nevertheless, project managers would like to know about earlier projects and activities with the customer, and also find early information about upcoming projects useful.

One project manager further would see benefits in a knowledge base, to exchange information about previous projects. This could be organized in form of a wiki. In addition, process templates for follow-up would be useful to standardize reporting.
4.2.5 Management

4.2.5.1 Objectives, role, and process description

Within resource planning and allocation, the management aims at optimizing the firm’s activities towards value creation. This means pursuing development of competences, marketing, and the business, while avoiding unnecessary administration work.

The firm’s general management team consists of CEO, quality manager, human resources (HR) manager, and marketing manager. Human resources management is a new role, to facilitate planning and resource allocation across teams. The management is generally not taking part in operational decisions, such as priorities of projects, unless they escalate. However, general managers do take positions in steering committees of critical projects.

Besides strategic planning, the HR manager, quality manager, and marketing manager support team leaders in their tactical planning, if necessary. Once per month there is a meeting, where details are discussed on current customers, projects, individual issues concerning staff members, and the performance.

Currently, marketing is not separated from sales, i.e. customer acquisition is performed by the same staff as marketing with existing clients. The marketing manager is responsible for matching sales activities with the available competences, for adjusting marketing, or encouraging competence development.

4.2.5.2 Problems and organizational change needs

Typically, smaller projects are handled by team-based project leaders, whereas project managers take over larger projects. Sometimes, it would be useful to also merge several smaller projects for the same client into one larger project. This is however subject to the cooperative decision of involved team leaders and project managers. Since it is not a defined process, it is difficult to decide when this should be done.

Each team needs a different profile for planning. Whereas it might be possible in some teams and for some tasks to plan ahead more than three months, this is not suitable for others. Therefore, the management suggests to also coordinate sales differently between these teams.

There is further a need for more clearly defining the role of architects. Currently, they are performing various activities such as defining and distributing tasks, leading the developers, and in other cases even developing. This sometimes hinders distribution of competence and is partially the cause for their high workload. As experts, they should be responsible of the technical solution design and task definition. They could also take responsibilities of a project manager, or work close together with one. The role of project managers would then be to assign the appropriate resources.
4.2.5.3 Firm information needs

More team cooperation is desired within projects, especially concerning the sharing of resources. Negotiations between project managers and team leaders would be easier if alternatives were known, i.e. if other resources can offer the same competence or the time flexibility of tasks. This particularly applies to comparably new staff and gains importance with growth of the firm. A competence database is therefore being developed.

Sales needs to be dynamic and flexible, and provide appropriate work to the teams. Therefore, it needs information from the team leaders about capacities and current workload on the competences. For planning within the teams, these also need to be available on an individual level. The dimensions suggested for the competence are: Competence (technical, e.g. programming language or system), role (e.g. being project manager, team leader), customer experience (possibly divided into technical, e.g. system architecture, and business), and customer relation (organizational). Sales should also consistently make use of the CRM system.

4.2.5.4 Management information use and information needs

The management uses information from the basic planning and invoice system, processed through a business intelligence (BI) system. For financial information, also an ERP system is reviewed. The CRM system is of most use to the marketing manager.

Defined measures obtained and analyzed through the BI are the available time, capacity and the workload, per team. The workload is separately reported as debitable time (paid for by the client) and non-debitable time. The latter could be unproductive time, administration, marketing, competence development, and business development; however, the current reporting does not provide these categories separately. Except for unproductive time and administration, activities are considered value-creating, and the closer distinction would be desirable for controlling this objective.

Moreover, the revenue of paid activities to clients is planned and analyzed per team. When the revenue corresponds with the plan, but debitable time is reported low in comparison to the total time, the management assumes that staff is working overtime to compensate for other non-debitable tasks and therefore, tries to locate allocation problems. Current information does however not allow for a direct comparison on a per-activity level, and consequently not for detailed conclusions on value-creation for the customer. The reported time measurements should further be linked to the financial view, as the aim is to charge customers based on value created rather than workload.

4.2.6 Solution Architect

4.2.6.1 Role and process description

The architects’ role in the firm is hard to define, since their methods and knowledge vary. Currently, architects’ activities can include solution design, testing, specification of the project, project follow-up, as well as the definition, distribution, and monitoring of tasks. Typically, they are involved most of the time throughout the project life
cycle. Due to their expertise however, they are also contacted for intervention when support cases escalate, especially with large customers and critical systems.

Architects can be introduced to new projects at various stages, which depends on the sales person’s technical knowledge. In some cases they are involved in the pre-study, in other cases after contracting. In some projects, they are not the solution responsible, but involved in technical help or review.

The role in connection with the project manager has been further defined lately. Whereas the project manager more focuses on administrative tasks and contact with the customer, the architects are responsible for the technical solution design.

When involved in planning activities, the project manager or solution architect attempts to plan over three months and tries to adjust plans with the current workload of needed resources.

4.2.6.2 Problems and organizational change needs

Most of all, architects have diverse activities and knowledge, and thus are directly contacted by many people in the organization. This causes many interruptions in their work, and requires changes of plans. Furthermore, people who have been working in the firm for a longer time know about competences and skills of other employees, but for newer staff, finding the appropriate person can be a problem.

The architect we interviewed stated that the distinction of roles between project managers and architects should be made in large projects, since all of the aforementioned tasks would be difficult to handle. The architects should however maintain contact with the customer in order to develop business cases and design the solution fitting the technical landscape. There should also be a close connection to sales, to learn about potential and upcoming projects.

Increasing demands by customers regarding support availability are likely to require organizational changes. Some solutions are critical and need immediate attention if problems occur outside of regular business hours. The interviewed architect expects that this will handled by specialized support teams with various competences.

4.2.6.3 Information use and information needs

As of now, the architect uses the basic planning and invoice system for time reporting. This system can also reflect the working progress, as it provides variables on reported tasks to distinguish between total time planned, time worked, and estimated time to complete. This system is used several times per day.

However, a technical information system cannot handle all planning activities. There is still a need for close cooperation on this with project managers.
4.3 Analysis and discussion

In this section, findings from the previous section are discussed in context of our frame of reference. Implications for the firm and its information system are discussed, but also issues with the application of the framework. In order to facilitate understanding, subprocesses are **bold-typed**, whereas external processes are named in **small capitals**.

4.3.1 Sales

A sales process is defined at the company and has similarities to our reference model. The standard procedure for the sales people in the case study is slightly more detailed for marketing activities, but in some parts almost identical to our hypothesized sales process. After the initial contact with the **client**, the process goes into a **pre-consulting** phase to outline an IT solution fulfilling the objectives. Depending on the estimated budget and complexity of the potential project, sales creates a business case cooperatively with a pre-sale person (team member) and proceeds to **preliminary planning**, or in case of larger and complex efforts, the objectives will be forwarded to a project manager for performing **PROJECT RESOURCE PLANNING** within a pre-study.

After the scope and preliminary competence needs have been planned, and main tasks have been defined, sales **negotiates** with the customer, possibly with involvement of the pre-sale person. When an agreement cannot be made, the process can loop back to **pre-consulting** for refinement of the project outlines, or the parties can choose not to contract. If an **agreement** has been reached, preliminary information (main tasks) is forwarded.

However, there are major differences within the information exchange. First of all, marketing does not get explicit knowledge of the current competence availability in the different competence teams, i.e. the **RESOURCE ALLOCATION** instances. The lack of this updated information leads to the inability for sales to focus their **marketing** activity suitable for the teams, having to rely on the marketing decisions by the marketing manager (representing the **GENERAL MANAGEMENT**). Consequently, there is a risk that overload in resource needs has to be balanced at a later time.

Furthermore, we found that the process of acquiring new projects is sometimes a very dynamic and implicit process. Instead of sales people, it is commonly team members (team-based project leaders), who initiate the process directly with existing customers. When bypassing the sales team, the team member acts as a sales person through the entire process and therefore performs the **marketing**, **pre-consulting**, and **preliminary planning**. **Negotiation** and final **agreement** with the client is then conducted by the team responsible. In the negotiation, we see indications that the team responsible maintains a team-based project portfolio and controls the competence availability. This can represent **PROJECT PORTFOLIO PLANNING** and **RESOURCE ALLOCATION** in an ‘internal’ **negotiation**. However, since the integration into the portfolio on **negotiation** and **agreement** is implicit and possibly even proceeds directly to **PROJECT RESOURCE PLANNING**, changes in the overall competence need and availability cannot be assumed to be known to
other planning instances outside of the team. **PROJECT PORTFOLIO PLANNING** has to consider these at some point, which is further discussed in section 4.3.2.

Sales also showed different practices of obtaining **pre-consulting** resources. For example, one sales person negotiates with a suitable team leader (**RESOURCE ALLOCATON**) for a pre-sale person, while the other sales person goes directly to an appropriate team member (architect). When sales performs the **RESOURCE ALLOCATION** directly, changes in resource availability might affect other planning instances. This is further discussed in section 4.3.5. Additionally, as sales has expressed that it is difficult to obtain a pre-sale person, this indicates that information on resource availability might not always be accessible to them.

There are no direct indications in our findings how sales informs **PROJECT PORTFOLIO PLANNING** and **MISCELLANEOUS ACTIVITY PLANNING** on potential engagements in terms of probability for upcoming projects and future impact on competence needs, other than in informal meetings and possibly through the marketing management. Implications are discussed in section 4.3.4. Only in case of maintenance outline agreements, we can assume that **MISCELLANEOUS ACTIVITY PLANNING** is explicitly informed. In case of pre-studies handled by **PROJECT RESOURCE PLANNING**, **PROJECT PORTFOLIO PLANNING** might also implicitly receive this information.

From the interviews it can be concluded that sales does become informed on project deviations, which require renegotiation with the client, although this seems to come from the **PROJECT RESOURCE PLANNING** instance. However, as suggested by sales, it seems reasonable that marketing efforts would also significantly benefit from more information on previous and current projects and maintenance activities at the customer. This especially applies if deviations from client’s objectives have been discovered, and sales has to expect to be confronted with these. In addition, it could help to focus **marketing** activities and **pre-consulting**. Even though this had not been covered previously in our model, we do consider it an important extension.

### 4.3.2 Project Portfolio Planning

A portfolio planning process is not explicitly defined at the company; consequently the role of a portfolio planner is also not obvious. However, the planning activities can be most apparently traced in the weekly and monthly meetings.

The meetings can be seen as two levels (instances) of **PORTFOLIO PLANNING** with **planning** in different time intervals. On the first level, each team determines the upcoming project workload on the current projects, either for the next two weeks or the next three months, including internal projects and client projects. On the second level, new projects come into the portfolio in the meeting with sales. In the same meeting, internal projects can be brought forward by the **GENERAL MANAGEMENT**, and the **PROJECT RESOURCE PLANNING** (represented by the project management) can discuss, if there have been deviations from the project plans (**follow-up** component), or if projects need rescheduling (**planning**). The team managers then adjust the per-team plans if necessary. The time between **planning** in one meeting and **follow-up** in the next can implicitly be regarded as **performance** according to plan.
The role of portfolio managers can be seen in a shared responsibility between the parties at both meeting sets. Besides these meetings, adjustments are also made on an individually negotiated level between team management (RESOURCE ALLOCATION) and GENERAL MANAGEMENT, SALES, or PROJECT RESOURCE PLANNING. In this case, not all parties are represented in the planning step.

Nevertheless, there are significant differences to our reference. First of all, the portfolio planning is not entirely separated from the RESOURCE ALLOCATION, as team members are already directly assigned in the internal team meetings and recorded in spreadsheets. This partially also applies to the second-level meetings. Moreover, rather than the information about time deviations coming from project management and being subject to discussion, PROJECT RESOURCE PLANNING communicate with sales directly on this matter.

Apparently potential projects from SALES are only represented to a limited extent in the portfolio. Instead, the portfolio planning instance usually receives information within the short-term planning horizon of two weeks. The hand over of main tasks and preliminary competence needs by the SALES instance does not always explicitly take place; projects sometimes proceed directly from the sales agreement or pre-study to initiation. This is especially the case, when team members acquire new projects from existing clients. It is then up to the PROJECT RESOURCE PLANNING instance (project management or project leader) to assure that the project is considered in the plan on the next portfolio planning cycle.

The fact, that RESOURCE ALLOCATION and portfolio planning is not entirely separated, seems quite logical considering the firm and its teams are not of an enormous size, and the team leader or a coordinator is represented in both instances. In the perspective of information system implementation, this means the spreadsheet represents the support for the portfolio per team, but does not allow for competence-based resource planning. Inside the team, we cannot directly see negative consequences for the organization and the performance of the planning; on the contrary, it appears rather efficient. However, once projects are spanning across team borders, the per-team view provides low transparency and is likely to cause more frequent individual negotiations with team members, especially solution architects and project leaders. From a more strategic point of view, the per-team perspective can prevent merging of smaller projects for the same client under a larger project due to the lack of knowledge of common objectives. This has in some examples been cured by assigning team-spanning resource coordinators.

Possibly more serious to the performance of the planning step in this instance is the point, that there is a high uncertainty about upcoming projects, since it is the most business-relevant source of projects and their workload. If main tasks and competence-based resource needs are not known ahead of time, resources can consequently not be requested from the RESOURCE ALLOCATION instance to integrate the project into the portfolio. Moreover, it is difficult to compare the revenue between different projects for prioritizing projects with potentially competing resource needs. From the information system point of view, a supportive system of portfolio planning is unlikely to work effectively unless more SALES information on potential is available.
Furthermore, the fact, that the portfolio planning is sometimes not explicitly performed and moving directly to PROJECT RESOURCE PLANNING, also challenges our model. From the information system point of view, this could be reflected in two ways: Either sales and project management can be seen as actors in the portfolio planning instance, who then assure that competences become available; or portfolio planning is actually bypassed, receives this information during follow-up, and considers it for the next cycle. Either way, this changes the resource needs, resource allocation eventually is renegotiated, and consequently, other planning instances might be affected. Changes in the firm’s information system could either make this process more explicit, or inform about the consequences of the changed resource needs as discussed in section 4.3.5.

In addition to our model, project managers have indicated that availability of more information about the customer, previous knowledge on projects, and standardized project procedures would facilitate their planning. As it could allow for a customer-value-based planning, it could even be a strategic goal, as expressed by the general management. A project portfolio could be a suitable instance for maintaining such a ‘knowledge base’, and we consider it as a useful extension.

4.3.3 Project Resource Planning

The process of project resource planning is rather straightforward to trace in the case study. When this process is started from the SALES instance, it can be in form of a larger pre-consulting project which cannot solely be planned by sales. In that case, the project resource planning aims to satisfy the objectives given by SALES. The purpose is to define tasks and boundaries (e.g. scope, time, and budget) for a potential project as a basis for negotiating with the client. In other cases, planning is initiated from the PROJECT PORTFOLIO PLANNING (meetings) when there has been a prior agreement with the client. The project manager requests project team members from the RESOURCE ALLOCATION instance (represented in our case by the team leader or planning meetings), who plan and perform tasks. Follow-up is also done in collaboration between project managers and the team. This process continues in further planning, performance and follow-up cycles until the end of the project.

However, as discussed in section 4.3.2, the PROJECT PORTFOLIO PLANNING process is implicit, and so is some of the information provided. Project managers have expressed that they sometimes have to catch up on preliminary information which has been created from the SALES process. This could affect planning quality and performance of the project.

Deviations discovered during follow-up can be assumed to be subject to discussion in the planning meetings. Since the management only takes part in steering of critical projects, reports of deviations to the GENERAL MANAGEMENT seem to be limited to these cases. Although our model has stipulated this as a regular procedure, there does not seem to be a need for it in our case. Additionally, pre-studies for internal projects, triggered by the GENERAL MANAGEMENT, were not found.

Similarly, we were not able to trace the information about impact on competence need on maintenance and support to MISCELLANEOUS ACTIVITY PLANNING. Instead,
project managers seem to handle support requests following larger projects, as discussed in section 4.3.4.

More remarkably, in the case study we found there are different role assignments of project managers in this process. Besides the actual ‘project managers’, there could also be team-based project leaders and solution architects conducting the planning as described. Due to their technical knowledge and higher awareness of team competences, resource requests can tend to be people-based rather than based on competence, as further discussed in section 4.3.5.

Aside from the impacts on information exchange which can be presented with our model, the process itself might be affected by the fact that architects are a scarce resource themselves. Occasions where the project (resource) planning performance has suffered were only reported on larger projects. However, in these cases a more definite role separation between project managers and solution architects might reduce risks.

4.3.4 Miscellaneous Activity Planning

A process for planning maintenance, support, and internal activities can be identified in the case findings. Partially, activity planning takes place in the weekly meetings, but also in reoccurring planning, and is led by team leaders or coordinators. As expected in our reference, it is subject to high uncertainty and frequent updates concerning resource needs and resource availability from RESOURCE ALLOCATION. Performance can be assumed, while follow-up is represented in the aforementioned meetings.

Regarding support, accurate planning of activities seems unachievable, as the team responsible can only rely on estimations based on experience. In that case, it is hard to practically trace the individual steps within the planning cycle. This uncertainty can lead to staff being able to attend to other activities, as resources are being released, but equally, there might be sudden needs for highly qualified experts. Often this results in requests for a particular person, and thus direct RESOURCE ALLOCATION. If this person is currently performing tasks for this planning instance, it is up to the miscellaneous activity planner to prioritize. Otherwise further planning instances are likely to be affected, as further discussed in section 4.3.5. As both miscellaneous activity planning and RESOURCE ALLOCATION is usually performed by a team leader or coordinator, this is often not visible.

Maintenance and support cases, if not considered as reoccurring and planned activities, usually are brought up by the CLIENT. While our model has not stipulated an instance to first receive them, practically it can be several different actors who can receive these cases. Usually it could be assumed to be a team member, but also project managers seem to have such responsibilities. From the information system point of view, there are more miscellaneous activity planning instances with many role assignments, but also more connections to RESOURCE ALLOCATION, possibly requiring more re-coordination.

Moreover, in difference to our model, there are no indications from the interviews that this planning instance receives information about ongoing projects or sales
negotiations (from PROJECT RESOURCE PLANNING or SALES), which could affect maintenance. The exception to this are maintenance agreements, where this information can be assumed to be provided by SALES. This nonetheless seems to be quite important, as projects can also be a source of sudden support cases. Therefore, this information could improve accuracy of maintenance and support planning.

4.3.5 Resource Allocation

At the firm, resource allocation is usually performed through a team responsible – a team leader or coordinator. Resources are regularly negotiated during the weekly and monthly meetings, where the maintenance, support, and internal tasks as well as the ongoing projects are being reviewed and discussed with the parties involved. Where available, also the competences needed for future projects in the portfolio are brought up. Decisions regarding all resource assignments are recorded in a spreadsheet, reflecting the allocation.

Besides the meetings, resource allocation obviously has to respond to more irregular events. One possible case is the request by SALES for a pre-sale person, which is assigned in negotiation between sales, the team responsible, and the staff. In addition, MISCELLANEOUS ACTIVITY PLANNING often needs additional resources, e.g. for urgent customer support cases. PROJECT RESOURCE PLANNING can similarly discover that previously allocated resources have been inappropriate, and consequently either request more or release resources.

Within the negotiation and allocation steps, the team responsible ensures that the assigned staff can dedicate time to team development, such as qualification measures, either by assigning training or non-time-critical tasks. The reporting of workload and capacity, in different categories, to the GENERAL MANAGEMENT also takes place. While the distinction between negotiation and allocation is sometimes difficult to perceive, this planning process is mainly traceable in our reference.

However, resource allocation also occurs in other forms. First of all, a sales person allocates resources directly, when not taking the approach of asking the team responsible, but instead attempting to locate the person with the appropriate competences themselves. Moreover, escalating support calls can be addressed directly to experts, such as solution architects. The same applies to project management, which sometimes acquires additional expertise outside of the already-assigned resources. In all of these cases, the interviews indicate that such unplanned allocations are colliding with other assignments, but negotiation with the team responsible and any other affected planning instance is left to the person performing the task (i.e. the allocated resource).

Some interviews further indicated that solution architects, other project leaders, and various other team members allocate resources outside of the regular meetings as well. Since they are part of competence teams, we can nevertheless assume that this allocation is mostly negotiated with the team responsible. Only when tasks are team-spanning, it could be that another team responsible is not informed.

Furthermore, descriptions of regular as well as irregular allocation procedures suggested that often, there is a request for specific resources instead of competences.
As long as the team responsible has the opportunity and necessary knowledge for intervention, a different resource can be assigned instead. This is however often not the case, and likely to cause more necessary allocation and negotiation steps.

In order to counter the possible problems emerging from direct resource allocation and move towards a competence-based specification of resource needs, it takes sufficient information. Our theoretical model only partially reflects the useful aspects of competence information, which could be provided to other planning instances.

When it comes to the regular allocation, the information system seems to support the activities sufficiently. Since the resource allocation is not done on a per-activity-basis, resources usually have some additional time for tasks, even when ‘fully’ planned. This planned slack time is inevitable for any operation under uncertainty. However, while this flexibility allows for changes without major renegotiation and releasing resources from other tasks, it is hard to limit these additional allocations to the ‘planned slack’. The interviews with the solution architect and the project managers indicate that especially experts mostly have to rely on their gut feeling to determine if the slack is exceeded, requiring postponement of other activities beyond the plan.

It is difficult to counter this problem in the information system, as the specification raises a dilemma: If experts such as architects are essential for many projects and maintenance tasks, their continuous information of availability and current allocation would be useful; but the more accurate this information should be recorded and followed, the less flexible the allocation process is. At the same time, this means more time spent for the experts or team responsible on updating it. A too close surveillance of staff activity is also ethically questionable. Generally, not only concerning the solution architects, a highly formalized system of allocation would likely undermine the practice of individual self-organization to an extent, where the cost outweighs the benefits.

Partially, the high workload can possibly be reduced with the aforementioned advancement of competence-based resource allocation. Additionally, a possible approach would be, to monitor how often and in what intensity scarce resources are withdrawn from their originally planned allocation. Based on this information, the reserved slack time can be adjusted systematically. This also means a refinement to our model in order to better reflect the practical needs of these resources. Nonetheless, this information can only support allocation decisions if the unplanned allocations are made explicit in the organization.

Another approach would be, to reduce the amount of instances the resource allocation has to respond to. Practically, this means to divide the teams in units, for example, only performing tasks either for PROJECT RESOURCE PLANNING or support activities for MISCELLANEOUS ACTIVITY PLANNING, but not both. Consequently, the resource allocation instance has to respond to less resource needs, which lowers the complexity of potential negotiation. This is however a trade-off with flexibility, as in case of shortages in one allocation instance, less resources can be used.
4.3.6 General management

The general management process can be identified in the case study as well. Input for the monitoring step is gathered through a basic planning and invoice system, where it has been recorded by the RESOURCE ALLOCATION instances, represented by team responsible or the staff performing the planned tasks. In addition, the management can obtain information at the weekly and monthly meetings. From the decision-making step, strategic decisions regarding marketing are given to sales. RESOURCE ALLOCATION receives guidelines for how much time to dedicate to internal R&D and team development.

As of now, information considered in monitoring includes the total planned capacities and workload of previous, current, and future tasks, as well as the actual time of tasks performed. These measures are per team, so roughly divided by competence. The key performance indicator is capacity utilization (divided into debitable and non-debitable time). The intention is to additionally determine the accuracy of the actual measures in comparison to the plan.

It is not entirely obvious in context of our model, which instance provides the total workload in terms of requested resources and competences. It is clear that RESOURCE ALLOCATION reports the actual values, but only in some cases the requested resources and competences. In other cases, this is handled by PROJECT RESOURCE PLANNING, PROJECT PORTFOLIO PLANNING, or MISCELLANEOUS ACTIVITY PLANNING when tasks are defined in the basic planning and invoice system.

As mentioned in section 4.3.3, reports on deviations from PROJECT RESOURCE PLANNING are primarily based on regular meetings with the competence team leaders and project managers and rather implicit. Only in larger, critical projects, the general management takes an active part in steering, and therefore implicitly receives more detailed information. Since they have not indicated this as a requirement, we cannot assume that this information would improve the process.

Furthermore, we have no explicit information, how internal projects are defined and communicated. While we cannot make any assumptions if there are pre-studies, we can nonetheless assume that main tasks are communicated to a PROJECT PORTFOLIO PLANNING instance, reflected by the weekly and monthly meetings.

However, the management has expressed that they aim at receiving more detailed information on non-debitable time. Currently, non-debitable time cannot be categorized sufficiently for making assumptions whether staff qualification and internal R&D have been conducted as planned. Therefore, this information should be made explicit in the RESOURCE ALLOCATION process.

If optimization for profitable projects should be performed as desired by the general management, firm-internal costs of the resources used for any of the above-stated tasks have to be taken into consideration. Currently, only time which can be debited to the customer uses a monetary measurement. In order to extend this towards non-debitable activities and planned projects, which as of now have to be estimated with other methods, the financial perspective should be linked to competences. Although this aspect is not represented in our frame of reference, it could be added.
4.4 Reflection and evaluation

Within the following section, we review the various results of the analysis and argue for decisions, which can be made on the grounds of those. In line with our research process using multi-grounded theory (see section 2.3.1), we see different implications and possible adaptations for both the organizational information system and for our model.

In some cases, we have found that information was obtained and used in the same means as hypothesized. In these instances, the related parts of meta-requirements and meta-design were confirmed, and there are no apparent needs for modifications, neither for our model nor the organization, which can be argued on these grounds.

When a process was performed as hypothesized, but did not receive the information as hypothetically required, the following consequences could be argued:

- The findings could reveal that the actors involved do not find this information necessary for fulfilling their needs within the coordination system. In this case, since a hypothesized meta-requirement was not applicable to the case study, neither is the part of the meta-design fulfilling this requirement.

- When the interviewees from their perspective expressed the need for certain information, they confirmed the applicability of this meta-requirement for the firm. The meta-design fulfilling that requirement can in this case highlight potential improvements in the consultant firm’s information system.

Additionally, the analysis showed examples, where the information system exists as hypothesized, but problems occur due to its complexity. Thus, organizational change can as well be argued with the aim to reduce it.

After proposing changes to the firm’s information system, we review the use of our frame of reference. During analysis, some limitations were discovered, which should be pointed out. Furthermore, there were elements, where the case study revealed new needs and possible design-approaches to additional information; although these could reasonably be regarded as useful, they could not be argued directly on grounds of our model. Therefore, extensions to our model are proposed, as the interviews suggested significant benefits for the planning processes.

4.4.1 Considerations for the firm’s information system

In order to meet the information needs by the different actors, the proposed meta-design can be applied in various combinations:

1. In cases where the information system is too complex, the complexity can be reduced by variations in the organizational structure.

2. When required information is not provided, possibilities should be discussed of making it explicit, i.e. visible to the process and the actors performing their planning functions. This could for example be facilitated by implementing a technical information system.
3. Various implicit information may be available, but not feasible to be made explicit; therefore, organizational changes could be more suitable. More precisely, when processes should share this implicit information, their roles could be taken by a person having this information, making its visibility less important. The improvements are therefore divided into changes in organizational structure, information visibility, and changes in role assignments.

4.4.1.1 Organizational structure – team division

The consultant firm under study has difficulties, when it comes to combining the planning process of projects with maintenance and support. For example, when a team member involved in a project has to deal with an urgent maintenance task, the whole project can be delayed for several days, sometimes even without a team leader or project manager being informed. In our opinion there are at least two strategies on how to respond to this problem:

First, it would be possible to divide projects and maintenance/support into separate resource pools. This could avoid the double booking of resources, since members of the project team can focus on their assigned tasks and will not get distracted by miscellaneous urgent calls. The downside of dividing the teams would be, that the project members with great knowledge of their completed projects do not participate, when the project later turns into an after-sale maintenance and support case. This type of organizational set up demands that knowledge is explicitly transferred once projects are finished. Another problem is, that in critical maintenance and support work, the IT consultancy may have to send the absolutely best suited experts for the tasks.

The second approach would be to divide the teams into customer-oriented teams, where each team is responsible for a set of customers. The teams must be small enough for being able to handle the dynamics of both projects and maintenance work, but large enough to effectively balance workload. This structure demands a high flexibility of the team members in terms of competences. Additionally, teams’ resources might be impractical to restrict. In that case, explicit knowledge about resource availabilities must be shared to balance the workload by teams.

4.4.1.2 Information visibility

The following paragraphs represent information artifacts, which we find could be made available to the different planning processes in a more explicit form.

Competence-oriented planning

The case study company has been growing rapidly during the last decade. The size of the company has increased the number of resource allocation instances and the demand for working across team borders. Especially to new employees it becomes increasingly difficult to find out who has the right competence and who is available.

We see several benefits of competence-oriented planning. For example, it is likely easier, to plan over a longer period of time. Sales can adjust their marketing activities better to the competences available and use this information in the negotiation for
informing the client when it is possible to start with a potential project. In return, these competence needs could be made known longer into the future.

Additionally, it would provide additional certainty before resources are assigned to a particular project task. They would not have to be assigned early in the pre-study, but instead maintain a portfolio of current and planned projects, which ensures that roughly planned competences are available. Once the project is initiated, specific team members could be assigned. Since this would allow for alternative allocations, resources are likely to not having to be renegotiated in the same frequency as it is now. The studied firm would become more flexible, as exchanging people between project teams would be possible to some extent.

While this planning approach might not be straightforward to implement, knowledge about general availability of competences at the firm could already be beneficial on its own, which has been confirmed by the interviewees. According to the suggestion of the general manager, the following dimensions could be specified for every employee:

- Technical competence (e.g. programming language or a technology)
- Role capabilities (e.g. project manager, solution architect)
- Customer experience (e.g. how familiar the employee is with a specific customer’s system; customers business practices)

This competence information should be available in a central repository, for example where the former competence-matrix was maintained. However, rather than updating it manually and therefore increasing administration workload, it should be embedded in the current work flow of employees. Since a technical information system for activity planning and tracking is already in place, it could be extended to automatically collect the competence-relevant data.

**Knowledge base**

When analyzing the findings and matching them to our framework, it became apparent that information about current and previous projects is quite important for sales, project management, and general management. In our framework, few information was rather implicitly included in project resource planning, where deviations were reported and used for further improving estimates. From the findings we can however make suggestions for details, which should be considered in a knowledge-sharing system:

Since the general management considers it a strategic goal, to price solutions based on the customer-value rather than the workload, there needs to be information about replicability of a project solution.

Furthermore, sales and project managers could use this information for outlining solutions and making more accurate estimates. This would support negotiations with the client on project boundaries and narrow down the main tasks as well as their competence requirements.

Finally, many teams, but most of all marketing, would benefit from knowledge about the relationship with the client and the installed base. The former would avoid
uncomfortable situations for sales of being confronted with missed client objectives in projects or maintenance (see section 4.3.1), and permit to propose a correction, whereas the latter would allow to focus marketing or develop a more detailed business case before an offer.

We believe that the information to be available in such a knowledge base should include both formal and informal information, perhaps integrated in the firm’s CRM system, project planning system, or a combination of these. The data could cover previous projects, current projects, potential projects, customer information, product information, project outcome according to plan, planning quality etc.

Formalized information about a project can be in terms of budget, time, and people, whereas informal information can address description and relations. As suggested by a project manager, it could further include company standard procedures. Information on replicability is not straightforward to formalize. Our initial approach would be to design a classification for solutions (e.g. first which domain: financial, logistics, etc.) or descriptive keywords, and link them to the data which is already being collected during projects.

4.4.1.3 Changes in role assignments

In the following paragraphs we discuss the cases, where information is not practical to be made explicit, and bring forward different variations within assignment of roles in the planning processes. These suggestions are by no means exclusive or exhaustive. Since the competence teams are different in many aspects, such as size, customer base, and planning horizon, a combination of these role assignment schemes seems most appropriate.

Sales and project portfolio

As identified in section 4.3.1 and section 4.3.2, there are implications for the knowledge transfer between sales and project portfolio planning. According to our framework, sales should provide the project portfolio with information about potential projects, whereas project portfolio should supply sales with information about previous and current projects. Although we have suggested that such information could be made explicit through for example a knowledge base information system, there are strategic and monetary questions on which projects to prioritize, which are hard to make explicit. We therefore believe that sales people or marketing-oriented staff should take a strong role in the portfolio planning. They might not have all necessary capabilities to manage a project portfolio, and thus should be supported by the teams and project managers, but the overall responsibility of the project portfolio should be taken by sales. This would also facilitate close business-relationships with customers. Nevertheless, this role assignment would not entirely substitute knowledge transfer between projects and (if applicable) different portfolios; therefore, the knowledge base should still be pursued.

Sales and solution architect

In section 4.3.1 and section 4.3.5, we have described issues in acquiring a pre-sale person for the sales process, especially concerning the solution architects. Since the
latter have the necessary technical competence, their availability to the sales process is crucial. As sales has the necessary knowledge within marketing and commercial matters, they need to cooperate closely, and likely both have to participate in negotiations with the client. This brings up the idea of having sales and solution architect fulfill overlapping responsibilities, but with variations in focus.

One option is, to have assigned pre-sale people in each competence team, which sales has access to. However, since the majority of new tasks and projects come from existing customers, it is essential that team members can initiate a sales process as well. They have the closest relationship with the customer and are able to perceive business opportunities. Therefore, there could also be dedicated sales people for each team. The dilemma that could arise in moving from a central sales unit to a team based sales is, that the goal of broadening the customer base could be neglected, as general marketing efforts could suffer.

**Solution architect and project manager**

Team members, in particular solution architects, are sometimes taking the role of a project manager, as identified in section 4.3.3. They usually know the available competences in their teams, and therefore tend to allocate or at least assign specific staff directly. Moreover, since they are acting within the team, they are developing an implicit team-based knowledge base. This does not necessarily have a negative influence for the specific team; it might even be more efficient. However, as the team grows, or solutions require team-spanning cooperation, it most likely leads to ‘re-inventing’ solutions. It has further been indicated during interviews that several projects handled by individual teams are not always merged, when they should rather pursue common goals. This highlights the importance of a team-spanning knowledge exchange and frequent updates of the project information. Thus, we find solution architects suitable for managing smaller projects, whereas knowledge transfer should be ensured. Finally, direct resource allocation makes the availability less transparent to other planning instances (e.g. projects), which might cause more negotiations.

**4.4.2 Evaluation of the framework**

During the case study, some limitations and potential improvements on our hypothesized framework became apparent, which are reviewed in this section.

**4.4.2.1 General remarks**

For the processes and roles in our frame of reference, it is particularly important to understand that they are by no means representing reference processes for implementation at a company, but rather to be seen as an analysis tool for making the current information system transparent. Therefore, notable differences, which were discovered in the interaction of processes, their information needs and information availability, as well as their role assignments, were expected.

It should also be noted that significant aspects of developed base and information concepts (section 3.6.2 and section 3.6.3) could not be traced. Partially, it can be assumed that some of these concepts implicitly exist. Due to time restrictions, a holistic understanding of the processes had to be given a higher priority, and
concepts could not be further pursued during the data collection. However, some of the hypothesized concepts might be too detailed to be applicable for the studied organization.

Nevertheless, the frame of reference has shown to be applicable to the firm, and essentially supported the conduction of interviews and analysis. It has further not only highlighted issues at the firm, but also helped to identify possible approaches for solutions.

4.4.2.2 Limitations

In addition to limitations of applicability, two limitations were discovered, which we mainly see in the nature of our models rather than underlying theory.

First of all, the process roles are restricted to the actors, where we can make reasonable assumptions that they participate in planning. Therefore, they do not directly include the staff of the competence teams as planners on their own. In return, planning roles are also not considered as limited resources. Whereas this partially serves as a reduction of complexity, the findings from different perspectives about the solution architects of the firm indicate that it is not entirely possible to separate planners and resources. Since a solution architect in our case study can be a sales person, project manager, or resource allocator, but at the same time be an allocated resource, resources needed to perform the planning in itself could be scarce, as discussed in section 4.3.3. Reflecting this in an information system would however be quite difficult, and possibly impracticable.

Furthermore, we have declared in section 3.6.4 (Design of processes and dynamics) that planning processes can exist in multiple instances. The amount of these instances has a significant impact on the complexity of the information system. It was apparent in the analysis (section 4.3.5 – Resource Allocation) that these effects exist; however, there could be more appropriate approaches to highlighting these. For example, the information system could also be reflected in a network of these different process instances.

4.4.2.3 Proposals for extension

The following paragraphs present suggestions, how our framework could be improved. Since their thorough analysis would exceed the scope of our study and possibly touch upon other research fields, they are only briefly discussed.

Knowledge base

The need for a knowledge base identified in analysis and discussed further in section 4.4.1.2 (Information visibility) was not part of our hypothesized processes. We believe that maintaining a knowledge base could be beneficial for an IT consultancy in their planning, and should also be included in our framework. Implementation and use of knowledge systems is however not trivial. Established research on knowledge management and their supportive information structures should therefore be considered.
**Slack time**

As identified in the analysis of the resource allocation process in section 4.3.5, it is essential to calculate for slack time when planning under uncertainty. Some time slots need to be free in case of unexpected events, which could be disruptive to previous planning efforts. A central resource allocation has the aim of minimizing the amount and intensity of reallocation and negotiation. One possibility to support the resource allocation planner is, to monitor how frequently critical resources have been rescheduled to other activities. This information can be used systematically to adjust slack time. However, the reallocation by unexpected events needs to be made explicit in the organization. A different approach would be, to adjust this slack according to the perceived planning risk. This could probably be most accurately set by the planning instance, which has knowledge of the task.

**Financial link**

One major objective of the general management in the case study is, to introduce customer-value-based pricing. In part, this could be supported with the suggested knowledge base, allowing estimation under which circumstances and efforts a solution could be replicated. We have also considered in our model that sales should make estimations on the revenue of the project, which can then be taken into consideration in the project portfolio planning process (section 4.3.2). Nevertheless, in order to decide on profitability, more data is necessary. As discussed in section 4.3.6, in addition to time considerations, anticipated competence and resource needs during preliminary planning have to reflect financial estimations. These could for example include internal cost estimates for use of certain competences, and therefore allow for comparison to the expected revenue.
5 Conclusions

In this final chapter, we review the work in relation to our proposed research questions. Furthermore, we point out limitations in terms of internal validity and generalizability. Finally, we suggest areas for further research.

5.1 Results of the study

Recapitulating the stated purpose of our research, we intended to provide an analysis framework, which can be tested and used in practice. In conclusion of our frame of reference and the case study, we provide the following answers to our research questions:

How can the information needed within dynamic processes of sales, maintenance, project planning, and resource allocation be analyzed?

In absence of best-practice approaches which could have been tested for applicability, we have reviewed existing research which was found to touch upon important aspects of our research problem, and argued for its contribution to possible solutions. Since the focus was on information needs, we have chosen to approach the issue from an information system perspective, coordinating the main business processes of an IT consultancy. Based on the theories within project business performance, enterprise planning, and project planning, we have constructed a hypothesized information system. This system reflects the information needs of the coordination processes and their possible information provision. This information system design is presented by the complementary components of underlying base concepts, information concepts, process descriptions and process maps.

How can this analysis be applied to practice, to improve the information system of an IT consultancy?

Rather than proposing reference processes, the aforementioned representation aims at serving as an analysis tool, which facilitates following the processes, associating roles with actors in a practical case, and additionally, identifying occurrence, contents, and use of information. Within a case study, we have shown, how the hypothesized information system requirements and design can be traced in findings gathered from semi-structured interviews, and what implications differences between our model and practice may have:

• Some hypothesized information requirements could not be related to the findings; in this case, the complementary part of the design is not applicable as there is no need for improvement.

• When the information requirements were confirmed in the case findings, but not found to be available, we brought forward two possible approaches for improving the organization’s information system using the theoretical design:
  – Information could be made explicit, i.e. visible to the processes which require it;
or organizational change, using different role assignments, could render the visibility of this information less important.

Furthermore, the analysis allowed for some conclusions on the benefits of reducing complexity of the information system. Finally, we have evaluated the framework, pointed out its limitations, and proposed extensions which could be useful for further studies.

5.2 Reflection on research methods

Due to the little research made in the area of study, it is difficult to find appropriate methods for analysis. The availability of useful literature is limited, and therefore parts of the selected theory used for building the framework may be subject to criticism. Although it was not our intention, the initial empirical studies at the company could have influenced the choice of theories. The multi-grounded theory method in theory building is an iterative process; therefore it could sometimes be difficult to follow why certain choices have been made in the development of the framework. In order to facilitate understanding for the reader, the explanation of links to our research can be quite detailed.

Additionally, further research needs to be conducted, and more case studies are necessary for supporting generalizability of the framework as a tool for analyzing an IT consultancy’s dynamic resource allocation. Especially IT consultancies with other organizational settings would be interesting to analyze further. However, we do believe that the purpose of this study has been served, as expectations in scope had been set appropriately in relation to time boundaries. The interview method was a fitting choice, since it allowed us to get in-depth knowledge about processes and information needs of an IT consultancy. Still, we think team leaders in the case study were the most difficult role to understand, and therefore at least one additional interview could have been conducted to confirm or enhance the findings. Overall, we find the methods suitable, and the case study interviews certainly helped us to find improvements, both for the case study company and for our framework.

5.3 Suggestions for further research

As pointed out in the introduction, IT consultancies apparently have not been subject to many research efforts. After conducting this exploratory study and getting an additional insight into the field, we have found several other relevant aspects, which could be examined in further studies. In addition to implementing extensions to our framework, its applicability could be tested on more IT consultancies with different business profiles, structures, and sizes. Moreover, the social aspect under the same topic of resource coordination, firm-internal as well as the client-consultant relationship, could be further investigated. More consideration could also be given to the adjustments within business strategy and staffing, as these are important aspects of our study, but had to be excluded from the scope.


List of references


Appendices

Appendix A: Case study – Interview questions

A.1 Process-related questions

A.1.1 Sales

• Can you describe shortly the ways you communicate and interact with:
  – Team leaders
  – Project leaders
  – Management

• How do you proceed (after marketing) when you gain knowledge on a potential project? How could more information facilitate this?

• In which steps are project negotiations made?

• How do you maintain a portfolio of potential projects? How are volume workload, turnover, probability, etc. considered?

A.1.2 Team leaders

• At what stage are you introduced to new or potential project? Which information would be useful before that stage, possibly in more abstract form? (What would you like to know about these potential projects?)

• In which steps is resource allocation negotiated with other competence departments, the project managers, and possibly sales? What information do you need to get from them, and in which intervals?

• Which strategic decisions do you have to consider right now? How are they communicated?

A.1.3 Project managers

• At what point do you gain knowledge of new or potential projects?

• In which way and steps is the knowledge transfer from sales to project management conducted?

• In which steps is project planning done, especially where are interactions with the departments in the planning process? How could more information improve planning reliability or speed?
A.1.4 General management

• Which are the key performance indicators you monitor? How do you acquire information on them, and when?
• Which are performance or status indicators you would like to know more about, but which are not available, e.g. due to lack of data?
• Which variables should be controlled in terms of strategic decisions, and how should they be considered?
• What are the information requirements from each department?
• How do you see the different roles: project managers, team leaders, sales architecture...what are their responsibilities?
• What project planning decisions do you make? Prioritize projects?
• What project planning responsibilities do the other managers have?

A.1.5 Architects

• At what point do you gain knowledge of new or potential projects?
• How is your cooperation with sales? Project managers? Team leader?
• In which way and steps is the knowledge transfer from sales to architecture?
• In which steps is architecture/tasks planning done, especially where are interactions with the departments in the planning process? How could more information improve planning reliability or speed?
• How independent are you in your planning of work?

A.2 Questions on current information system use

• What information systems do you use?
• What information would improve your work practices? (table)
• What priority would you give that information on a scale from 1 to 10?
• How much time do you spend in meetings, mails, or otherwise acquiring this information?
• Would this also reduce the decision time? If yes, how much?
• Would it require further discussion?
• Would it improve the quality of your decision? Can the improvement be quantified (less repetitions because of errors etc)?
Appendices

A.3 Questions on information system potential

- If department X needs information Y from you, could you provide it through an IT system?
- On a scale of 1 to 10, how difficult is it to formalize?
- If it could be formalized, how much time do you think you would need?
Appendix B: Case study – Interview responses

B.1 Sales

B.1.1 Sales I

After the initial contact with the client, sales introduces a “pre-sale person”, which is a staff member with knowledge within in the specific area. Within a negotiation between sales and the team leader of a competence department, which provides the competences offered, the pre-sale person is assigned. The team leader has the responsibility to understand which person has the best knowledge and then ask for that person’s time. Depending on the size of the project, sales might ask a staff member directly, if he/she can meet the client together with sales, to discuss the client’s needs. Sales is supposed to avoid this shortcut, and prefer going through the team leader, but in smaller projects they make exceptions.

Generally, the goal to sell a pre-study, where the company can get paid for the process of structuring the project. In this cases, the a pre-study can involve more people into the process of pre-defining the project. If it is not possible to place a paid pre-study, the company is basically working for free and hoping to get an order later on.

A solution architect is always involved in the offering process to define task and calculate the time needed to complete the project. Also, a project manager can be involved in this. The preliminary plan also includes suggestions for the composition of the project team. For estimation, also comparable past projects are reviewed. This forms the basis for negotiations with the client. Usually, the amount of meetings from first client contact to the agreement ranges from two to seven.

Once the agreement has been formed, a project leader or project manager gets assigned to the project to work from there. On a larger project, there is a steering group that consists typically of sales, project manger, architect and a client representative. If this steering group exists, it assists follow-up, decides in case of major changes of activities, and commercial issues; otherwise, commercial issues are deferred from project management back to the sales department.

Sales follows a standardized process, which can be described in the following steps:

1. Prospect
2. Identify
3. Confirm
4. Qualified Offer (supported by pre-study & internal negotiations)
5. Acceptance
6. Transition
In general, cooperation with the other departments and negotiations is working very good. Sometimes it can be a problem to get a hold of the solution architect. When negotiating an architect with a team leader, the team leader is positive. The architect is also positive, but then when getting back to see what has been done. The architect does not have the time to do what he/she was supposed to do.

Sales feels that there are too many meetings with detailed technical discussion before a project can be sold. It is difficult to specify how much time spent in these meetings. Sales just wants to sell the product while the technically-oriented people want to have specifications and requirements of the product. Sometimes it feels that they are too technical instead of business oriented. Everything doesn’t need to be made in the perfect way, just make it.

Also, sales feels there is little time and effort spent on the pre-sale process. Especially when the pre-sale project is not paid for, because the customer does not want to pay for offers, low priority is given, and it is hard to get architects.

Currently, sales uses a CRM system. It supports the entire process, but does not necessary contain all contacts with the client. This system would also support handling support calls from the customers, and even has a project management module, but these are not used.

One of the worst things is to get to a client company and they start to ask specific questions, or address problems with other deliveries, that sales have no idea about. Sales would like the CRM system to work better to have pre-knowledge of the previous contact with the company to be prepared for meetings.

The CRM system they have could be very important for to have pre-knowledge about the situation and about the company. A “dream” is to have working CRM and an integrated project management system, probably based on Microsoft software. The most important information would be the time available for the solution architect. The workload on the different departments is not so important. The skill level of employees, can be obtained from the team leader. Sales wants to focus on selling activities. The previous project is also not so important, but it could be nice to summarize in a CRM system.

B.1.2 Sales 2

This sales person only has contact with existing customers. The process follows the firm’s sales process definition. When sales gains knowledge of a new project, a business case for the consultant company is developed, and a pre-study is performed. However, many projects come in without any sales involvement. They can be established based on outline agreements with the customer, and do not each time require a formal contract.

In larger projects, sales initiates a pre-sale study with a solution manager or solution architect; otherwise only a system architect is involved. Sales people do not have the skills to be able to define tasks and so on. Architect and the project manager is often the same person. Only in large projects, or projects spanning over many teams, a project manager is involved. In most of these large projects, the project manager is external, put in place by the customer.
There paid and non-paid pre-studies. An unpaid pre-study is subject to a budget limitation. If a defined budget is expected to be exceeded by the resources needed for the study, sales needs to ask the management if they should do the pre-study or not. It can be dangerous to do a pre-sale study and later on the company just use the study to use the services of someone else.

Normally, there are two or three meetings with a customer before an agreement can be made, but that is because they are existing customers. For the other sales activity it probably takes around six to seven meetings to get a contract.

It is an unclear process of how to get in contact with the solution architect. The architect is not assigned in contact with the team leader, but instead selected on basis of a CV database, and personal interviews. Sometimes it is not clear, who is an architect, or who is rather a senior developer. Senior developers are equally suitable to define and explain solutions to the customer, but do not consider all necessary internal activities and allocation of resources. The firm needs to have clear roles in the teams, specialized pre-sale persons in each team.

The sales process should be shorter. Sometimes, customers have lost interest in new projects, when the pre-sale process took too long. It should absolutely not take longer than two months and probably shorter to sell a new project.

When informing teams about the new project, the customer often wants to start right now and “teams always have too much to do”. Also, future projects are too uncertain in their time planning, for informing the teams. Solution architects are often aware of the resource allocation situation in their teams, but sales is not. This often leads to clashes on project launch.

A CRM system is not used. It would not be possible in the current structure. There are too many activities with the customer, so it would take two days a week just putting in information into the system. There could easily be too much information in the system, so the relevant is not found. It could work better for example, if it was more integrated in the work flow. For example, just a few pre-defined boxes for checking-off after doing a call or other contact, so its not time consuming and easily accessible.

Scheduling is done in a calendar application, and relevant activities are gathered in e-mails and spreadsheets. Constantly having focus areas to sell a set of products/services. CRM is “difficult when selling services in consultancy”... “would work better for manufacturing companies”. It is hard to inform the team leaders of what is coming up in the order stock. Customers call and want to start directly. A CRM system could help if it was more integrated. For follow-ups and reporting, the basic planning and invoice system is used.

Recently there have been attempts to plan the time boundaries of the projects. Knowing the start of the project would make it easier to plan. Sales Needs to be better at “what is happening when you get a problem”. The company needs to make future plans with all customers. It is important to have a per-customer portfolio and think long-term. Some sales could be in the teams. They could also be involved in the delivery. 80–90 percent of the volume is from existing customers so it is very important to focus on them. It is important to build relationships. The business
Appendices

The environment has changed: Customers do not just call in anymore, projects have to be acquired actively.

Information on previous projects and the architects involved is gathered in local files, to help choosing the solution architect. The company has a CV-database but it is not updated. It should be updated at least twice per year, to be more accurate.

There should be more sales teams and specific for different customers. The focus should be on existing customers, two to five people in each group. There should be a few sales people active in new customer acquisition. This would allow more teamwork and to keep team leaders informed. Also, an appropriate process should be designed.

Currently, planning is often short-term. The range of solutions should be wider. There should be development of the customers and new developments and technologies promoted in a business case (example when new iPad is released). A business case should consider the customer-value, to be presented to the client. It should present a solution, not just a product. There should be regular meetings with the customers, at least once every three months, perhaps more often to have some new product (task) and do follow-up. Otherwise it means that every time you meet you need to start all over again. The delivery teams already have follow ups. Sales should be working in the same way. It should to have the right sales person for the right project.

**B.2 Team leaders**

**B.2.1 Team leader 1**

This team leader has different roles, but we mostly discuss the role as a team leader. In the team they have one major customer that accounts for around 70 percent of the workload, the other 30 percent is from various customers. Most of the time there is a team member that is the starting point for a new project.

The team leader’s responsibility is, to keep updated with the different activities, team leaders, project leaders and competences. Sometimes negotiations are made between sales and team members for resources, but this is mostly delegated to a resource planner. There is a dedicated resource planer for the major customer. In the best case, the team can plan for three months, sometimes the resource planner can plan longer than three months.

A basic planning and invoice system is used for the detailed planning, but only for the major customer and large projects. Resource allocation is tracked by the coordinators in special spreadsheets. The CRM system is also used, but only to gather information on new customers.

Typically the major customer can specify the desired solutions more in detail. If necessary, the customer decides which of their project to prioritize.

In the team, there are 14 members and one project leader. The team has a tight cooperation with one other team, and resources are coordinated cooperatively. Competences outside these two teams are not known in detail. Also, staff is involved in many small projects with project leadership outside of this team.
If needed, contact is initiated with other team leaders from the concerned team to find support in a different competence. Usually only team leaders, project managers, and some resource planners know who to ask specifically. It would be preferred to have a competence database to avoid sending out emails and ask for people with the right competence. There has been a try to have a team-spanning competence matrix where the employees could rate themselves in different areas, but is it seldom updated and therefore not used anymore.

When conducting the work with the major customer, the team has cooperation with the other team on a daily basis. The resource planner of the team knows the competence of the employees in both teams. There is a support group, which consist of the two cooperation teams. They need little resources on selling new projects. The customer that uses their project are very loyal and are not switching between companies. However, improvement could be made in the selling of new projects to new customers. Sales should have more information on this team’s solutions, so they can consider it on new customer acquisition.

The team member has a strong self-drive so there is no need to control what is going on all the time. Every week they plan for two weeks ahead, and but there are often changes. They try to balance the workload as much as possible but the people with the highest skills are usually loaded with the most work.

The project leader is doing the follow-up on projects, sometimes also the architect. They need to update the description and requirements more often. This should be done by the person last reviewing it, which is most of the time the project leader or architect. The relationship between project leaders and architects works completely different from case to case, it depends on the people involved. It is desired that there is a tight teamwork and people know what is going on. Sometimes architects just push out task without knowing when they will get them back.

There should be a better cooperation over teams. Teams tend to keep projects within the team. This sometimes results in two separate projects, which could be combined. Then it is missing the big picture and the aim at one single goal (common understanding). In order to resolve this, such projects should be merged under one project manager, who communicates the common goals.

**B.2.2 Team leader 2**

About 80 percent of the sales come from the team itself. The project leaders within the teams has the function as “sales people” to find out what the existing customers’ needs are. Often new sales come from further development of the existing projects or successor projects. The other 20 percent come from the marketing function outside the team itself, but the team gets involved at the pre-sale stage. Sales contacts the team leader for this directly. The goal is to sell competence and keep great competence within the team.

To plan they have one meeting every week for the next two-week and one meetings every month for the next three months. Team leader decide which projects to prioritize within the team. When a project leader comes to negotiate the resources, the team leader has sufficient information and knowledge about the skills of the
team members. Often the project leader also knows, and can therefore request the resources needed.

Generally, the process is perceived to work pretty well. Each project team consists of an architect, developer, project leader and testers. If they do not have enough of resources, they can take in external people from other organizations. However, now when the economy is getting better it is harder to find people that are able to work for the company within short notice.

Team leaders are “planning all the time”. Besides the team leader, there is a coordination group. The coordination group consists of the task maker from each of the sub-teams in the team. In each sub-team there is architect, developer and a project leader. The teams meet every week for the two-week planning and they can see how much time they have scheduled to customers. If there is too less or too much workload they talk to other sub-teams in the team to balance the situation. The coordination group meets once every month. The company has a team leader meeting once a week with the sales, management and team leaders to discuss the overview picture of the whole organization. Sales therefore has good knowledge of the resource situation.

There is a competence database with CV, of for example what kind of projects people have been involved in. The system is okay, but it is not often used, and it is not easy to find information. Such a system would be especially important for new people in the organization. But it is also getting more and more important the bigger the company gets. The team leader has good knowledge of the team members’ skills, but would like to be able to see the competences and time available, previous projects etc. of other teams. Also, roles should be more clear.

The team has four to five project leaders. Most of them are also architects, or involved in testing. These project leaders normally have smaller projects, with the time span of four to eight weeks maximum. Larger projects are transferred to project managers.

40 percent of the total work is maintenance and support. The goal is to have 77 percent time debitable to the customer, and 37 percent percent of the time spent on projects. The other 23 percent is team development, which is very important.

There is a CRM system but the team is only using it for new customers. The team leader feels, the system should be used more intensively. In addition, the firm-wide basic planning and invoice system is used for short-term activity planning and tracking. The main resource planning tool is a specialized spreadsheet with the resource needs and availability of the team. Project histories, if present, are only maintained by individuals.

Currently, the team cannot plan long into the future. One month can be planned ahead quite certain. The second month has many uncertainties. The third month is rather a guess. Information improving this would be helpful.

It is especially hard to plan when an employee is in both maintenance and support, and another project at the same time. Sometimes there are short-noticed maintenance
and support tasks, which can take up to three days, and the team leader does not get informed. In consequence, projects can get delayed.

**B.3 Project managers**

**B.3.1 Project Manager 1**

The first information about a new project comes from sales. The type of the project can vary a lot. It can come at many different maturity levels. From clear description and guidelines to something completely from scratch.

There should be more close involvement between sales, the project manager and the architect early on in the process. The architect should be “behind the scenes”, since the architect is more technical oriented and not business oriented. The architect is needed to define the tasks and time boundaries.

As it is now the sales person, and sometimes the project manager decide about the money and the time, then the team and the architect have to make the best out of the situation. It is difficult to initially get a clear picture of how much time a project will take, that is much better done by an architect.

To get an architect the project manager goes to the team leader or team organizer to negotiate. The team leader has great knowledge about the competence of the member in their team, and can make resources available for project work. Negotiation with other project managers is only necessary, when conflicts cannot be resolved with the team leader.

The reason for the different maturity levels of processes are, that usually sales people have good understanding about how long a project will take and its activities. Sometimes “too good” so they make assumptions before a technical person is involved, but there is also sales who are less informed. Also, sometimes even the project manager is informed of few delivery details and has to catch up. This is also a problem, because project management has the knowledge for defining the scope, but then has little influence.

At later stages of the project, project managers only interact with sales to discuss commercial issues. When a project is at the finalizing stage, the project manager becomes available for handling client requests for maintenance and support, and assign tasks to the competence teams.

There are paid and non-paid pre-studies for clients. There would be potential, for getting paid for more pre-studies.

The interviewed project manager belongs to the team operational control. This team is independent from the technical competence teams, and has its own team leader. They are six project managers, working across competence team borders. However, they are most of the time working with one team at the time. The project manager is working after delivery process model, standardized by the company.

There are also “project leaders”, who are part of competence teams. The engagement of project leaders or project managers is decided by size of the project, how many teams are involved, and the management level required by the project.
The interviewed project manager is working on a way to track the resource availability of the people within company. Most important are the architects. Currently, the project manager is developing a chart with timeline and needed resources. It should also include the assigned resources.

The company’s basic planning and invoice system is currently not used for planning, because that would clog it down with too much detailed activity information. It is not good for planning but good for invoice. It is also of good use for review of previous projects. The project manager has been working with MS Project, but it has too many functions, is working bad and boring. MS Project is only used for Gantt schemes, Excel for activity planning, estimates, and follow-up.

Preferably, there would be a system to keep track, if the architect has been working on the assigned project or got assigned to other activities. It is understandable, that the architect has a lot of different tasks to perform, but to make progress in the project, project manager needs to see that things get done. It would be enough to know “what the architect have been doing today”. Resource information on other sources is not so important.

The project manager comes from the business perspective, has less technical skills and feels dependent on the architect. If the architect becomes unavailable (e.g. sick) it is a big problem. However it might not be economical for the business, to have several architects with the same information on various projects.

A competence database is not needed. Instead, the team leader can be asked, and they tell what resources that are available and which competences they have and so on.

Regarding information systems, the company has enough of information available, what is really needed is a way to visualize all this information in an easy way.

To prioritize between the different projects of the project manager, the sales and management are responsible for the decision.

There is no fixed report system to management. Management uses the information available in the basic planning and invoice system.

It is too much information in the CRM-system. A suggestion for improvement is, that the sales should provide the project managers or the head of project managers with knowledge about potential projects, so they know a bit ahead what to expect.

B.3.2 Project Manager 2

The project manager currently handles three large projects. They came at different stages, partially since the project manager is comparably new to this consulting firm: The first project was not started, but set completely in time, budget, scope, and activities were mostly planned. The second project had begun already, and was transferred to this project manager. Scope is set, but time can be adjusted. In the third case, the project manager is acting as a consultant manager for another company. The latter service is not very common.
There is a project coming up, which needs to be planned and run from the beginning. The pre-study is made by the solution architect and sales. Then the sales person handing over to project management to run it. The responsible project manager is negotiated with their team leader.

The project manager would like to have more influence on the project in an early stage, and be able to discuss the time boundaries. Activities that the technical oriented people forget about for example documentation, implementation, and testing, need more consideration. Also, earlier discussion with the customer would help to have the same picture of the situation, so when they start they do not have different expectation of the outcome. It is in the offering process that project managers should be involved.

What happens now is, that when a new project is handed over, the project manager sits down with the customer to discuss how to proceed. They discuss which activities to prioritize.

The project manager is not aware of a CRM system, so information on earlier activities with the customer have to be obtained otherwise. Information on potential projects is exchanged in informal meetings (e.g. during break).

When it comes to deciding which persons to work with, the project managers can often decide and ask the team leaders directly. Team leaders also take care of conflicting resource needs. This process works well.

Sales should be the ones to say which projects are important, which to prioritize and which flexibility they have. Project managers and team leaders should not do this, because they tend to think that their own projects are the most important ones.

There are only five project managers in the company but there are maybe 15 people in total that describe themselves as project managers. These additional people are handling “projects” with tasks that are maximum one week long.

Sales/marketing should be the owner of the whole delivery process, where the teams act more as resource pools. As it is now, there is “a wall between the different departments”. Teams want to work in their own way and are not asking for help across team boundaries, if they need additional competence. Teams prioritize their own project and cross-team projects get behind. However, there have been improvements on the cross-team cooperation.

Under normal conditions, projects have around two meetings per week. Using a variant of the SCRUM-method adapted to the company.

The project manager does not take a lot of influence on the specific activities. They are often handled by the developers themselves or more common through the solution architect.

It would be more appropriate to see the solution architect as a senior developer instead of a co-project manager, as it is now. In really big projects it is hard to manage everything alone, but the company does not have many projects of that size.
Actually it might be a problem for project leader to be working mostly with large projects. In one case did too much research instead of trusting the solution architect with his/her solutions/activities.

A “normal” developer has to be more involved in the developing process in the way that they can see the big picture. The solution architect often handing out tasks to the programmers, so that they are just completed without reflection on what they are doing. Because of this, the solution architect becomes a very critical resource for the company so when he/she gets sick, the other developers do not have the power or responsibility to complete the task. They are used to have someone telling them what to do.

Planning the projects with a whiteboard with sticky notes, tracking the necessary activities throughout the delivery process (plan, do, test, deliver). This view is permanently available in the office. The system works really well because everyone gets an overview, and people get motivated to work. The problem is, that it is hard to document what exactly has been done and when, where something goes wrong with the client.

The project manager has been working with projects of 1000+ hours. Normal size for a project in company is much smaller. The company defines a project to be large, when it is around 500+ hours.

A project portfolio would be good, but the project manager has never seen any such thing that is working in practice. A more informal Wiki could be suitable to spread knowledge. In a too organized information system people do not write down what has gone wrong, learned etc. Therefore, the documented information would not be used.

One way to spread knowledge within the organization and between the different project managers could be, by having regular meetings between the project managers to discuss lesson learned, information about different companies etc. Now the project managers contact someone who has been working with the customer before. This informal exchange is working good.

One thing that would save a lot of time is to have templates for follow-ups of projects. Now there is no standard procedure of how to report the things being done.

To prioritize projects, visualization on a big piece of paper could be the basis for discussing between sales and the project manager.

If something goes wrong there is no “pointing fingers” atmosphere in the company. It is considered a shared responsibility between sales, architect and the project manager.

The project manager becomes responsible for maintenance and support activities of the projects. However, also each team has a support group for a delivered solution, which handle the necessary tasks.
B.4 General management

The management’s main performance indicator is capacity utilization. Compared to how much time of the available capacity has been used, also the time for paid activities to clients (debitable time) is monitored. In addition, the revenue is planned and measured (financial-based). Recently, the firm has introduced a new measure, which reflects the accuracy of planning the capacity by each team leader. All measures are per team.

Non-debitable time should be divided into ‘unproductive’ time (due to performance problems or errors), administration tasks, marketing efforts, competences development, further business development. Marketing, competences development, and business development are creating value. The aim is, to stick to “value-creating” activities.

If revenue is on track, but debitable time is comparably low, it is seen as an indicator for overtime, and allocation problems.

The intention is, to also transform the time-based measurement into financial-based, since this would allow better comparison and profitability optimization. For example, project already performed could be conducted again, with fewer hours of work. Also, customers that could pay a bit more could also be charged little bit more. Generally, customers should be charged rather based on the value delivered, than on the time spent on the performed tasks.

The CEO is not involved directly in the projects, unless there is so to say, a critical project. On critical projects, there is a steering group with at least someone from the management to support the project. In non-critical projects, management only prioritize on escalation.

Every month there is a meeting, where management goes into details of each customer with ongoing projects, issues of individual staff, quality issues, and review of the use of non-debitable time.

In addition to the CEO, roles in the general management team are quality management (also processes), human resources (new, to monitor and manage planning and allocation across teams), and marketing (match competences to market demands, forward demands to teams, marketing development – developing wider customer base). The HR manager, marketing manager, and quality manager can support team leaders, if they are overloaded. This is very important, since the team leaders have a lot of things to think of.

Regarding sales, there has been a marketing development department to focus on bringing in more customers and look for the customers need. Now the sales and marketing is one department, which is sometimes hard to manage. Sales needs to be dynamic and flexible in their sales process to give the teams the right amount of work. They are also depending on continuous information from the team leaders.

There should be different planning profiles between the teams. Teams can have different time horizons, planning perspectives etc. Some teams could plan for more than three months, but for some teams a three months plan does not make sense.
since everything changes so fast (e.g. they have more support calls). Therefore, the company should organize sales and planning for each department differently.

The firm is trying to sharpen the definition of an architect. The architect has so many different work task and work in different ways. The desired role is, that architects are the technical responsible for the solution, specify and define it. In fact, they lead the development team, define and distribute tasks, and sometimes even develop. They have the best knowledge in technical definition and analysis of requirements. The wish is that architects define the tasks, but the project managers assign who will perform the task. It would be the best if the architect and the project managers where the same person, or working close together.

Architects are a bottleneck in the firm. They are also hindering the competence to be spread around the employees, since on some instances, they are involved in tasks they do not need to. Sometimes, architects prefer to do tasks by themselves, because they want it to be made in the way they had in mind.

There are 20–25 architects in the company. Sales decides in the sales process, if they need a technically oriented person (architect). Also, if the customer demands more of a process view of the implementation, and in change management projects, a project manager is involved first.

Team leaders together with the project managers decide when small projects are handled by project leaders, or should be overtaken by a project managers. Project managers usually work with bigger tasks. For example, if there are many small projects and maintenance work for a client, everything could be placed in one big project. However, this is not a defined process yet and does not always take place when it would be useful.

More cooperation between teams would be desirable. As it is now, the team leader has all the knowledge about the staff. If the team leaders have worked for the company for a long time, he/she also knows about competences in other teams; otherwise it can sometimes be difficult to find the right competences in the company. A competence database is required and in progress.

Team leaders prioritize the projects together with other team leaders, but of course ask sales for advice. Prioritization between team leaders and project managers is often difficult, because options are not known: postponing tasks/projects, use different person for the task. This happens more often as teams grow.

CRM is taken care of by the marketing manager. It is the sales that use the system the most. All people involved in the sales process, whoever it is, should do inputs in the system.

Information systems used by the management are business intelligence, based on basic planning and invoice system, and ERP for financial information.

A dynamic planning process is a key factor in creating efficiency and value. This is not limited to projects, but all activities. It requires continuous monitoring and adaption. It has to range to the individual level, and consider all events.
There could be four perspectives in planning resources on individual level: Competence (technical, e.g. programming language or system), role (e.g. being project manager, team leader), customer experience (possibly divided into technical, e.g. system architecture, and business), and customer relation (organizational).

**B.5 Architect**

A customer responsible (sales person) builds relationships with the customer. Architects receive first information on projects from sales. Sometimes it can be in the pre-study phase, sometime it can be first after the contract is signed. It depends on the sales person.

Problems arise, when a support case escalates, and support needs people with experience, and they need them fast. For example if a big and important customer has a problem, it is impossible to wait, someone has to go there immediately.

Over time, as the firm has grown, roles have become more defined. However, architects’ work tasks are hard to define and different from architect to architect. The explicit definition of the role is rather new. For new employees, it is easier to define.

An architect follows a project for a long time. From design, to specification, to testing. Activities are usually task definition and planning. Planning can involve asking team leaders for competences or specific people. During project performance, an architect can also monitor the progress.

The architect works a lot across teams and projects, for example with direct technical help or review, and gets a lot of requests from development, support and also from customers. This can be disturbing in the flow of work.

The basic planning and invoice system is used for time reporting, but it is very important to speak to the project managers. In this system, there is no easy way to describe progress. The variables possible to put in into the system are time “planned”, “worked”, and “left”. Close cooperation with project managers is still necessary. No information system can handle all planning activities.

The weekly planning is subject to a lot of sudden changes. If getting too much to do, the architect “just tries to fix it”, working evening or even weekends sometimes.

The architect works in a team that consists of six people, but has a lot of cooperation with another team. Together the two teams have around four architects, but the definition is not very clear.

Project managers have lately taken a more administrative role, as organizing things with the customer and plan. The project manager has the contact with the customers and is not so much involved in the solution design.

When planning which persons should be included in the projects, they use three months planning. Project manager or architect request resources to projects. Then they look who has a lot to do and who has less and then they try to calibrate.

There is no clear ideal picture, of what the role of an architect should be. The architect could have a close cooperation with sales to know, which are the incoming
potential projects. The architect should create a business case around the idea, and develop solutions which fit into the customer’s landscape.

Personally, the architect has been working for the company for a long time, knows many different areas, and can jump in and do things that needs to be done. Also, competences and skills are well-known, which however could be a problem to new employees.

It is good to divide the work between the project manager and the architect, so the architect does not need to take part the negotiation and prioritization with the customers. The architects can also have a close relationship with the customer, do the technical design, and close interaction with the team. It would be too much to handling all at the same time.

Regarding support, there are small teams centered around customer-specific solutions. Not only is it a problem that it can be too few people available for fixing a problem, but also that they need to have support teams available more than eight hours a day, and also available on Swedish holidays, since they have international customers. It is likely, that 24/7 support is becoming a requirement for the customer-critical solutions. To have one big support team would also expand the overall knowledge between more co-workers.