THE PROFILES OF PROJECTS SUPPLIED BY A FULL-SCALE ICT-SERVICES PROVIDER

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Abstract: The role of modern ICT-services providers has changed from easily defined system engineers to full-scale providers. The types, or profiles, of projects supplied by such providers are not very well understood. In this article a company specific analysis of a set of projects is presented. The analysis clarifies the types of projects and discusses the features of those types. Five distinctive profiles of projects were found excluding the maintenance. Some of the profiles were unexpected and seem to reflect the changing nature of the system engineering market. This change shows that changes to existing methodologies and new methodologies are required in order to offer proper methodological support for modern full-scale ICT-services providers.

1 INTRODUCTION

In the modern business environment the traditional role of information system engineering companies has changed quite dramatically. One of the changes has been the emergence of full-scale ICT-services providers. Such providers have a much larger repertoire of services than companies providing traditional information system development.

It seems that the changed variety of services reflect the changed use of information systems. Information systems are not any more used only to perform very restricted tasks (DeMichelis et al., 1998). In the current business world information systems span different organizations and act as strategic business tools (DeMichelis et al., 1998)(Johansen, 1988)(Robson, 1997)(Ward and Peppard, 2002). That development has created pressures for ICT-providers: it is no longer enough to be very good in implementing single information systems. From the experience of the company analyzed in this paper it seems to be the case that in order to get implementation deals the provider has to have a much larger understanding of the business environment and provide additional services.

The types and profiles of such services are not, however, very well understood. It is common to characterize those services as consulting, and that consulting is further divided into management consulting (Block, 2000), management ICT-consulting (Robson, 1997)(Spewak, 1992)(Ward and Peppard, 2002) and technical consulting, for which there are some tools and approaches like (The Open Group, 2002), (Armour et al., 1999b), (Armour et al., 1999a), and (NCR, 2003). Such division is not accurate enough because different types of projects require different skills from the provider's employees and act in different roles in the overall business of the provider.

In this article we report a study performed inside a single full-scale ICT-services provider. The aim of the study was to obtain a better understanding of the actual business. Such understanding is required in order to be able to develop new methodologies and process models. Those new methodologies and process models should reflect the real business requirements. This is a very important consideration because existing methodologies or frameworks, like (Zachman, 1987), (Sowa and Zachman, 1992), and (Putman, 2001), do not reflect the changing business well enough.

In Section 2 we will outline the research setting and the data collection, in Section 3 we will outline the data, in Section 4 an analysis of the data is done. In Section 5 we will provide a brief conclusion and discuss future research.

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2 RESEARCH SETTING AND DATA COLLECTION

This study is a part of a larger, company-wide effort. The aims of the effort are methodology development and process improvement. One of the basic steps is gaining a better understanding of the real business and projects of the company. The company is one of the five biggest full-scale ICT-services providers in Europe.

The basic reason for the effort was that it seemed that the existing information system and/or software engineering methodologies and approaches do not reflect the changed business environment encountered by a full-scale provider. The methodologies and other approaches have to be changed in order to improve the overall performance of the company. The selected improvement methodology was process improvement and methodology development.

Because the variety of the projects performed by a full-scale ICT-services provider include much more than pure software engineering or maintenance, it is necessary to understand the types of projects provided in order to be able to improve. The selected approach to improvement was method development, process modeling and improvement.

One way to get better understanding of the projects is to analyze the different types of work and work distribution between those types. After evaluating the project plans of several projects and having discussions with project managers, the selection of different types of work was decided. Project phases were considered to represent the different types of work. The selected phases are outlined in Table 1. The table includes the shortcuts used for denoting the phases in figures. Actual work distribution (provider's effort) between phases was queried from project managers. The questions included the size of the project (provider's effort as working days) and the relative distribution of effort between different project phases.

3 COLLECTED DATA

In this section we briefly describe the data and provide a short analysis on the found project types. A more detailed discussion on the types of projects is provided in Section 4. The data consists of 49 projects and their metrics. A brief summary of the data is as: number of projects = 49, mean size (working days) = 370, cumulative size (working days) = 18 506, median size (working days) = 155, minimum size (working days) = 10, and maximum size (working days) = 5 500.

The summary shows that the average size of projects in the dataset is not very large, the average size is the same as one and a half year's work of an individual. The distribution of size is shown as a boxplot in Figure 1. The first impression of the mean and the median of size is that the size of the projects is surprisingly small. That seems to reflect the changing nature of the business as will be discussed later on.

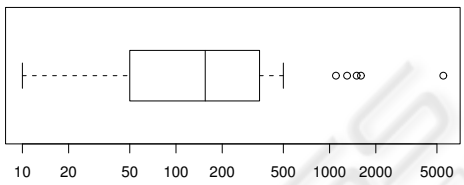


Figure 1: Boxplot of the size of the analyzed projects (provider effort).

One of the basic analysis methods is to look at the distribution of different variables. In addition to Figure 1 which shows the sizes of projects, the boxplot in Figure 2 shows the distribution of effort in different projects. The boxplot is very interesting, especially because the plot suggests that there are clearly different groups (or clusters) of projects.

Figure 2 suggests that the number of clusters is four or five. In order to find out the actual number of clusters we used the Partitioning Around Metoids -technique described in (Kaufman and Rousseeuw, 1990). In that analysis we tried the cluster numbers three, four, five, and six; contrary to our prior expectations, the most fitting number of clusters was five.

The clusters were separated by using the built-in method provided by R version 1.7.0 on Windows NT. The number of cases in each cluster are shown in Table 2. In our opinion the clusters represent the real types of projects although the number of cases in a cluster is fairly small in some cases: two clusters have only six members and one cluster has only four members.

The boxplot of the work distribution in cluster "Strategic consulting" is shown in Figure 3. The most important phases are understanding of the current situation, target definition and strategic planning. The average effort required by understanding the current situation and target definition is over 60 % of the total effort. It seems that the effort in strategic consulting projects is in deriving the target situation from the current situation. The explains the work distribution in a natural way.

The second cluster is "Process consulting", which is normally considered to provide ICT-related consulting for business process re-engineering. The boxplot of the work distribution in this cluster is shown

Table 1: Identified project phases.

Name of the phase	Description	Shortcut
Project planning and management	Effort used for planning and managing the project	plan
Quality definition	Effort used for defining the target quality	qde
Understanding the current situation	Effort used for understanding the current situation or the context of the project	und
Target definition	Effort used for defining the outcome or target of the project	tdef
Strategic planning	Effort dedicated for strategic issues, i.e. strategic planning	str
Technology architecture design	Effort used for designing the technology architecture of the target system (includes the definition of technology architecture of an enterprise level approaches)	t.a
Application portfolio design	Effort used for the design of application portfolio	a.po
Design of application architecture	Effort used for designing the architecture of and application or an individual system	a.a
Design of information architecture (organizational level)	Effort used for designing organizational level information achitectures	i.a
Business process design	Effort used for business process reengineering or design	p.pro
Requirements engineering/Specification	Effort used for requirements engineering and high-level specification of the target system	r/s
Design	Effort used for designing a system	des
Implementation	Effort used for implementing (including programming) a system	impl
Unit/component testing	Effort used for unit/component testing	u.t
Integration testing	Effort used for integration testing	i.t
System testing	Effort used for system testing	s.t
Education and other activities related to taking the system into use	Effort dedicated into taking the system into actual use	use
Customer satisfaction query	Effort used for measuring the satisfaction of the client/customer	c.s
Project closing	Effort used for project closing activities	p.clo
Other	Effort used for other activities	oth

in Figure 4. The majority of work is distributed between understanding the current situation, target definition, strategic planning, technology architecture design, and business process reengineering. It is worth noting that not a single phase required more than 20% of the effort in average, as is shown in Figure 8.

The third cluster "Architecture consulting", shown in Figure 5, is a much more specific case. Most of the effort is spent for understanding the current situation, target definition, and application portfolio design. In some cases effort is spent also for technology architecture design. It is not known what the phase "other" means in this case.

The most outstanding type of projects is "requirement engineering", shown in Figure 6. Almost all of the effort is concentrated in the creation of requirements. This is the most specific type of projects.

The fifth type of projects is the system engineering (or system implementation) project, shown in Figure 7. The work distribution shown in Figure 7 is very near the classical one discussed in literature, e.g. (Pressman, 2000), (Sommerville, 1998), and (Boehm, 1988). The most interesting feature is the surprisingly small amount of effort dedicated for requirements. There is, however, an explanation for this, as will be discussed in the next section.

Table 2: The number of cases in clusters.

Name of the cluster	Number of cases
Strategic consulting	6
Process consulting	13
Architecture consulting	6
Requirement engineering and specification	4
System engineering	20

4 ANALYSIS

The found clusters prompted us to perform further analysis of the projects. This analysis is based on in-depth discussions with project managers, specialists and consultants responsible for the analyzed projects. Those specialists agreed on the classification and considered it a natural one. The analysis provided in this section is based on the achieved consensus based on those discussions.

4.1 Strategic Consulting

This cluster consists of projects that set the directions for the whole client organization. This type of

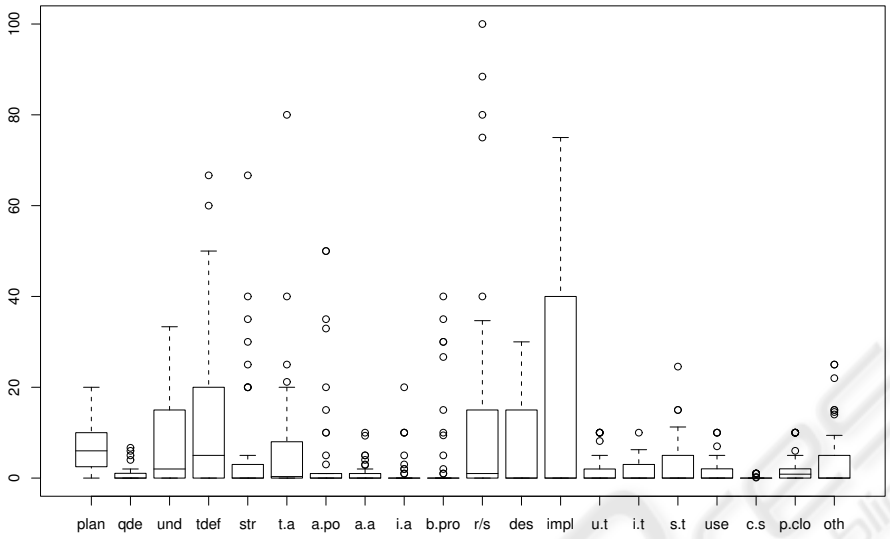


Figure 2: A boxplot of the relative distribution of work into different phases.

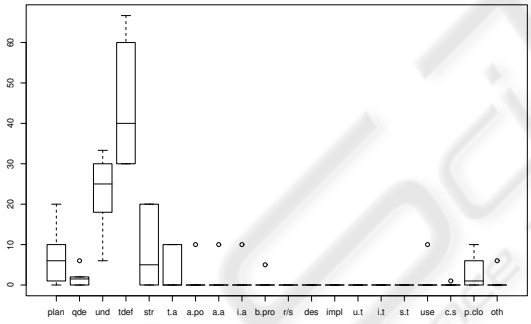


Figure 3: A boxplot for the cluster “Strategic consulting”.

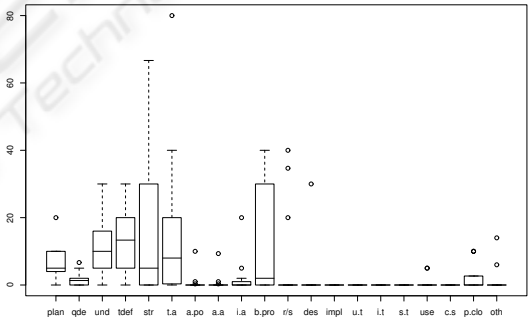


Figure 4: A boxplot for the cluster “Process consulting”.

projects form the first step and the starting point of enterprise wide ICT-architecture and solution development.

This type of strategic development is a continuous process. The continuous nature of strategic planning makes it natural that there are parallel and simultaneous development within the operative units of an enterprise. Typically this type of projects are conducted in order to solve some specific strategy, vision, and business model enablement problem or development issue.

The client participation in this type of project consists of senior management or senior specialists from strategic management and business leadership. The consultants who represent the provider must be very experienced people with good communication skills and social competence. They have to employ the business vocabulary with the client’s top management and provide the client with additional business value by pointing out new or cost-cutting uses of ICT. Therefore this type of projects act as the essential starting point for all other types of projects.

This type of project does not aim for a technical system. The aim is to create an abstract sys-

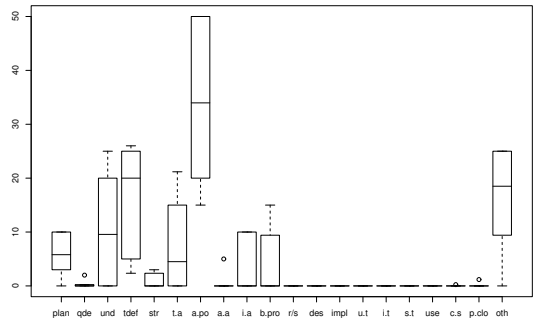


Figure 5: A boxplot for the cluster “Architecture consulting”.

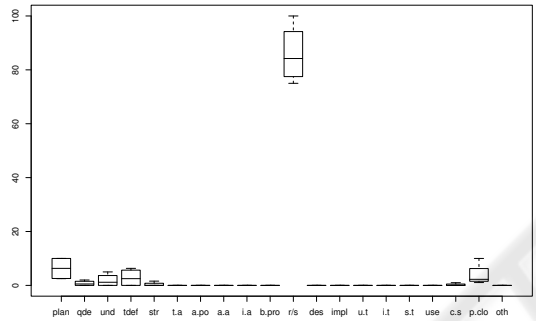


Figure 6: A boxplot for the cluster “Requirement engineering and specification”.

tem of business concepts, humans, and technology. These projects may span a long time, but their results are often compact and concise like strategic definitions, vision, descriptions of services, or a high-level road-map for the future. These results require good business domain knowledge from the consultant and proper understanding and commitment of the participants.

4.2 Process Consulting

When the strategic issues have been solved, the practical planning and implementation of the client’s business models and service processes can be started. That planning and implementation is normally performed in business development projects. This type of projects often include knowledge and change management. The implementation of the strategic aims of the client may require business process re-engineering in order to create ICT-enabled processes, business models and services.

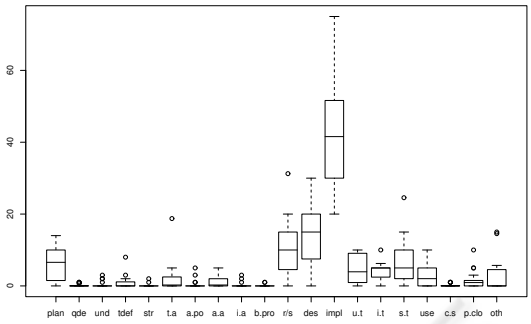


Figure 7: A boxplot for the cluster “System implementation project”.

This type of projects involve the operational management of the client. Therefore the improvement of communication between the client’s operational business management and ICT-management is an important issue. The most important issues to be tackled in this type of project are still soft issues, not technology itself. This type of consulting uses business vocabulary combined with technology-oriented considerations. The deliverables of this type of project are more formal than the deliverables of strategic consulting.

The provider has created a methodology with notations and process-models for the process consulting subtype of these projects. The requirements for the consultants are not as strict in this type of project as they are in strategic consulting. Exhaustive understanding of the business domain and excellent social skills may be compensated by more technical knowledge and proper working practices.

Both strategic consulting and process consulting are performed by special consultancy groups in the company. Strategic consulting and process consulting are important to full-scale ICT-service providers because these projects focus on the client’s strategic issues and increase the awareness of the client’s top management of the provider and open new business opportunities. In many cases such consulting is the starting point of large business development projects. In the modern world such projects require information systems development and the benefits to the client mean implementation projects for the provider.

It must be noted that the potential for the additional value of ICT-utilization is highest here. Therefore good deliverables and honest attitude in strategic consulting and process consulting are essential for both the client and a full-scale ICT-sevices provider like the analysed one.

4.3 Architecture Consulting

The type of projects, architecture consulting, can be seen as the first step in actual information systems related work. The focus of this type of projects may be in system portfolio management, planning the support for new or modified business processes, planning of the ICT-solution, technology adaptation, security improvement and management, and many other technology oriented issues.

This type of projects shift the focus from the higher management to the ICT-personnel of the client. This type of projects are guided by specific semi-formal methodologies with notations and process models. That methodology has been internally developed by the analysed provider. Knowledge of the business domain is still required by the consultants, but this is the first type of projects in which technical knowledge has risen to a dominant role. Technical specialists, system architects and even system development specialists often contribute to this type of projects.

This type of projects acts as the bridge between the more abstract strategic or process consulting projects and traditional information systems development activities. This type of projects is very important to the analyzed provider and the client because the proper needs and opportunities for actual system engineering are defined in this type of projects.

4.4 Requirements Engineering

In many sources modern system development or software engineering is considered to constitute an iterative or incremental development process which repeats several cycles with requirements engineering, specification, analysis, design and implementation. The publicly known methodologies like RUP (Jacobson et al., 1999), OMT++ (Jaaksi, 1998)(Jaaksi et al., 1999) and Catalysis (D'Souza and Wills, 1999) are based on this approach. In many cases that is not, however, true any more. The business environment has changed in ways which make such incremental projects more and more uncommon.

From the perspective of a full-scale ICT-services provider the analysis part (this part is considered to include requirements engineering, specification and high-level analysis) is willingly splitted into a separate projects. The price of this type of projects is often based on the amount of work (hours) required. This minimizes risks because the need for this type of projects is high when the final requirements and specifications of the target systems are vague and the estimation of the size of the final implementation projects are practically impossible to be performed.

One additional benefit of performing this type of projects separately has clearly been noted by clients. The separation of the requirement engineering from the system engineering project enables clients to ask several tenders from providers for the actual implementation because the analysis results describe the target system in such a detail that providers are able to prepare proper tenders and the client is able to compare those tenders.

It is interesting to note that European Union legislation suggests that the distinction between consulting, analysis and system implementation should be clearer. Such regulation would directly support the separation of requirements engineering from implementation projects — especially in the public sector.

In this type of projects, the client's representatives are from various business fields. Requirements engineering is formal and supported by methodologies and rich notations like UML (Booch et al., 1999). The analyzed provider uses an in-house developed methodology for this type of projects. The skills required from the provider's personnel are methodology knowledge and understanding of the business domain. At least some understanding of the notations is required from the client's representatives also.

4.5 System Implementation

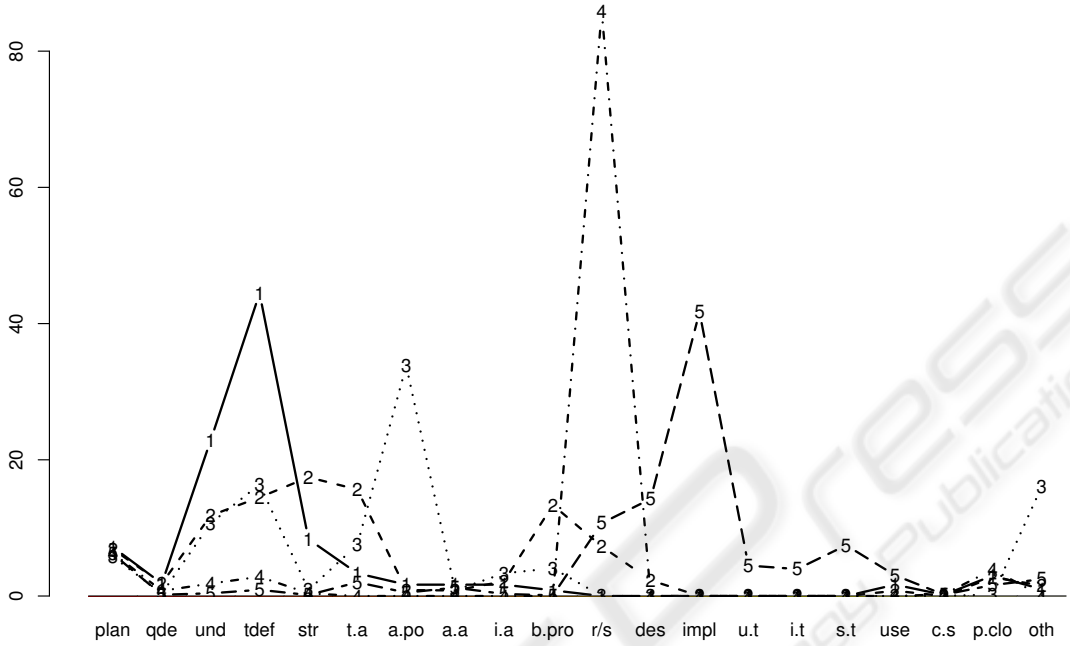
This type of projects consists of the activities traditionally associated with the information system engineering. The main activities are design, implementation, testing and taking-into-use. It is more and more often the case that this type of project does not include the analysis phase because those phases are performed in a requirement engineering project. The provider performs most of the work, but the participation of the client is practically required in testing, project management and the clarification of the unclear parts of the requirements. The participating representatives of the client are normally the same as in requirement engineering projects.

The key competencies of providers are project work, methods, and implementation technology skills. Staff is required to have at least elementary social talents and cooperative capabilities. Some knowledge of the business domain is also needed.

The turnover provided by this type of projects is very important for a full-scale provider. In the case of the analyzed provider, for example, the implementation projects constitutes the largest part of the whole business.

4.6 The Continuum of Projects

In Figure 8 the distribution of work is shown. The numbers used are the project type specific means for every phase. There is an important issue proposed by the figure. It seems that the different types of projects form a natural continuum of work.



1 = strategic consulting, 2 = process consulting, 3 = architecture consulting, 4 = requirement engineering and specification, 5 = system implementation

Figure 8: The distribution of work compared between types.

The distribution of work shown in Figure 8 illustrates the empirically evident fact that the types of projects found may be considered to form high-level phases of the general business of a full-scale ICT-services provider. The general flow of business apparently follows a natural cycle. The provider performs strategic consulting to the customer, and after successful strategic consulting the provider may be given a contract for process consulting which may, in turn, be followed by architecture consulting. Architecture consulting leads to the need for information system development, which means requirement engineering projects and finally system implementation projects.

In other words: the business of a full-scale provider follows a cyclic meta-level process in which the different types of projects form the phases of the process. That way of performing business is more and more systematic and the required methodologies and notations are developed step-by-step. It is, however, interesting to note that there are no full-scale methodologies aimed for this new way of looking at the business of a full-scale ICT-services provider — or at least we are not aware of such methodologies. Therefore the development of an internal methodology was initiated.

The aim of the internal methodology is to provide support for the complete high-level cycle. Different types of projects would act as phases of the overall customer management process. The methodology should provide a coherent and clear backbone for all types of projects performed by the provider.

A more technical issue is the separation of analysis-oriented phases and the implementation-oriented phases of normal information systems implementation projects. That separation is getting more and more common. The separation will provide new challenges for modern software engineering methodologies like RUP (Jacobson et al., 1999), OMT++ (Jaaksi, 1998)(Jaaksi et al., 1999) and Catalysis (D'Souza and Wills, 1999), which currently assume an iterative or incremental approach to the system engineering work. In such cyclic approaches it is assumed that the provider is able to incrementally work with different phases and easily return to require-

ments if there are some uncertainties in the design phase. In the emerging business models that is no longer possible due to the separation of phases and the use of competing providers. This will present new challenges to methodology developers both in the industry and in the academia.

5 CONCLUSION

It must be noted that our results are from a single provider and may not represent other providers and markets. In addition to that, the number of projects analyzed is not very large and fresh data from other companies and markets should be acquired in order to make the results more reliable.

The most important result of the analysis of the projects is that the types of projects form a high-level process that constitutes the client-provider relationship. The profiles of projects and their relationships to each other have consequences to the organization of a provider's activities. Those providers that take this into consideration will have a competitive advantage.

The clusters of projects represent the changing nature of the business. In order to get new system engineering projects a provider has to be good in consulting also. That is not very easy because there are no existing methodologies or process models which could be used for the management, measurement and improvement of the provider's business.

In addition to the need of a holistic methodology for providers there is a real challenge to the existing engineering methodologies. Modern methodologies assume working practices that are less and less common in the business environment of a large full-scale ICT-services provider. Methodology developers from both the academia and the industry should develop new methodologies that will be better suited for the changing business environmet.

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