Management of IS/ICT with focus on ICT services outsourcing

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To Markéta

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Statement of Originality

I hereby declare that this submission is my original work. All sources of information have been adequately acknowledged in the included references section.

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Abstract

Research on outsourcing has been around for several decades, while recent evolution in the information systems discipline towards ICT service commoditization significantly changes the context of decision-making. Services that are available on-demand via the Internet allow organizations implementing functions they demand in a fraction of time. This trend represents a chance for organizations seeking to use advanced ICT services without a need of major investments.

Problem is the current lack of guidelines and tools for managing ICT services and their outsourcing. Given the trends on the ICT service market, it is expected that much of the IT management in the future will encompass the ICT services and utilize service-level structures. Methods currently available are either too broad or encompass only small part of the whole problem. Ad-hoc or unsound decisions in this area might cause major complications in terms of quality, usability, integration, and consequently influence total cost of organizational IT. Organizations need to either revise existing models or propose and implement completely new models to manage their IS/ICT.

This thesis deals with the management of IS/ICT with focus on the ICT services outsourcing. It discusses available sourcing models in the literature and links them to the various interconnected areas. Based on these areas, it presents an integrated view on IT outsourcing strategies. Most importantly the thesis proposes an original concept for decision-making about outsourcing of ICT services named the SOURCER framework. This approach utilizes the presented outsourcing strategies, and introduces a complex methodology and decision-making criteria that will assist organizations with selection of ICT services in order to maintain and manage a most suitable ICT service portfolio. The decision-making is based on four essential viewpoints: function, costs, time, and quality. These viewpoints are discussed, individually analyzed, and serve as a basis for further research.

The whole framework is developed and validated according to Design Science Research Methodology (DSRM). Individual components are evaluated using a survey among a group of selected IT managers. Proof of concept is then established by a case study on framework use in a real organization. This case study covers strategy specification, business–IT alignment, specifying service architecture and its interconnections, outsourcing, and management of the ICT service portfolio.

Keywords: Information systems, sourcing strategy, outsourcing, service, management, framework, SaaS.

Abstrakt

Předmětem odborného výzkumu je sourcing již několik desítek let. Evoluce v oblasti informačních systémů v poslední době charakterizovaná především komoditizací ICT služeb však významně mění celkový kontext rozhodování. Služby dostupné na vyžádání přes Internet umožnují organizacím implementaci požadovaných funkcí oproti dřívější době za zlomek času. Tento trend znamená významnou šanci pro organizace, které by rády využily pokročilé ICT služby, bez nutnosti vysokých investic.

Problémem je současný nedostatek metod a nástrojů pro řízení služeb informačního systému a jejich outsourcing. Vzhledem k vývoji a trendům na trhu ICT služeb lze očekávat, že v budoucnu velká část řízení IT bude zahrnovat ICT služby a strukturované řízení jejich úrovně. Současně dostupné metody jsou buď příliš široké, anebo naopak zahrnují pouze malou část celého problému. Nahodilá a nepodložená rozhodnutí v této oblasti mohou způsobit značné komplikace z hlediska kvality, využitelnosti, integrace, a v důsledku toho významně ovlivnit celkové náklady na IT daného podniku. Organizace musí buď revidovat existující modely, anebo navrhnout a zavést zcela nové modely řízení svého IS/ICT.

Tato disertační práce se zabývá řízením IS/ICT se zaměřením na sourcing služeb informačního systému. Diskutuje dostupné sourcingové modely uváděné v literatuře a propojuje je se souvisejícím oblastmi. Na základě těchto oblastí pak prezentuje integrovaný pohled na možné strategie sourcingu IT. Především pak práce navrhuje originální concept rozhodování o sourcingu ICT služeb nazvaný SOURCER framework. Tento přístup navazuje na zmínené strategie sourcingu, a předkládá komplexní metodiku a kritéria pro rozhodování. Ty pomohou organizacím s výběrem ICT služeb s cílem udržování a řízení co nejvhodnějšího portfolia ICT služeb. Rozhodování je založeno na čtyřech základních pohledech: funkce, cena, čas, a kvalita. Tyto pohledy jsou diskutovány, individuálně analyzovány, a slouží jako základ pro další zkoumání.

Celý framework je vyvíjen a validován s využitím přístupu Design Science Research Methodology (DSRM). Individuální komponenty jsou vyhodnoceny s využitím průzkumu mezi vybranými IT manažery. Další ověření přístupu je pak zajištěno realizováním případové studie, která mapuje reálné využití frameworku v organizaci. Tato případová studie zahrnuje specifikaci strategie, business–IT alignment, specifikace architektury služeb a její propojení, sourcing, and řízení portfolia ICT služeb.

Klíčová slova: Informační systémy, sourcingová strategie, outsourcing, služba, management, framework, SaaS.

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Chapter 1

Introduction

Evolution in the information systems discipline towards ICT service commoditization significantly changes the context of decision-making. Services that are available on-demand from the Internet allow organization to implement functions they demand in a fraction of time. This trend represents a chance for organizations seeking to use advanced ICT services without a need of major investments.

There is a lack of theoretically sound guidelines and tools for managing ICT services and their outsourcing. The guidelines available in academic literature and general IT management practice as described further in this chapter are too broad, complicated, elaborative, or deal with outsourcing in the sense of traditional outsourcing. Other methods published by professional practitioner organizations are not properly grounded by in-depth research. Methods that focus specifically on ICT services outsourcing usually cover only small part of the whole problem.

It is expected that much of the IT management in the future will encompass the ICT services and the service-level structures. Ad-hoc or unsound decisions in this area might cause major complications in terms of quality, usability, integration, and consequently influence the total cost of the service.

Subject area of the research combines multiple research directions, both in the field of IT, and other scientific disciplines[1]. In terms of information technology, it is possible to subdivide the examined area into several research flows. It comprises the management of IS/ICT[2] and related strategic management, and especially the outsourcing and ICT services research.

Within the later chapters, we discuss the IT management area and connect this area to the decision-making and current trends influencing the ICT services field, such as Cloud Computing, and also to recent changes in the business environment. Special emphasis is put on outsourcing which is our main field of study where we outline existing outsourcing areas and summarize present research.

[1] Such as finance, economics, but also psychology, philosophy, etc.
[2] Information Systems & Information and Communication Technologies.

In this introductory chapter we identify a research gap and define our research objectives, formulate research hypotheses and present the thesis structure.

1.1 Identification of the gap within current research

Outsourcing research nowadays comprises relatively separated research directions. In addition to the academic articles dealing with theories[3] and its impact on practice, there exist a large volume of approaches based on management experience and purely empirical knowledge. Both of these ways of thinking are interesting. In order to get an accurate picture of the field one has to study the theoretical foundations, but also look more closely into the best approaches applied in organizations by practitioners. The reason is that outsourcing itself is a very actual thing, which ultimately happens in practice and in a business environment that is to a certain extent unique. Therefore its linkage with various organizational problems that emerge in practice is beneficial. When studying this literature, we have to be aware of a serious issue surrounding practitioner literature, which in most cases lacks sound research methods, and is not scientifically grounded. The practitioners in most cases do not utilize any theories, but on the other hand, they include many interesting points mainly from day to day operations and practical management experience. These observations bring us to an approach when careful selection of appropriate resources of both types is desirable.

Firstly, speaking of academic research, the articles are mostly aimed on Business Process Outsourcing (BPO) and the traditional approach to IT outsourcing (ITO). The research of outsourcing (such as [73], [11], [113], [61], [66], [109], [172]) focuses mainly on theories, their relevance to outsourcing field, on management approaches to outsourcing practice, or on quantitative calculations of specific problems.

Closely related is the mentioned field of ICT services, which is described in ITIL [92] or [33]. Moreover, we can hardly find academic publications focusing on outsourcing together with ASP or SaaS/Cloud Computing concepts, while emphasizing strong decision-making support[4]. On the other hand, the topic is covered by a some practitioner publications such as those presented on the Outsourcing Institute[5], or Gartner [39]. The research direction that examines the decision-making focuses especially on the factors that influence the overall outsourcing strategy, but it does not address factual applications of these findings in a form of a functional management tool like a framework.[6] Another area related to this problem is the mentioned Enterprise Architecture (EA). From this point of view, major EA approaches like TOGAF [188] use the term services with more orientation towards

[3] Such as the Agency theory, Transaction-cost theory, or Contracting theory.
[4] Exceptions are Bennett and Timbrell [13], Vorisek et al. [200], or Susarla, Barua, and Whinston [182].
[5] See http://www.outsourcing.com/.
[6] Conceptual framework addressing a complex problem.

SOA[7] than towards application services, and therefore it makes them not very practical for our aims. Specifically, as mentioned by Sebesta and Vorisek [164], TOGAF[8] lacks a sound services architecture that can be used to manage ICT services. Although some of the less used EA approaches like DoDAF, or FEAF utilize services in their models to some extent, they typically do not cover possible outsourcing criteria and do not present any unified outsourcing framework or methodology that could effectively help organizations with their decision-making about sourcing of their defined ICT services.

Let me point out some of the interesting concepts available in the literature in addition to the presented approaches. Relatively innovative is a concept presented by Han et al. [79] that brings in the customer feedback factor. Han et al. [79] propose a decision-making system that is based on user recommendations, which is specifically targeted on the field of Cloud Computing. Within this approach, service price and a special service evaluation index is used to compare available variants. However, being at a very early stage of development it is a question whether the system based on user recommendation may actually work. The main obstacle in this case is how to ensure appropriate control over false votes or fake recommendations. When we have a closer look on Han's approach, it does not include detailed methodology, and the overall solution is overly simplified.

Other approaches that aim on the decision-making process, its flow, methodology, or criteria for deciding the most suited sourcing variant are the models developed by Jurison [96] or De Looff [44]. For instance, Jurison [96] deals with the general risks and benefits of IS/ICT outsourcing, which he subsequently uses to create his risk–reward outsourcing model. De Looff [44] then presents a purely descriptive framework. However, due to the fact that they were introduced more than ten years ago, these approaches do not reflect contemporary trends in application service sourcing and it would be complicated to adapt them to the recent IS/ICT market conditions.

An international standard published during recent years, the ISO 37500 [90], was not accepted well by the community, because of its proprietary character, but also because of the fact that it does not build on recent architectural findings and stick too much on the legacy concepts of outsourcing. This in fact makes it very complicated to use in SMEs. On the other hand, it provides some guidance on the overall governance, and on associated risks.

One of the most interesting approaches in the literature is the life-cycle model of outsourcing introduced by Cullen, Seddon, and Willcocks [37]. However, this approach does not provide information, guidelines, or comprehensive methodology for choosing the most suited sourcing variants. Furthermore, the model does not seem to be very practical in the

[7] Service Oriented Architecture.

[8] Currently the most commonly used EA approach.

Table 1.1: Gap within major IT management approaches. [author]

Approach	Service-based	Guidelines for outsourcing	Service selection factors	Reflects commoditization of IT	Suitable for SMEs
ITIL V3	Yes	Partial	Partial	No	Partial
COBIT 4.1	No	Partial	Partial	No	Yes
TOGAF 9.1	Partial	No	Partial	No	No
ISO 37500 [90]	Partial	Yes	Partial	No	No
Jurison [96]	No	Yes	Yes	No	Yes
De Looff [44]	No	Yes	Yes	No	Yes
Han et al. [79]	No	No	Yes	Yes	Yes
Cullen, Seddon, and Willcocks [37]	No	Yes	Yes	No	Yes
Goals of our approach	Yes	Yes	Yes	Yes	Yes

recent SaaS/Cloud business environment and is more aimed on the traditional model of outsourcing.

To summarize the situation we may illustrate the gap using the Table 1.1[9] where we point out principles and their coverage by major approaches currently available. It may be noted that present academic research in this field of study lacks a unified approach that would include a methodology and criteria for evaluating outsourcing variants, while being able to be successfully used in practice together with respecting new ways of service sourcing. Although the particular components are covered in the practitioner literature, they are not based on a real research with sound methods applied[10] Although in some cases this literature might be informationally enriching and might also bring new ideas to the table, in many cases these approaches are significantly biased due to affiliations of their authors.

This is confirmed by Malgorzata Sobinska and Leslie Willcocks [123] in their recent article, where they specifically mention that the use of proper tools and resources to support optiomal sourcing decisions is often very deficient, and that there is an urgent need for further research on the efficiency and cost-effectiveness of modern tools.

Development of information systems during the last decade, its wide deployment among

[9]The individual columns describe: *Service-based* - whether the approach is built on the service approach to IT management; *Guidelines for outsourcing* - if the approach includes explicit guidelines for outsourcing; *Service selection factors* - whether the approach includes factors for service selection; *Reflects commoditization* - whether the approach reflects the current structure of the ICT service market; *Suitable for SMEs* - whether the approach is suitable for SMEs given the easiness of use and overall requirements on IT expertise. Although there is a new version Cobit 5, we still refer to Cobit 4.3 since it is still preferred by most organizations.

[10]The same applies to other attempts by practitioners, that are in most cases an opinion pieces. Examples of other practitioner examples include NOA Outsourcing Life Cycle by National Outsourcing Association in the UK, Outsourcing Professional Body of Knowledge by International Association of Outsourcing Professionals (IAOP), or the Vendor and Sourcing Management Life Cycle by IDC. These were summarized together with the ISO 37500 recently by Ron Babin and Adrian Quayle [156].

all fields within the corporate segment, as well as the associated rapid expansion of recent technologies and their standardization and commoditization, has caused the current situation where in order to gain a competitive advantage, it is no longer enough just to be the owner of the technology. As confirmed by the predictions by Gartner [69] and also from the experince of Ross and Weill [158], from the viewpoint of IS/ICT, it is necessary to effectively *manage* and *control* IS/ICT and to be able to *flexibly respond to ever changing market conditions*. Within these activities is from my point of view an obvious potential of the concept of SaaS[11]. However, a necessary condition is an appropriate choice of service sourcing practices for particular services within the organization, and selection of the most suited solutions available.

Given these circumstances IT outsourcing can be considered one of the most important aspects of IT management in the next decade.

Questions that can be considered important and still deserve further research are mainly:

- Which services should be sourced internally and which externally (in the form of outsourcing)?
- Are there any specific outsourcing related strategies?
- What outsourcing strategy is the most appropriate for the particular service?
- What categories of services exist and what is the situation on particular service markets?
- What service on the market is the most suitable for the defined service requirements?
- What are the factors that need to be taken into account when deciding about outsourcing?
- What are the weights of these factors?
- What are the prerequisites and consequences of such decision-making system?
- Who shall be responsible for management and outsourcing of ICT services?

To ensure an effective decision-making is in my opinion a clear definition of sourcing practices, categorization of the various types of application software, and the use of a clear enterprise typology. Furthermore, there is a need to conduct an analysis of relevance and weight of decision criteria, and detailed and constantly updated evaluation of application services on the market.

[11] And respectively of the concept of ASP.

1.2 Research model

Since our main aim is to design a framework for decision-making about ICT services sourcing, the nature of the problem and its high complexity calls for a specific approach. The Design Science Research (DSR), as suggested by Hevner et al. [85] enables a solution to a previously defined problems through creation and validation of artifacts. These artifacts can be subsequently used in similar situations in order to replicate successfull solution of the problem. Namely, we may draw on the work of Peffers et al. [145] who specifically defined a methodology based on DSR – the Design Science Research Methodology (DSRM).

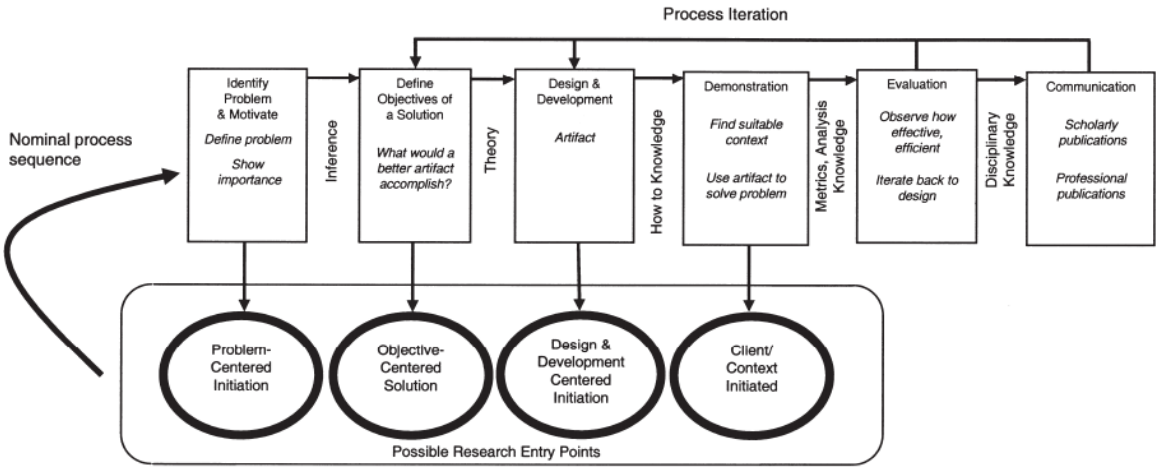

Figure 1.1: DSRM Process Model. [145]

This approach has been recently quite popular in the information systems discipline thanks to its ability to focus on problem solution without sacrificing the research rigor. Building mainly on paradigm valued by the European IS research community, we can find a lot of supporters on the old continent (as mentioned by Österle et al. [141]). However we can increasingly see its adoption coming from overseas together with increasing number of resources to build on and number of journals and other outlets Baskerville et al. [12].

Gregor and Hevner [75] published a DSR Knowledge Contribution Framework, in which our approach would be positioned in the first quadrant as improvement – the one with low solution maturity and high application maturity.[12] According to Gregor and Hevner [75], this is the quadrant where much of the previos and current DSR in IS/ICT belongs. Examples of such research can be articles published by McLaren et al. [125], or by Nunamaker Jr et al. [140].

As depicted on Figure 1.1, there are four possible research entry points, where those are connected to a DSRM process steps. These steps are chained in a sequence with optional process iterations.

[12] New solution to a known problem.

Process mapping of DSRM within this thesis is then as follows:

- Identify Problem & Motivate – Chapter 1.
- Define Objectives of Solution – Chapters 1, and 2.
- Design & Development – Chapters 3, and 4.
- Demonstration – Chapter 6.
- Evaluation – Chapters 5, and 6.
- Communication – Section 1.6.

As mentioned by Vaishnavi and Kuechler [192], there can be various outputs of DSR: constructs, models, frameworks, architectures, design principles, methods, instantiations, and design theories. Given the nature of the problem we are trying to solve in this context, we may identify *a framework* the most suitable form of output. This is defined by Vaishnavi and Kuechler [192] as a *real or conceptual guide to serve as support or guide*.

1.3 Research objectives

According to the previously presented initial examination of the outsourcing research and the analysis of related research areas I defined several objectives of this thesis in accordance with DSRM. These objectives may be divided into two groups. Primary objective that covers the main points addressed within the thesis, and secondary objectives that are extension of the primary objective and cover closely related areas of the problem.

Primary objective is mainly:
Design a framework for decision-making about ICT service sourcing, including methodology, and criteria for selection of most suited practices as well as particular solutions, and validate this framework using a survey among experienced practitioners in the IT outsourcing area, while subsequently demonstrating its use on a pilot deployment in a real business environment.

Secondary objectives are:

- Identify factors influencing IT outsourcing success from the viewpoint of end user organizations.
- Define decision-making factors and their significance for the selection of IT outsourcing solutions.
- Define prerequisites of framework adoption.

- Analyse contemporary sourcing models and present a unified classification of possible IT outsourcing strategies.
- Study situation on the market of ICT services with emphasis on the Cloud service markets and propose possible functional taxonomy.

As expressed in the research gap identification earlier, the presented approach should based on service concept[13], provide guidelines for IT outsourcing, provide service selection factors, reflect commoditization of IT[14], and be suitable for Small and Medium Enterprises (SMEs)[15].

Following the definition of objectives it is useful to code these objectives into working hypotheses. In this regard, we divide the hypotheses testing into two steps. In the first step we use the traditional form of hypothesis testing where we define a null hypotheses together with relevant alternative hypotheses. In our research design, given its architectural nature, we test three groups of hypotheses which are further described in this section and extended in chapters that follow. In the second step we examine these extended hypotheses which are constructed in accordance with the overall model mentioned (see Figure 5.1).

Hypotheses group A

H_{A1}: IT outsourcing success is influenced by various factors.

H_{A0}: IT outsourcing success is completely random phenomenon.

Hypotheses group B

H_{B1}: IT outsourcing success can be predicted by other than financial factors.

H_{B0}: Financial factor is the only predictor of the IT outsourcing success.

Hypotheses group C

H_{C1}: Importance of the individual factors involved in IT outsourcing success prediction varies.

H_{C0}: Importance of the individual factors involved in IT outsourcing success prediction is equal.

Other **31 hypotheses** as described in the following chapters and on Figure 5.1.

Broadly speaking, the individual hypotheses at this initial stage form a chain that is further evaluated. In the first step, we need to find out whether the identified factors exist and whether the phenomenon is not not influenced randomly. In the second step we try to prove that there exist other than financial factors that might be important for outsourcing decisions. Most important is the third step, where we try to assess importance of factors

[13] Position of service concept in management of IS/ICT is discussed in Chapter 1, whereas ICT services are further explained in Chapter 2.4

[14] Commoditization of IT is further discussed in Chapter 2.3

[15] SME context in IT management is further discussed in Chapter 2.2

for outsourcing success. Hypothesis H_{A1} aims on the main objective, which is initial factor identification, whereas hypotheses H_{B1} and H_{C1} relate to the objectives of factor significance.

Although validation of the hypotheses H_{A1} and H_{B1} might be estimated from the literature review, and experience captured in recent outsourcing contracts might have had already confirmed them, we test these hypotheses on our own data in order to present a clear and straightforward research design.

Important part of the research then encompasses thirty-one additional hypotheses as described in methodology chapter (Chapter 5.1) and discussed within related chapters (Chapter 4.3, Chapter 4.2, and Chapter 4.1).[16]

1.4 Research methodology

In order to test the defined hypotheses, we need to have sufficient information about the field. From my viewpoint, the best source of this information are the practitioners that already have some experience with outsourcing projects and preferably the Software-as-a-Service concept. These can be Chief Information Officers (CIOs), IT managers, or managers responsible for IT function in the organization as mentioned by Weill and Ross [202]. Regarding the data collection phase, I decided to gather the data using a survey. The survey has two parts, first is a questionnaire among an international group of managers of this type focusing on limited number of questions while taking advantage of the higher quantity of potential respondents, and second is an additional set of interviews with selected experienced IT management figures, focused on getting more detailed insight and framework validation.

The whole approach passes further validation using a case study, following the advice on the method as summarized by Myers [134, 133] and more concretely by Yin [208]. This descriptive case study follows a structure that emphasizes areas necessary for successful use of the framework in practice. Within its parts, it also illustrates possible lightweight service modelling guidelines that can be used within the framework.

The case study, which generally serves as a proof of concept, illustrates usability of the approach in real-life environment. It can be regarded as a much needed starting point for potential future framework adoption into organizational practice.

Detailed structure of the thesis follows in the next section.

[16] Hypothesis regarding implementation time is also mentioned in Chapter 3.

1.5 Thesis structure

Presented doctoral thesis is divided into seven chapters, which cover the objectives defined in the previous section. The structure itself is depicted on Figure 1.2. Within this section, we describe each chapter individually with emphasis on its content and outcomes.

Chapter 1: Introduction

The first chapter forms an introduction of the doctoral thesis. It defines research objectives, outlines research model and methods used to address the defined objectives, formulates hypotheses, and presents overall structure of the thesis. Another outcome of this chapter is identification of the research gap.

Chapter 2: Management and outsourcing of IS/ICT

This entire chapter is devoted to laying a foundation for further research. From my viewpoint, several influence layers intersect within this chapter, namely: management, economic, strategic, IT specific and service-concept related. This classification also enables differentiation of the particular outsourcing areas: BPO, ITO, and SDO. From the viewpoint of IT specific problems the main resources are studies and forecasts of organizations like Gartner (annual leadership trends), or IDC (market research). The strategic layer is related to the heterogeneity of organizations in terms of their objectives and strategies. Organizations profess various approaches, which are reflected in their way of dealing with resources and perception of their value within the organizational structure (hence, the different approach to value/supply chain within the particular market). Special emphasis is put on analysis and identification of IT outsourcing strategies.

Chapter 3: SOURCER framework

This chapter presents design of an original approach named SOURCER framework that covers methodology and criteria for decision-making about outsourcing based on the services concept. This also includes the Tear-drop model consisting of four views on ICT services: function, cost, quality and time.

Outcome is a general framework description which is further extended in the following chapter. This outcome sets a basis for meeting the main objective of the thesis.

Chapter 4: Framework settings

This chapter further extends the SOURCER framework design, where it focuses on discussion of various settings that can be used within the framework. It points out the aspect of the framework flexibility in terms of its use. It is expected that in certain cases, the framework settings may be modified according to the actual context of the decision-making

process. This chapter presents recommended framework settings in typical IT outsourcing decision-making situation, and its constructed on the basis of current academic and practitioner literature. The views covered in this chapter are structured into individual sections covering: functions (Section 4.1), costs (Section 4.2), and quality (Section 4.3. These are explained in more detail below.

Section 4.1: Functions of ICT Services

This section deals with the architectural aspect of an organization. Special emphasis is put on the architecture focused on serving the business functions. It explores some of the approaches currently used in practice, as well as the ones discussed in academia. Much of the chapter is then devoted to an original differentiation of ICT services that might be used as resource for the SOURCER framework. The functional areas which outline individual application services are defined on the basis of current ICT services market situation while taking into account the existing approaches in the literature and practice.

Outcome of this chapter is an analysis of existing ICT services on the market and extension the framework in terms of possible ICT services, their use in the service architecture, and their potential aggregations onto application services.

Section 4.2: Costs of ICT Services

Main aim of this section is to summarize possible approaches to costs quantification. It discusses ICT services pricing models, and various pricing structures related to the available services on various markets. Also, it sums up financial metrics that might be used to quantify costs associated with outsourced ICT services.

Outcome is the guidance regarding pricing models, typical costs and typical gains in IT outsourcing, and selection of relevant financial metrics.

Section 4.3: Quality of ICT Services

The section is devoted to identification of non-financial criteria influencing success of IT outsourcing. Exploring and analysing these criteria a comprehensive set of service quality factors is proposed. The chapter also sums up possible criteria values and defines scales for the service quality factors to be used within the SOURCER framework.

Outcome is the identification of factors influencing service quality, and related design of scales for measuring these factors.

Chapter 5: Survey and framework validation

This chapter deals with verification of hypotheses and subsequently with achieving the specified research objectives. It is divided into two sections – methodology of the survey, and findings and discussion. Methodology section sets the stage for the data collection. It

describes the method how the data were gathered and analyzed. It also extends the essential hypotheses presented in the previous chapters, and sums up how the gathered data contribute to shaping the SOURCER framework. Outcome is the survey that helps to estimate impact of various areas on IT outsourcing success. Findings and discussion section focuses on analysis of results, and presentation of survey findings. It focuses on validation of framework design and provides further suggestions to framework settings and use in an organization. Outcome of this chapter is fully validated framework, and a set of weights regarding various criteria influencing success of IT outsourcing.

Chapter 6: Proof of concept

This chapter presents a proof of concept of the framework, and generally aims on validating the whole framework using a case study. The case study covers implementation of the framework in a selected real organization. This includes recommendations for successful use of the framework in practice focusing on ICT service sourcing and management, presented together with use of a lightweight architectural representation based on the SPSPR approach to emphasize ICT services connection to other architectural layers in the organization. It also serves as a guide through the whole cycle of the SOURCER framework as designed in the earlier chapters, pointing out the important parts of the whole approach.

Chapter 7: Conclusions

Last chapter presents conclusions, summarizes findings and emphasizes original contributions introduced in the thesis. It also describes potential future research streams. This includes a plan of possible further framework development.

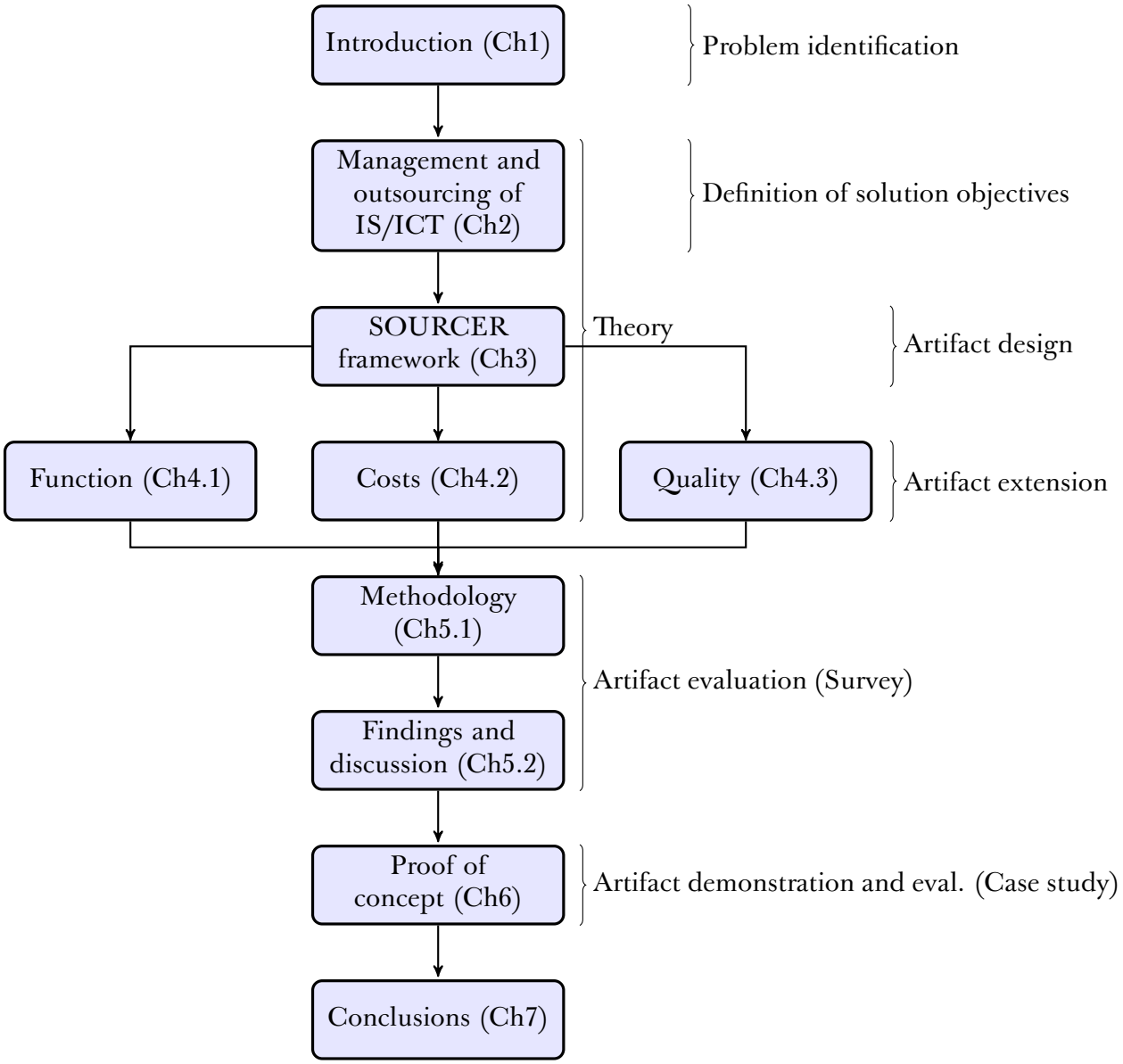

Figure 1.2: Structure of the thesis. [author]

1.6 Published papers

Various parts of the framework were already individually published as articles in journals or conference proceedings. Paper [163] described the context of decision-making about outsourcing and proposed an initial version of a decision-making approach presented in this thesis, the SOURCER framework. Article [164] then analyzed the services architecture concept which is currently an important paradigm in the field of management information systems, and described the possible alignment of SPSPR model with the with the SOURCER framework including specification of the requirements on human resources. In another publication [166] an analysis of available multicriteria decision-making (MCDM) methods and their potential for the use within the model was presented. Paper [169] discussed existing outsourcing areas and identified their relation and possible application within SPSPR model. Article [167] then analyzed available literature on outsourcing strategies and outlined an original categorization within the model. Other important output presented in this article is the analysis and presentation of possible use of the framework within small and medium enterprises (SMEs). Moreover, this article also connected these sourcing strategies with existing outsourcing areas, and outlined an innovated version of the SOURCER framework.

From this viewpoint, the Chapter 2 is covered by publications [167], [169], [62], and [164]. Chapter 3 is then covered by [163] and [167], whereas Chapter 6 is covered partially by [166].

Moreover, within the research grant of our Cloud Computing Research Group, we have conducted a survey among Czech organizations and their experience with the Cloud services (namely SaaS, PaaS, and IaaS), initial results have been published in article [62].

Chapter 2

Management and outsourcing of IS/ICT

Management of IS/ICT embraces a wide range of strategic, tactical and operational activities. Describing a clear and universal guidance on effective IS/ICT management would be extremely difficult, since there are too many factors/areas that affect it[17]. In an effort to at least approximate the ideal situation, there are various approaches that provide a helping hand to the enterprise so as it can effectively manage its IS/ICT. Examples of these approaches are ITIL[18] [92], COBIT[19] [33], or ISO/IEC 20000 [91]. Another example might be the model MBI[20] [199] currently developed on our department at the University of Economics in Prague.

Critical aspect is the business–IT alignment whereas the most influential in this area are probably approaches of Henderson and Venkatraman [83] or Duncan [51].

Although it has been discussed many times in the practitioner and academic literature, current studies such as those by Chan, Sabherwal, and Thatcher [28] or Luftman and Ben-Zvi [119] show that it is still a crucial topic needed to be addressed by researchers. This viewpoint is also supported by an extensive study presented by Chan and Reich [27]. In relation to the alignment, equally substantial is the control of the entire cooperation between these two worlds; the effective management of IS/ICT and the whole IT Governance can therefore be regarded as one of the key activities across the whole enterprise.

One of the areas that highly leverage the management, its forms, and its overall impact on the organisation is how we structure the solved problem. In our case this is how to structure the information system in order to be efficient and effective in delivering the functional needs specified by the executive board and the involved business units. These structures or

[17] Processes, people (psychological factors, sociological factors, cultural background), organization, technologies, time, etc. So as other more elusive or completely random factors.

[18] Information Technology Infrastructure Library. (www.itil-officialsite.com)

[19] Control Objectives for Information and related Technology. (www.isaca.org)

[20] Management Business Informatics. (mbi.vse.cz)

its templates are often provided by specific methodologies. The solution used in practice might be also one of the Enterprise Architecture frameworks.

The Enterprise Architecture (EA) is a complex area and can be defined in many ways. One of the most accurate definitions is the one proposed by Ross, Robertson, and Weill [157] from Massachusetts Institute of Technology, where they define Enterprise Architecture as 'the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company's operating model', where the operating model has two dimensions: business process standardization and integration. We may also point out definition of EA by Schekkerman [160], who provided a comprehensive overview of the EA frameworks. He defines EA as 'a complete expression of the enterprise; a master plan which acts as a collaborative force between aspects of business planning, aspects of business operations, aspects of automation and the enabling technological infrastructure of the business.'

There exist a number of approaches, where some were constructed with focus on universal applicability (Zachman framework, TOGAF [21]), and some emerged from an industry specific application (DoDAF [22], FEAF [23], MoDAF [24]).

Although generally can be the EA approach considered a powerful concept to manage organizational IT, unfortunately, the current major EA approaches, mostly do not reflect the services nature of current application offerings. In most of the methods for architecture planning, such the TOGAF Architecture Development Method (ADM), the service architecture is still missing or hidden within other views.[25] An organization might accomplish this partially while using other architectures. However, missing an explicit service architecture covering the various quality attributes, and service interconnections, can make the actual outsourcing of ICT services complicated. On the other hand, an approach that successfully applies the service view is the above-mentioned ITIL [92]. Mostly thanks to the ITIL and ISO/IEC 20000 standard we can increasingly encounter organisations utilizing ICT services.

Service-based IT management[26] is a concept that is slowly but surely gaining its place within the contemporary management practice. A good definition of the concept is provided by Van Bon and Jong [194] who state that it is 'a management of all processes that cooperate to ensure the quality of live ICT services, according to the levels of service agreed with the customer.' Service is then managed within various stages of its life-cycle as described in ITIL [92]: service strategy, service design, service transition, service operation

[21] The Open Group Architecture Framework.

[22] Department of Defense Architecture Framework.

[23] Federal Enterprise Architecture Framework.

[24] British Ministry of Defence Architecture Framework.

[25] For instance the application services can be partially fitted inside the application architecture within TOGAF.

[26] Sometimes referred as IT Service Management.

and continual service improvement. An illustrative example of the possible services position within the organisation could be also model SPSPR mentioned by Vorisek and Jandos [197] (originally introduced in Vorisek et al. [200]) where this model clearly defines the role of information technology (ICT Services) as supportive to particular business process or business processes. The logic behind the model is that the organization ensures sourcing of the defined functionality by using ICT services. We can find various types of functions within the enterprise, as outlined in the analysis within Chapter 4.1, which presents application services which generally cover various smaller ICT services. These services then can be either sourced internally, or externally using available services on the market.[27] A crucial part of the service management is its link to strategy through business processes. Therefore these approaches and their success tend to be highly dependent on the defined strategy.

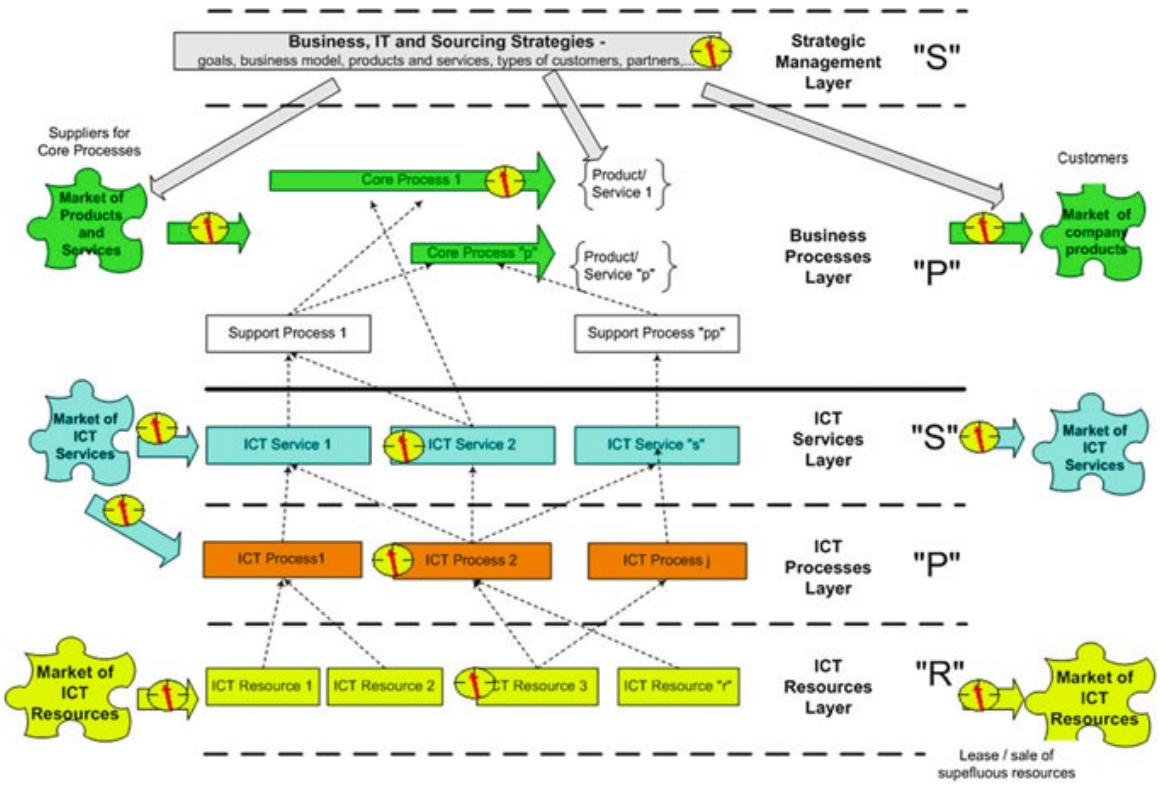

Figure 2.1: The SPSPR model.[200]

An integral part of management is then a wide range of decision-making types. In case of management in the field of IS/ICT, it is generally decision-making about Enterprise Architecture, business processes, outsourcing, or systems integration. The decision-making

[27] We may either solve the sourcing on the level of ICT services, or on the level of application services. As we point out further in the thesis we recommend aggregating the smaller services onto application services. Nevertheless, in case of a unique ICT service, the organization should preferably include the service as-is without any forced aggregation.

is also covered in the broader field of IT Governance, which is an evergreen in the area of management information systems.

There are multiple views regarding IT Governance, while from our viewpoint the most notable are definitions by Weill and Ross [202], IT Governance Institute, and Peterson [146].

Weill and Ross [202] define IT Governance as 'specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT.'

Whereas at the IT Governance Institute [15] they chose a more concrete definition, where they point out the linkages within other management areas: 'IT Governance is the responsibility of the board of directors and executive management. It is an integral part of Enterprise Governance and consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategies and objectives.'

Appropriate addition is then presented by Peterson [146] who emphasizes the decision-making and its monitoring: 'IT governance describes the distribution of IT decision-making rights and responsibilities among different stakeholders in the enterprise, and defines the procedures and mechanisms for making and monitoring strategic IT decisions.'

Weill and Ross [201] use Governance Archetypes and categorize responsibilities for inputs and decisions in various decision-domains. We may refer to their IT Governance patterns on Figure C.1 as these may help us with identification of responsibilities in our approach.

2.1 Implications on outsourcing and the thesis

Within this doctoral thesis the main area of interest is the area of decision-making about IT outsourcing.

Outsourcing literature, or its basis in general, can be divided into several larger streams. More concretely:

- *Economics stream* dealing with issues based in economics. Main theories adopted in outsourcing are Agency Theory (originating from Sharma [171] or Eisenhardt [52]), Transaction Cost Theory (such as works from Williamson [206], but going back to the roots of the theory of the firm as published by Coase [32] in 1937) and Contracting Theories (mainly built around the work of Domberger [46]). There have been a lot of articles in this field, whereas some of the most representative from IT outsourcing field are the ones by Aubert, Rivard, and Patry [9], by Lacity and Willcocks [107], by Logan [113], by Ang and Straub [5], and the quite recent discussion around role of Transaction Cost Theory in IT Outsourcing by Schermann et al. [161], and Lacity and Khan [106].

- *Sociological stream* with focus on Social Power Theories (following Pfeffer [147]), Innovation Diffusion (concentrated around works of Rogers [155]), Social Capital Theory (published by Nahapiet and Ghoshal [135]), and other theories. Whereas there are some interesting IT Outsourcing resources as well, such as the one published by Lee and Kim [112] or the work published by Loh and Venkatraman [114].
- *Systems theory stream* oscillating around the General System Theory (and the well known work by Bertalanffy [14]) and Systems Dynamics (building on research by Forrester [67]).
- *Strategic stream* that encompasses classical theories such as Firm Strategy (building on now classical works of Porter [148] and Prahalad and Hamel [150], Game Theory (established in research by Nash [136, 137]), and the Resource-Based View (following the work of Barney [10]). IT Outsourcing examples in this area can be articles by Kern, Willcocks, and Heck [98], DiRomualdo and Gurbaxani [45], or by Alvarez-Suescun [3].
- *Other theoretical streams* dealing with special theoretical problems in various fields.
- *Practitioner stream* that is drawing on the actual problems in practice.

As such, outsourcing (and IT outsourcing as well) is highly multidisciplinary area of interest, since it is interconnected with many fields of research. In our research we follow some of the above mentioned fields, mainly the Strategic stream and Practitioner stream of research, while also refering to resources from other streams with some significant findings for our case.

Although IT outsourcing is referred in some way in majority of the publications we mentioned, in case of outsourcing decisions within the information systems field neither provides much concrete guidance[28], nor offers any comprehensive criteria to consider when making decisions about IT outsourcing in the organization.

However, some of the areas might help organizations with defining the needed inputs to the proposed model, or with the overall management of their IS/ICT. They may essentially utilize the approaches to accomplish other aims than managing and outsourcing their ICT service portfolio.

From our viewpoint, the position of ICT services, which are discussed further in this chapter, might be based in the ITIL that provides a sound base for *IT service management*.[29] Since the ITIL approach is based on the service concept, the captured organizational best practices are in most cases compatible with our approach. Emphasizing the IT service

[28] Apart from the approaches mentioned in our analysis of the gap in current research in Chapter 1.

[29] In the academic and practitioner literature, there is some inconsitency associated with use of the terms IT services and ICT services. In this thesis, we use the terms ICT services and IT services interchangeably.

management, utilization of the ISO/IEC 20000 standard might be also useful for boosting overall service efficiency.

Speaking of the *Enterprise Architecture*, the position of ICT services is problematic and it might be useful to incorporate the service view into the overall architecture. For instance within TOGAF ADM, which serves as a tool for assisting with EA development and management, the services can be positioned as a sidestep between Business Architecture and Information Systems Architecture. However, the Enterprise Architecture can assist with identification of areas with resource gaps or overlaps and help to restructure and improve the existing situation. In this way, the SPSPR model might help with assessing the linkages between separate levels, as it implements the service-based view of IT functions which most of the EA are missing.

IT Governance then could provide procedures and mechanisms for making and monitoring strategic IT decisions, and help with distribution of decision-making rights and responsibilities across the organization.

Business-IT alignment might help with the re-defining its strategy and linking IT to better reflect the business strategy. The so called IT strategy has then significant impact on IT related decisions including the decisions about outsourcing.

Also discussing the separate areas helps to gain better understanding of the approach presented within this thesis itself and its position in the IS field.

Generally speaking, often are the outsourcing decisions made under the enticing prospect of savings, which either may or may not be justified. Such ad-hoc decisions are typical in case of the emerging Software-as-a-Service (SaaS) concept. This concept is currently getting increasingly popular and slowly but definitely attracts the attention of the corporate segment. Specifically this happens in the segment of small and medium enterprises (SMEs) as mentioned in the Microsoft survey [47]. SaaS being a part of the broader term Cloud Computing as presented by Mell and Grance [127] represents a chance for small and medium enterprises to rapidly adopt cutting edge technologies in order to be competitive to the large organisations.

In the following sections we deal with the role of the IT management in the SME context and we discuss the ongoing commoditization of IT. Subsequently we define several areas in more detail such as Cloud Computing, ICT services, or outsourcing including its taxonomy. In the end, we propose a set of outsourcing strategies and open a stage for proposing our approach potentially solving the identified problem.

2.2 Role of the IT management in the SME context

The state on the market offering relatively many ICT services covering a range of various functionalities, implies that the SME segment might benefit the most from the upcoming

situation.[30] The actual existence of these services shifts the focus of IT managers from actual service design and their individual development to the areas such as business model creation, strategy, and requirements engineering. Appropriate management methods regarding these areas are potential requirement for success. Therefore, we try to emphasize the impact on this segment throughout the following chapters.

Our aim in this section is to identify what constitutes a SME organization. After examining various definitions, such as the one introduced by De La Cruz [175], Eurostat [58], or Günterberg and Kayser [76], we may consider the one proposed by Eurostat as the most favourable from a long-term perspective. Eurostat [58] and European Commission [34] define SME as an organisation that has less than 250 persons employed, and that also has an annual turnover of up to 50 million EUR or its annual balance sheet does not exceed 43 million EUR.

The reason why an effective support of SMEs is needed is the fact that their aggregated economic power forms an important part of the economy in most of the developed countries in the world. An example could be economies within the European Union area (together referred as the EU-27 economy)[31], where in the year 2009 according to presented official statistics [57], the total turnover of SMEs was 12682.6 million EUR, and at the same time the turnover of large enterprises was 9415.9 million EUR. Simple calculation shows us that in the case of EU in the mentioned year 2009 the turnover of SME formed 57.4 % while the turnover of large enterprises formed 42.6 % of the total turnover in the EU-27 economy.

Moreover, studies that were conducted recently in the field of information technology (such as [71] or [128]) show that the adoption rate of advanced IT applications within SMEs is still relatively low when compared to the rate within large enterprises.

Reasons why it is desirable to utilize outsourcing in the SME segment are namely:

- Chance to use latest resources and applications without the need of large investments into infrastructure.
- Getting the services for better price than in case of internal sourcing, as the service providers in most cases execute economies of scale.
- In order to compete successfully with large organizations, they need to adopt tools that make their operations less resource-demanding and more efficient.

Unfortunately, there exist obstacles that prevent SMEs from utilizing outsourcing such as:

[30] Large organizations might also benefit from this. However, as we discuss below, most of them already have this functionality covered by current information systems.

[31] Although from 2013 the European Union area includes 28 member states, we use the EU-27 abbreviation since the recent statistics only cover the 'older' EU members.

- Their business model is in some cases not properly defined, and therefore they can not identify what to outsource. As a consequence the quantification of costs associated with a particular service is complicated.
- They usually do not have the expertise to select appropriate applications. Therefore, the choice is mostly limited to price of the service and in some cases the other criteria are neglected. Moreover, most of the SMEs do not monitor the market for suitable alternatives.
- Many SMEs do not know how to properly manage long-term co-operation with the service providers.

The fact that the SMEs form a significant force in economy of the European Union and many other developed countries, and given the circumstances that they do not utilize their full IT potential due to the above-mentioned obstacles, both emphasize the need for a method such as the one that is proposed in this thesis. Because SMEs in most cases do not have enough experience with outsourcing the best option how to get data for this study was to gather experience of broad range of enterprises including large organizations. This experience and the model settings can be quite comfortably transferred to the case of SMEs. This is also thanks to the commoditization trend on the IT markets which we discuss in the following section.

2.3 Commoditization of IT and emergence of new service models

In 2003, Nicholas G. Carr in his much discussed article IT Doesn't Matter [22] expressed his view on future of information technology. Although some of his points remain questionable[32], one of the main statements proved correct. It was his prediction of the trend towards commoditization of IT. An excellent example of commoditization is the Cloud Computing concept together with the related SaaS model.

Recent spread of Cloud Computing is an evolution of the well-known models of outsourcing, Application Service Provision (ASP), Grid, and Utility Computing. Maybe a more appropriate term would be a *fusion*, because it uses recent advancements in Grid/Utility Computing[33] and combines them within the concept of ASP/outsourcing. Developments within current IT infrastructures together with the fact that the network connectivity around the world became more advanced influenced the mentioned switch equally and maybe even more than the standardization mentioned by Carr. Cloud services which are generally provided from a remote location could not be effectively implemented ten years ago because of insufficient network performance and general connectivity issues. In the end, Cloud services even if they emerged earlier could not provide sufficient user comfort[34] and due to the mentioned infrastructural issues would fail to meet reasonable Service Level Targets specified within the Service Level Agreements (SLAs). We may conclude that qualitative differences of IT related to the SLAs are the attributes that differentiate it from electricity/common utilities. Additionally, this viewpoint is also supported in some of the recent articles, such as the one written by Brynjolfsson, Hofmann, and Jordan [19].

Another point that influenced this paradigm shift towards Cloud services was probably a change in the business environment. Worldwide financial crisis that started in 2008 forced organisations to reduce their investments. This change also influenced IS/ICT budgets and subsequently led to certain investment cuts specifically in this area [124]. However, it was the emergence of Cloud Computing concept that allowed organisations transferring part of their costs on IT from capital expenditures (CAPEX) into operational expenditures (OPEX). Although this often involves choosing a different provider[35], it offers a relatively easy solution to sustain the needed IT innovation together with respecting particular CEO or CFO decisions.

[32] Such as his underestimation of overall IT importance or such as the way he insists on the similarities of IT and electricity.

[33] When talking at the level of infrastructure.

[34] Many of the applications require graphical user interface and its use involves significant amount of data transfers. Slow network connection or insufficient computing power could possibly lead to slower communication and major lags when working the application. All these aspects could possibly lower the overall usability of such solution and productivity of employees.

[35] Migration to a Cloud-service provider implies additional costs associated with the transfer. On the other hand, these costs similarly apply to other *non-Cloud* providers and traditional software solutions.

Recent emergence of Cloud providers opens new possibilities of how can the organizations satisfy their IS/ICT innovation needs. One of its main pros is the flexibility. As mentioned by Armbrust et al. [6], the consumer has the scalable capacity on demand, so the peak loads within the day/week/month/year can be seamlessly covered. If we have a look from the other side, there are some pros involved as well; Providers are able to offer subscription-based models thanks to the fact that most of these applications are built in a multi-tenant environments. Therefore, there are certain economies of scale involved. However, that does not mean that Cloud services are cheaper than the traditional proprietary solutions in all cases. Due to the numerous reasons, some of which we presented above, this area is becoming interesting for new players, and every year, there is a number of new providers emerging on the market. Although the commoditization became a reality within the IT field, the idea presented by Davenport [40] that the commoditization is standard-driven is from my viewpoint not valid any more. Due to the outlined paradigm shift we can consider the commoditization that nowadays takes in the IT field is more or less market-driven. This is because providers are searching for various ways to make their systems more effective and equally comparable with their competition, while one of the ways could be adopting an existing solution on the market rather than developing a completely new individual solution, ordering a bespoke solution and/or investing in complex proprietary systems.

Until recently, one of the major competitive advantages of large enterprises in comparison with the SMEs was that the large enterprise in most cases owned an extensive information system. This system further assisted the organization in the communication with customers, partners, or employees, or in tracking various stages of organizational documents (such as invoices, internal memos, or reports). That helped the organization when competing with other companies including their SME competitors. However, operating the system and keeping it up to date also meant considerable costs that needed to be paid regularly, i.e. costs associated with license renewal, hardware upgrades, scheduled outages, or annual maintenance fees.

With the SaaS model, an organization does not need to make large investments because the services are provided on-demand. The availability of appropriate services together with the fact that these services are relatively inexpensive in the short run can be considered as a benefit. On the other hand, an incorrect or unsuitable selection of services can result in major service outages or overwhelming costs in the long run.

2.3.1 Cloud Computing

When we talk about Cloud Computing, it is important to differentiate its various types. The most accurate division is the one presented by Mell and Grance [127], which divides Cloud Computing according to three service models, and four deployment models. From

the viewpoint of the service models, it is namely: Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS).

In the approach that is introduced within the thesis, a special emphasis is put on the Software-as-a-Service model. From the viewpoint of the deployment models, the mentioned document divides private, public, community, and hybrid clouds. Although, given the fact that the thesis is oriented on management rather than on technical details, a special focus is put on the public cloud concept. However, the framework that is proposed is able to facilitate all the mentioned deployment models and their possible combinations.

The NIST definition also outlines some essential characteristics of Cloud Computing, which are: on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service.

2.4 ICT services

As mentioned by Galup et al. [68], in 2006, Jim Spohrer and Doug Riecken from IBM Corporation stated in one of the IS journals: 'To the majority of computer scientists, whether in academia or industry, the term services is associated with Web services and service-oriented architectures. However, there is a broader story to be told of the remarkable growth of the service sector, which has come to dominate economic activity in most advanced economies over the last 50 years. …The opportunity to innovate in services, to realize business and societal value from knowledge about service, to research, develop, and deliver.'

In the service-based IT management, ICT services play a central role as a communication interface between business and IT. Therefore, it is of high importance to discuss the term ICT service in more detail.

Defining ICT service primarily requires clarification of the general definition of service. The concept of services has been discussed for a number of years; for instance, Lovelock [117] provides a comprehensive analysis of the term and presented a general classification of services. For our aim, we have identified several useful definitions. For example, Hill [86] outlined a more generalized definition of service as 'a change in the condition of a person, or a good belonging to some economic entity, brought about as the result of the activity of some other economic entity, with the approval of the first person or economic entity.' Kotler [104] then defines the service as 'a deal, which one party may offer to the other party and which is basically immaterial.' We may further extend the view by mentioning the position of Booth et al. [16] who defined service as 'an abstract resource that represents a capability of performing tasks that represents a coherent functionality from the point of view of provider entities and requester entities.'

The aforementioned definitions provide necessary space for a separate ICT service definition, which is essentially its subtype that bears specific attributes. Vorisek, Jandos, and

Feuerlicht [198] summed up comprehensive list of definitions, and they themselves present a suitable definition that we might utilize in our research:

ICT service is represented by coherent activities and information delivered by ICT service provider to service consumer. ICT service is implemented by ICT processes, which consume ICT resources (hardware, software, data, expertise, etc.) during their execution. Service is realized on the basis of agreed business and technological conditions.

As we can see, this definition provides a base for the SPSPR model mentioned earlier in the chapter and in the article by Vorisek, Jandos, and Feuerlicht [198].

In this thesis, in relation to the presented research objectives, we focus solely on application services. According to Jelínek, Šild, and Voříšek [94], application services are ICT services that perform functions of software application[36] while utilizing various ICT resources. The application service then supports one or more activities within a business process, or a business process as a whole.

These application services can be decomposed to smaller ICT services covering various functions, which may in some circumstances incorporate other service types, such as information services or supporting services. The functional taxonomy of ICT services is further discussed in Chapter 4.1 based on various approaches and current state on the ICT services market.

[36] Such as CRM, or accounting.

2.5 General classification of outsourcing

Outsourcing itself can be characterized as a situation, where two parties make an agreement, where one party provides a specified goods, or services to the other. Typically these parties are the provider and customer, and the agreement is underpinned by a formalized contract. However, there exist many types of sourcing, while they differ not only in structure of the parties involved, but also in the type of agreement, and the subject of interest. Also we may identify strategies that can be taken in case of IT outsourcing itself, which we may utilize in our approach.

Primarily it is necessary to narrow the field we deal with in this thesis to outsourcing from the viewpoint of customer organization[37]. This is needed because either of these fields aims on different strategies and business goals, and therefore guidelines intended for a provider should significantly differ from the ones intended for a customer.

Before we get to the outsourcing strategies and their adoption in our approach, it is necessary to clarify terms used further in our research. In this part of the thesis, we therefore outline various types of sourcing used within current IT management literature.

Generally, we may identify the following three classifications: *process-based classification*, *territorial classification*, and *classification by outsourcing area*.

2.5.1 Process-based classification

Process-based classification divides sourcing into two types: outsourcing and insourcing.

Outsourcing can be according to ITIL defined as [92] 'Using an External Service Provider to manage ICT services'. We might also point out definition by Vorisek et al. [200], where they mention that outsourcing is 'a process that ensures transfer of responsibilities for a particular service/process/resource onto external provider.' There exist multiple types of outsourcing, whereas in some cases not only responsibilities, but also the employees, technologies and other resources get transferred onto the provider.

On the contrary, the *insourcing* might be according to ITIL [92] defined as 'using an Internal Service Provider to manage ICT services.' The term used for insourcing is sometimes also internal sourcing. From our viewpoint, the internally sourced service shall be treated the same way as outsourced service. Mainly, these internal services should be monitored and measured in order to assess their performance and when possible, they should be compared with other options available on the market.

2.5.2 Territorial classification

From the territorial viewpoint we may identify three types of sourcing: offshoring, nearshoring, and onshoring.

[37] Sometimes referred as end-user organization.

Offshoring is a practice of outsourcing to a country different from the country of organization operations. This practice is often driven by lower labour costs in the host country when compared to the home country. Although its use in the literature is not consistent in a sense that it sometimes encompasses any foreign country, and in other cases only distanced countries (in order to distinguish this practice from nearshoring as described below). Alternatively, the names *offshore outsourcing*, *global sourcing*, or *global offshore outsourcing* are used. However, in some cases the latter[38] might just target the practice of sourcing in general. Given the global nature of ICT service markets today, studying outsourcing in its general meaning encompasses much of the attributes of offshoring.

Nearshoring can be described as a practice of outsourcing to neighbouring or highly proximate countries. More concretely it can be defined as the destination where outsourcing happens is foreign and at the same time relatively close to the country of original organization operations. As emphasized by Carmel and Abbott [21] current use of the term nearshoring unlike previous usage has lost any connection to an actual seashore. Also the nearshoring utilizes labour costs difference. However, this difference is mostly not so significant as with offshoring. On the other hand, cultural proximity tends to be generally better in case of nearshoring.[39]

Onshoring describes a practice of outsourcing within the same country. Most typically the practice of onshoring involves outsourcing to remotely located domestic, and in some cases also less developed or less expensive locations. Lacity, Carmel, and Rottman [105] explicitly describe such location as non-urban, typically low-cost area. Alternative designation of the onshoring practice in the academic literature is also *rural outsourcing* or *domestic outsourcing*.

2.5.3 Classification by outsourcing area

Lastly, we can identify the following *classification by outsourcing area*:[40]

- Business process outsourcing (BPO).
- Information technology outsourcing (ITO).
- Software development outsourcing (SDO).

[38] Offshore outsourcing.

[39] Large cultural differences cause much of the problems with offshoring. Therefore when the organization wants to avoid these risks, a nearshoring might be a solution.

[40] Further classification of the IT outsourcing is discussed in the ITO section. Classification by the extent of outsourcing, such as the sometimes mentioned Complex/Complete/Total IT Outsourcing pointed out by Willcocks and Choi [205], Vorisek [196], or Feuerlicht and Vorisek [63] is from our viewpoint highly dependent on chosen sourcing strategy. The strategies discussed in separate section and are one of the original contributions in this chapter.

The classification into BPO, ITO, and SDO especially emphasises a separation of organizational IT and its business processes, which is often used within various Enterprise Architectures (EA) in order to better structure the organizational IT in relation to the business needs. Apart from that, an illustrative example could also be the model SPSPR mentioned by Vorisek and Jandos [197] that clearly defines the role of information technology (in this case in form of defined ICT services) as supportive to particular business process or business processes.

While the BPO is more common within large organizations,[41] the ITO could be considered as the most enticing area for contemporary SMEs. This is mostly thanks to the recent emergence of Cloud Computing technologies and the related Software-as-a-Service concept.

Separation of the outsourcing areas into BPO and ITO is crucial for an accurate perception of the problem of IT outsourcing. The area of SDO is then rather a separate category that can be possibly combined with both concepts. Particular areas are described in more detail within the following subsections. Special emphasis is then placed on Information technology outsourcing.

It is important to emphasize that given the area of outsourcing, various parts of Enterprise Architecture get involved in the process. In case of the BPO, the directly affected is the business architecture, and the service architecture, technological architecture, and other architectures are affected indirectly. The ITO has a direct effect on service architecture, or on technological architecture depending on whether it is aimed on outsourcing services or resources.

2.5.3.1 Business Process Outsourcing

The term business process outsourcing is widely used within both the researchers and practitioners. However, it is hard to find its exact definition. This might be because its meaning can be logically derived from the term business process itself. One of the most appropriate seems to be the definition presented by Gartner consulting; it covers the important facts while at the same time remains simple. According to *Gartner IT Glossary* [70] the business process outsourcing could be defined as 'a delegation of one or more business processes to an external provider that, in turn, owns, administers and manages the selected processes.' In our view, possible business processes are not limited to IT-backed processes, since there might exist a process which operates completely without an IT support. For instance, Sparrow [177] also supports this idea. On the other hand, he subsequently mentions that these processes are more or less interconnected with a core process. This core process is usually backed by some sort of computer system, in our terminology a specific ICT service.[42]

[41] Although also in case of SMEs, we may find traditional areas for BPO, such as transport and logistics.
[42] Or alternatively by multiple ICT services.

The existence of these connections implies that while deciding about possible business process outsourcing, an organization needs to inspect whether there are any major interconnections with a needed ICT service or an ICT resource that otherwise needs to remain internal. If there are no interconnections, the business process can be possibly outsourced. If there are, the fact needs to be taken into consideration in further decision-making. This task itself can be supported by various methods and tools. For instance, when we map the system using the mentioned SPSPR model [197], these interconnections become evident and we can avoid an unfavourable situation of outsourcing a process that is possibly highly integrated within the organization. Similar assistance can be also acquired using a number of currently available Enterprise Architecture frameworks.

We can also spot a term Knowledge Process Outsourcing (KPO) in the literature. Although Gartner and other entities usually mention knowledge process outsourcing as a separate category [189, 209], from my viewpoint it could be considered as part of the business process outsourcing. The reason for this is the fact that it deals with business processes of a specific type — based more on judgement and thus requiring extensive knowledge. This broader view on business processes is further supported when using the traditional definition proposed by Davenport and Short [42] who define business process as a 'set of logically related tasks performed to achieve a defined business outcome.'

This does not mean that the existence of knowledge processes should be neglected, but rather indicates their position under the general business process definition.

2.5.3.2 Software Development Outsourcing

The sometimes-referred software development outsourcing (SDO) could be also considered as a separate category of outsourcing. Looking at this area through the lens of the management implications, we may see it as an alternative to in-house development that can be possibly combined with either of the other areas in this classification.[43] It also shares some of the characteristics with both of the mentioned concepts, such as the need of precise contractual terms.

When we talk about customer or end-user organizations: instead of buying the application service as a ready-made solution, the organization could develop the application in-house (in case when it has its own IT department), or use the mentioned software development outsourcing, or alternatively a combination of these approaches. Developing or ordering a bespoke software solution can be very expensive and therefore it is not very probable that SMEs would prefer this type of outsourcing. Exception could be a situation when a project is rather small scaled or when it is aimed just on tailoring the ready-made application.

[43] With either BPO, or ITO.

A situation when the SDO is typically applied is the case of an organization acting as a service provider, a system integrator, or a service broker. Use of the software development outsourcing overall emerges more often on the side providing the application service (software) than on the side of a pure customer organization. One reason could be that managing such development needs a significant amount of experience and knowledge of relevant methods. As mentioned Richmond and Seidmann [154], 'the delivery task is partitioned into two consecutive stages: system design and software development. The parties can contract for each stage separately or specify an initial contract that covers both stages.'

As is apparent, because SDO aims mostly on software development and its methods, and does not deal with the IT management in the end-user organizations, we do not examine the SDO arrangement attributes in more detail. However, its inclusion in the classification emphasises its role in cost calculations dealing with in-house or bespoke ICT solutions.

2.5.3.3 Information Technology Outsourcing

Currently most interesting area of outsourcing is probably the Information Technology outsourcing (ITO), which is closely connected with the current SaaS and Cloud Computing trends. The difference from BPO is that in this case, only the IT function is outsourced while the related business process remains within the organization.

Information technology outsourcing can be further divided into two types:

- ICT services outsourcing.
- ICT resources outsourcing.

This division focuses on the level on which the ITO is applied. In case of ICT services outsourcing, the organization outsources the service and also the related resources. In case of ICT resources outsourcing, the organization outsources just the selected resources. This obviously depends on the overall situation since these types can be combined into various forms of IT outsourcing as discussed further in this section. In our approach we focus on the ICT services outsourcing, however, the resources related to the service influence our calculations for particular variants.

Ever expanding range of available SaaS services considerably supports the potential use of this approach. Therefore the area of ICT services outsourcing is the most relevant from the viewpoint of our research.

As mentioned by Loh and Venkatraman [114] 'IT outsourcing is a significant contribution by external vendors of the physical and/or human resources associated with the entire or specific components of the IT infrastructure in the user organization.' As apparent from the definition, IT outsourcing does not consist only of SaaS services. It could be further

categorised into various forms. For instance, Kern, Willcocks, and Lacity [99] propose the following resource related forms of IT outsourcing:

Insourcing Using internal resources under internal management.

Buy-in Bringing in external resources to run under in-house control

Traditional outsourcing Supplier taking ownership of customer resources and managing those resources on behalf of a customer

ASP Renting supplier-owned resources to customers and delivering over the Internet.

The mentioned SaaS concept could be from our point of view another category in this classification. Although it is very similar to the ASP, it is based on multitenancy of the application [127] and thus the application is standardised with limited customization options.[44] Therefore the additional category might be defined as:

Software-as-a-Service Supplier provides on demand access to a standardised multi-tenant application to customers. Service is typically provided over the Internet using supplier-owned resources, resources provided by a third party[45] or combination of these resources.

We may observe many forms of outsourcing arrangements as presented earlier in this chapter, which sometimes overlap in terminology. As apparent from the taxonomy above, it is aimed mostly on the resources of the organizations. This resource-based taxonomy therefore provides an essential view on IT outsourcing forms, which does not collide with the situation within various contexts, either territorial or process-based.

When we look on IT outsourcing from the relationship aspect, we may find another set of possible taxonomies. After examining several options, we have opted for the approaches presented by Da Rold and Berg [39] from Gartner Research, the ITIL classification by Iqbal and Nieves [89], and a taxonomy used by Currie and Willcocks [38].

According to Da Rold and Berg [39] we can distinguish ten sourcing model variants: multisourcing, brand service company, prime contractor, mix joint venture, outsourcing joint venture, best-of-breed consortium, client organization consortium, full outsourcing, insourcing, and internal delivery.

On the other hand, Iqbal and Nieves [89] mention six possible sourcing models categorised into three groups: multivendor sourcing (prime, consortium, and selective outsourcing), traditional sourcing (full service outsourcing), and internal sourcing (shared services, and internal services).

[44] We have to add that some organizations advertise their services as a SaaS although by definition they provide an ASP.

[45] In case of the PaaS or IaaS.

Finally, Currie and Willcocks [38] identify four types of sourcing decisions: total outsourcing, multiple-supplier sourcing, joint venture / strategic alliance sourcing, and insourcing.

The selection between various sourcing models depends on a larger scale context of decision-making, which can be regarded of mostly strategic character. Sourcing relationship models presented by Gartner Research report [39], sourcing structures in ITIL [89], and four types of outsourcing decision by Currie and Willcocks [38] overlap to some extent. Therefore, it is desirable to establish a unified classification of outsourcing strategies based on the relationship aspect. This classification is presented further in this chapter.

2.6 IT outsourcing strategies

Analysis of various classifications of sourcing models / structures / decision types discussed earlier in this chapter indicated significant overlaps of these concepts. One of the outcomes presented within this section is an original unified classification of IT outsourcing strategies. This classification is based on the relationship view of IT outsourcing types. Moreover, we examine possible consequences of adoption of these strategies within the SME segment.

The strategies can be classified into the following categories:

- Singesourcing,
- Multisourcing,
- Consortium Sourcing,
- Prime Contractor Sourcing,
- Internal Services,
- Joint Venture.

We describe proposed types of outsourcing strategies separately and in more detail within individual sub-sections.

2.6.1 Singlesourcing

One of the essential strategies is the singlesourcing strategy.[46] In this case, the customer organization outsources a part of its information system to just one provider. Multiple parts of the system could be outsourced depending on the functionality offered by the provider and on his capacities. Currie and Willcocks [38] also mention an option of total outsourcing, which they define as outsourcing more than 70–80 % of organizational ICT services to an external provider. A better price per service can be achieved with an increase of the outsourcing extent to just one provider. However, this may lead to higher dependence on this provider, and may consequently cause less flexibility concerning IT related decision-making and possible future vendor lock-in. To reduce the risks associated with this strategy, it is needed to set in-depth rules, conditions, service level targets, and associated fines within the contract. The most important things to set are: the process for possible future service termination and/or change of the service provider concerning liabilities, data ownership, and a mechanism for transferring the database.

[46] Resulting in complete IT outsourcing in some cases. The complete outsourcing is also sometimes referred as full outsourcing.

The Singlesourcing strategy, when an organization decides to use it, is universal for much of the services, and therefore significantly limits use of other strategies in combination.[47]

2.6.2 Multisourcing

Another sourcing strategy could be multisourcing, sometimes referred as multivendor sourcing [89], selective outsourcing [39], or multiple-supplier sourcing [38]. Unlike the previous type, a customer organization outsources various services to various providers. This type of outsourcing strategy becomes more complicated especially with the increasing number of providers.

Multisourcing strategy is the most beneficial in terms of provided functionality. Sourcing selected services to various multiple providers allows covering of specific application functionality with less restrictions and more flexibility. On the contrary, a higher number of providers mean also a higher possibility of obstacles and future problems with communication, SLA monitoring, and other related areas. In order to select providers that are credible for the cooperation, an organization needs to perform a due diligence before any major sourcing decision. Although this applies to all sourcing strategies using external providers, with increasing number of providers this can become a much more complicated task if not performed systematically. Therefore, the due diligence can be considered as one of the crucial tasks within the multisourcing strategy.

In addition, when the organization is not limited by a single provider in its choice (which is typical when using singlesourcing strategy), it can choose smaller services that fit the functionality it needs. Usually there are multiple providers of the service on the market that offer the particular type of the service so the in-depth comparisons and calculations may take place. The multisourcing strategy is from our viewpoint ideal when the organization wants to benefit from the SaaS concept since Software-as-a-Service providers usually publish SLAs for potential customers[48] on their web pages. When making the decision, organization may perform an analysis of the offerings and subsequently choose the best of breed services to fit its ICT service portfolio. However, it is not necessary to cover all the needs using external service providers. Combination of internal and external services is possible and in most cases favourable.

Although this sourcing strategy may cause higher overall cost of IT in the long run, the benefits especially in the context of SMEs could be much higher. One of the significant benefits could be access to innovative technologies without a need of major investments.

[47] Typical combination is use of singlesourcing strategy on a larger package of services, and using internal services strategy for the rest.

[48] Although these contracts are usually fixed, (re-)negotiations about discounts or temporary service level upgrades are in some cases possible.

2.6.3 Consortium Sourcing

The approach combines the singlesourcing and multisourcing strategies. Customer organization in this case consumes the service provided by a consortium of providers that is set up in order to satisfy demand for a larger service or a bundle of services. Providers present their solution together and they need to be able to integrate their services to some extent. Also they have to provide the services with a guaranteed and reliable interconnection. Different types of consortiums exist, for instance the strategy presented by Da Rold and Berg [39] as best of breed consortium is closer to our description of prime contractor than the consortium sourcing.

The view contained within ITIL [89] correctly describes the case of consortium sourcing. The customer organization itself pre-selects providers that it deems the most favourable, and invites these potential consortium members together to present a unified management interface with their offers.

2.6.4 Prime Contractor Sourcing

Other strategy to sourcing could be using a prime contractor. Similarly, to the previous approach it combines the singlesourcing and multisourcing strategies while it tends to be positioned more on the side of the singlesourcing. The reason is that unlike the consortium sourcing, the prime contractor strategy is based on an agreement between the customer organization and just one contractor[49]. Particularly, the contract is signed between the customer organization and the prime contractor, who is responsible for the contract and overall SLAs. This contractor then communicates with other providers, and ensures that the service is provided according to the agreed service levels. Usually, this provider also protects his own profits and interests in the contract using written underpinning agreements with other providers in the group. In addition, Da Rold and Berg [39] mention a form called best-of-breed consortium where the providers form temporary consortiums to compete together in particular private or public tenders[50].

Within this strategy, it is most important to create a functional network of agreements that would allow the group of providers carrying out the contract in its full extent. Selection of the prime contractor may be considered as a crucial success factor. The prime contractor has to be able to ensure reliable communication and long-term relationships within the group. This is especially important in case of a looser form of prime contractor sourcing arrangement.

[49] This provider is often called *prime contractor*, *main contractor* or in some cases *main provider*.
[50] Such as government tenders or large commercial tenders.

2.6.5 Internal Services

Depending on the desired level of provider unit independence on the organization, we can identify three internal service strategies: Genuine Internal Services, Shared Services Centre, and Independent Service Organization.

2.6.5.1 Genuine Internal Services

This strategy is the purest form of Internal Services. It is based exclusively on internal service sourcing consisting of dedicated employees or groups of employees working on specific service within the particular business unit. Business units may be not only departments, but also local offices or in some cases even specific projects/project groups. In case of SME segment there might be just one or two units in the entire organization.

The essential part of the concept is that the customer organization provides the service using its own resources. Often the same applies to the business units in a form where every unit could have an own internal provider within the unit. Again, our view is in this regard more similar to the view of ITIL [89].

Resources such as servers, software, databases, employees, or infrastructure are usually not dedicated to a whole organization. Rather they are dedicated to a particular business unit[51].

2.6.5.2 Shared Services Centre

This type of internal service strategy[52] comprises setting up a separate business unit that provides services to other business units. Iqbal and Nieves [89] state that this unit typically operates its own profit and loss, and a charge-back mechanism. From our viewpoint, the services centre could be defined simply as a separate cost centre in the organization structure. As mentioned by Da Rold and Berg [39], this centre may also provide its services to external entities using particular service markets.

Unlike the mentioned concepts of Gartner [39] and ITIL [89], we may position the Shared Service Centre under an umbrella term Internal Services, since it partially overlaps the internal service sourcing.

Setting up this ICT services unit within an organization provides a clearer separation from other business units. This can help a lot with accounting of the IT operations, and with a number of other organizational issues. From the viewpoint of the mentioned outsourcing forms, when using the Shared Services Centre strategy, it is favourable that the use of buy-in and insourcing forms can be easier to implement. This is thanks to the existence of established structures for internal service sourcing, and more transparent reporting of costs and revenues.

[51] Setting up a separate business unit is the case of Shared Services Centre strategy.

[52] Although in some cases such as Tiskarna cenin or Ceska posta SSC this strategy is not purely internal.

2.6.5.3 Independent Service Organization

This strategy is based on an approach using a separate service organization that is wholly owned by the customer of the service. Because it is a separate entity, it can be deployed in combination with various other strategies [39] such as Prime Contractor, Joint Venture, or typically a Shared Service Centre.

More than the previous strategy, the Independent Service Organization emphasises separation of the customer organization from its subsidiary/affiliated service company. This also means that the contracted services are operated in the same regime as the services contracted on the market (provided by an external provider). In case of a more complex service system, this strategy could possibly influence an increase of the quality of service operations.[53]

2.6.6 Joint Venture

This sourcing strategy is built on a joint venture (JV) business agreement. Da Rold and Berg [39] define joint venture as a 'creation of a new business entity by two or more partners.' The partnering subjects set up a new organization that can later serve as a provider of the service. All parties involved in the particular service take a part of the organization ownership. Typically, they hold a certain share in the joint venture that gives them a particular level of control. However, they also bear responsibility for the service and its sourcing.

Level of risk when choosing this strategy depends mainly on the division of responsibilities between both parties. In most cases, this strategy should be used only temporarily in order to overcome possible legal, cultural, and process barriers related to the particular service sourcing. As is evident from the cases provided by Currie and Willcocks [38] the key advantage of the joint venture approach is possible reduction of the risks of single-supplier or multiple-supplier outsourcing contracts. In the long term, the joint venture usually transforms into an ordinary outsourcing agreement with traditional roles of customer and provider. This also implies a transfer of particular assets, responsibilities and control to one of the parties involved (provider/customer organization or its business unit), together with subsequent shift to one of the strategies mentioned earlier.

Joint venture consisting of two parties is the probably a most frequent case. However, alternatives exist. Especially for the SMEs, a joint venture with multiple parties involved could be more attractive. In this case, a group of independent SMEs that are in need of some specific service[54] together set up a joint venture. This JV then provides that service to all of the founding entities and could also provide its services to other customers on the ICT service market. Namely, this variant of JV cooperation allows execution of significant

[53] However, this increase is conditioned by an appropriate choice of legal form and geographic location of the subsidiary/affiliated service organization.

[54] Or a group of services.

economies of scale when compared to internal forms of service sourcing within individual organizations[55].

2.7 Chapter summary

The trends influencing contemporary ICT service market offer many opportunities to a variety of organizations. Recently emerged Software-as-a-Service concept utilizes on-demand application service sourcing. Such service could be in most cases deployed at a fraction of time in comparison with the traditional business software applications. This is mainly thanks to the concepts on which their are built on, their innovated business models, commoditization of ICT services, as well as thanks to the ongoing evolution of IT infrastructures and resources.

However, what is missing are the methodologies, guidelines, and specific tools that would ensure appropriate outsourcing, deployment, integration, and management of such solutions. Although some of the existing methodologies could support a portion of the tasks, they are mostly too much all-embracing, cumbersome, and therefore not very suitable for a majority of potential customers. These changes therefore shape the future focus of IS/ICT management area.

These findings are useful for all types of organizations, however the SME segment will benefit from the changes the most. It is a fact that SMEs in most cases do not have enough funds to maintain an extensive methodology. Neither have they funds for setting up a group dedicated exclusively to operate such methodology. SME context of information technology is also specific in the low adoption rate of advanced ICT services. This is probably caused by the preceding era with barriers in form of expensive licences and high costs of the infrastructure. Given the fact that SMEs form more than half of the annual turnover in most of the developed countries (i.e. in the EU it was 57.4 % in the year 2009) their efficiency can be considered a cornerstone of future growth of these economies. The desired increase in efficiency can be supported by the right choice of ICT services and its subsequent management.

Most distinctive contribution of the chapter is then an analysis of contemporary sourcing models, structures, decision types, and subsequent original unified classification of possible IT outsourcing strategies.

[55] Question is what can be a result of such cooperation on a market with high level of competition. A problem that we can see is the factual availability of sensitive service related information to all parties involved in the joint venture. For instance information about the services used by a particular organization, its attributes, or quantities including seasonal differences, could be used as an information basis for the competition within their business area. Therefore, considerations about this strategy have to be grounded on an in-depth analysis of sensitive information, and possible strategic scenarios. It is likely that in some of the cases, a use of joint venture strategy would not be possible.

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Chapter 3

SOURCER framework

This chapter presents a design of an original approach named SOURCER framework that is aimed to be a conceptual guide for organizations dealing with IT outsourcing, and that covers methodology and criteria for decision-making about outsourcing based on the services concept. Generally, the framework provides various criteria to be considered for a much-suited ICT service sourcing practice and offers individual phases to ensure effective management of IS/ICT with focus on ICT services outsourcing. This also includes various framework components, such as the Tear-drop model consisting of four possible viewpoints on ICT services – function, cost, quality and time – which we discuss further in the thesis. When applicable, areas relevant to SME and outsourcing strategies presented earlier, are emphasized and discussed.

Within our outsourcing classification, the framework aims on the Information Technology Outsourcing, particularly the ICT service outsourcing. The Software Development Outsourcing and Business Process Outsourcing are not taken into consideration. Its main focus is on application services and their individual parts (see Chapter 2.4).

The framework itself is focused mainly on the assistance with ICT service selection and on the IT service management, thus its main benefits can be anticipated when used together with multisourcing strategy.[56] This also involves a relationship aspect, although to a limited extend due to the fact that these relationships in Software-as-a-Service arrangements limits to contractual relationships.

As is apparent from the analysis in previous chapter, a process of IT outsourcing is a rather complicated task. It would be impossible to generate unified solution in one step. It is therefore useful to divide the decision-making into several steps that can be followed by any organization.

The SOURCER framework consists of seven separate phases that in the end form a cycle. The name itself is an acronym made from the management activities characteriz-

[56] Although use with other sourcing strategies is also possible and encouraged. These strategies were presented in previous chapter.

ing the particular phase: Strategize, Organize, Unscramble, Reckon, Compare, Execute, Revise.[57]

In this introduction a general description of phases is outline, while the following sections deal with the phases and individual steps in more detail. Additional analyses concerning the costs, function and quality view utilized in the framework are presented in the next chapter[58] further in the thesis.

Phase I (*Strategize*) comprises mainly of strategy definition and business-IT alignment. It focuses on the emphasis of value of strategy as an essential point for subsequent framework phases. The existence of strategy and its linkage with IT strategy is crucial, and hence it is a necessary organizational condition for using the framework. An organization has to include sourcing strategies within its IT strategy.

Phase II (*Organize*) covers creation of ICT service architecture to be in accordance with the output from previous phase. Its major part is an extended service catalogue, focused on functional areas based on business needs. This step is a necessary condition to use the framework as it creates an architectural base for subsequent phases.

Phase III (*Unscramble*) focuses on identification of sourcing practices, compatible sourcing strategies, and whether outsourcing is suitable for the particular service. This influences the functional areas and options examined in the next phase.

Phase IV (*Reckon*) aims on gathering ICT service options available within the selected functional areas. Options are gathered for each service separately. The list is then used within the subsequent phase.

Phase V (*Compare*) provides a set of criteria for comparing the selected options. This activity is performed separately for each service. The manager receives a set of information about the pre-selected options in the following structure of four views: business functions covered, price, time needed for implementation, and overall service quality. The price element is presented according to measures defined by the organization policies or the manager himself. The framework still provides guidance about available financial criteria. The services are in the end selected according to management decision based on the above-mentioned information within the four views. This is supported by a Tear-drop model incorporated in the framework.

Phase VI (*Execute*) aims agreeing on sourcing structure, final decision, and execution. It comprises final selection of providers, signing contracts, implementation project execution including desired level of integration into the organizational IT. Finally, this phase covers starting the service operation. In case where this is a revision-run of the framework, only those services that are supposed to change its provider get involved in this phase.

[57] Although these phases are common for much of the sourcing strategies, in case of the pure singlesourcing strategy the detailed steps differ. More concretely, unscramble, reckon, and compare phases take place for all services included in the consideration bundled together.

[58] More concretely in its individual Sections 4.1, 4.2, and 4.3.

Phase VII (*Revise*) is the last phase of each framework cycle and suggests operation in a stand-by regime between the framework runs. It focuses on monitoring and revision. The organization should especially take care of monitoring the services and their attributes, application service markets, industry IT adoption and its specifics. In case of changes in either of these areas the organization should reflect these changes in the next cycle of the framework. If these changes are so significant that they can have a major impact on organization performance, a new cycle should be started immediately. Otherwise, given the dynamics of IT service markets, the recommended minimal revision run should be once every year.

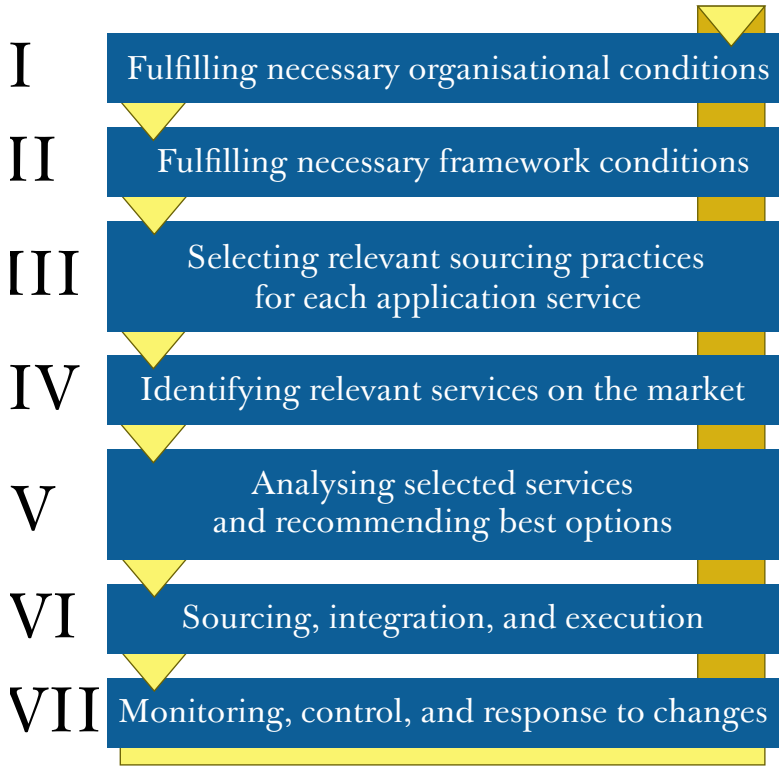

Figure 3.1: Objectives for particular framework phases. [author]

To sum up general logic behind the framework, let me point out the phases in more aggregate view. Heart of the framework is in phases III, IV, and V, where a majority of sourcing-related decisions occur. In phase III, the organization selects sourcing practices that are recommended for particular services. Phase IV consists of identification of services on the market. Finally, in phase V, the organization analyses the identified options and the framework assists in selecting a portfolio of services that are most suitable according to its needs and preferences. Figure 3.1 presents a simplified version of the framework emphasizing objectives of its particular phases.

In order to follow these three main phases efficiently, necessary conditions are needed to be set or revised in phases I, and II. Phase I consists mainly of creating strategies and

description of the organization itself. Phase II then comprises creation of ICT service architecture according to the strategies stated in the previous phase. These two phases are limited only in terms of defined outcomes. Other details, such as how to create the strategy, or how to connect it with the ICT service architecture, are left on the decision and capabilities of the organization. When the organization utilizes Enterprise Architecture (EA), some of the organization's activities and outputs (such as specification of service level requirements and organization of IT capabilities fulfilling goals and objectives) already cover the outputs within phases I and II and therefore might be easily used in the SOURCER framework.

Phase VI consists of actual deployment and integration of the whole model. It has usually a form of a project. Finally, phase VII closes the whole cycle. It serves mostly as a standby regime where all the metrics are set and the monitoring of performance occurs. In a scheduled intervals, or in case of a critical situation the organization proceeds to the next cycle of the framework.

The following sub-sections are devoted to a more detailed description of the individual phases.

3.1 Fulfilling organizational conditions

This is a preliminary phase generally dealing with analysis of the organization and its context, while the overall outcome of this phase is a set of information needed in the following phases of the framework. Although the framework has no limitations related to service sourcing practices, there are certain assumptions in terms of organizational conditions. The aim of this phase is to ensure that these assumptions will be fulfilled. As for specific outcomes of this phase, the organization should define clearly its general strategy integrated with its business model, IT strategy, business processes, and ICT service requirements. Possible strategy creation methods can be gathered either from the literature as presented by Analoui and Karami [4], or from specialised methodologies. In this regard, the framework is open to any approach.

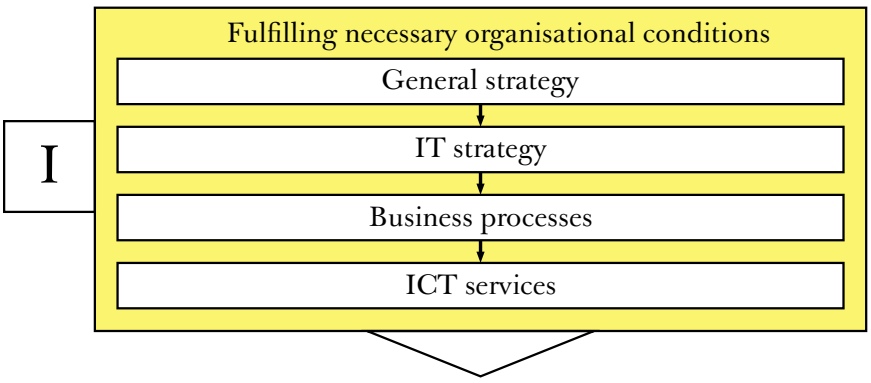

Figure 3.2: The SOURCER framework - phase I. [author]

There are some general principles within detailed steps that have to be taken into account:

- Business strategy definition is crucial for the framework. Many of the phases rely on strategic decisions of the manager which have to be grounded in a previous detailed analysis. Mostly this strategy should relate to the business model of the organization. Important part is setting the business goals and priorities.
- On the basis of a detailed analysis of the business, a clear IT strategy should be defined. This IT strategy has to be aligned with the business strategy serving as a part of the overall business-IT alignment. An outcome should tell the organization how to potentially increase efficiency in reaching the defined business goals using IS/ICT.
- The business process definition[59] should take place in connection with the previous two steps. The main outcome is identification of core and supportive processes. Especially in case of more complicated organizations, use of a process model is highly suggested.
- Last step of this phase is a defining ICT services needed to cover functionality of the modelled business processes.

One of the IT management approaches that might help defining outputs of this phase is the SPSPR model presented earlier. In this case the General strategy and IT strategy steps are covered in the Strategy layer of the model. Business processes step is then covered by the Process layer, and ICT services step is covered by the Services layer.

3.2 Fulfilling framework conditions

This is a second preliminary phase. The aim of this phase is to perform necessary operations that are needed for successful use of the framework. After defining strategy, business processes, and ICT services, we need to structure these ICT services so as we can work with them like with architectual components. Furthermore, it is useful to aggregate 'smaller' services when differentiated in the organization onto application services[60], and then link these within the enterprise ICT service architecture.[61] The so called application services are usually ICT services with broader scope of functionality [196], for which is this framework optimised. An example of such services could be Customer Relationship Management,

[59] Or revision in case of repetitive use of the framework

[60] For instance, using the functional areas of information systems in Section 4.1, the organization may aggregate *E-shop* and *Auction management* service into larger *E-commerce* application service.

[61] Example of this can be seen on Figure 6.4.

Business Intelligence, or E-commerce, but also a variety of industry specific services.[62] Moreover, to ensure that the organization outsources its services effectively, we need to know the overall rank of each service according to its relation to the defined strategy.

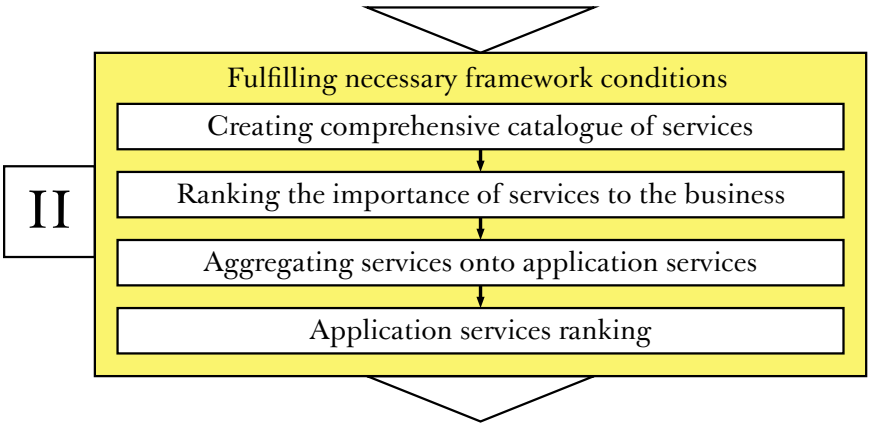

Figure 3.3: The SOURCER framework - phase II. [author]

The outcome of this phase is a detailed ICT service architecture, including service descriptions, their relationships, rating of the services, and their possible aggregations. Another outcome should be an extended service catalogue, which has to be aligned with the mentioned ICT service architecture. As apparent from the above description, it aims mainly on application services.[63]

Detailed outcome of this phase is as follows:

- *Extended service catalogue* is created with the following minimal structure: service identification, service name[64], description of the service[65], monitoring of the service (party providing maintenance), service audit (name of the auditor), service volume indicators[66], and service quality aspiration levels[67], importance of the service for business, relevant sourcing practice, aggregated application service name, aggregated application service rating, current service provider, and currently provided service quality levels[68]. The last two columns are left blank in case the service is not yet provided, which is typically the first time an organization runs the framework. The column *relevant sourcing practices* is left blank until next phase of the framework.

[62] We introduce these application services as functional areas further in the thesis.

[63] Although other service types such as information services can be also included in the ICT service architecture, in the framework, they mostly form just an information about application service information needs.

[64] Reflecting functional area that is expected to be covered.

[65] Description of the service functions together with data used in the service.

[66] Such as demanded number of users, volume of data expected to be transferred or its thresholds, and other indicators. These are used further in the framework as inputs for analysis.

[67] As mentioned further in the framework. The aspiration levels might be represented by defined service level requirements.

[68] Which might have a form of adjusted service level targets.

- *Ranking of service importance for business* on the basis of relation to a particular business process. The service related directly to a core process will have better importance than a service related to a supporting process, or second level supporting process.[69] This ranking occurs on the more detailed level of services. Within these detailed ICT services the organization ranks these services according to their importance from the most important service down to the least important. Given the fact that it is a relative ranking it might not be the same as a rating used later in the framework. This ranking later serves to better assess the overall rating of aggregated application services.

- *Aggregation of services into application services* ensures the demanded services can be compared with the solutions available on the appropriate ICT service markets. The aggregation is made according to the functional areas, which in the end form so called application services. The organization should choose aggregation that ensures the highest possible functional coverage.[70] A guidance for this can be found in Section 4.1, where we analyse functional areas according to ICT services on the market.

- *Application service ranking* comprises of counting the importance of aggregated application services. This ranking is constructed using arithmetic mean for every aggregation and sorting the application services according to these calculations.[71] This importance is then utilized in later phases of the framework.

3.3 Selecting relevant sourcing practices for every application service

This phase is devoted to analysing whether it is appropriate to provide particular service externally or internally, and to what sourcing strategies might be most favourable to utilize. Even though some of the available practices could be much less expensive at first sight, the analysis could provide a more strategic view on the service and in the end help deciding the recommended form of sourcing. Subsequently, particular practices should be excluded from further decision-making process, so as the organization can concentrate on the sourcing practices that are more likely to be successful. The criteria proposed for recommendation of most suited practices are as follows[72]:

[69] Or x-th level of supporting process.

[70] In case where there is some functional area so specific that it can not be covered by any of the application services, the organization puts this area into a special category that will be provided internally.

[71] Using the example in the footnote above, we may rank the *E-shop* service 2nd, whereas the auction service might be 4th. Then the *E-commerce* rating would be 3.00, using the arithmetic mean. When the *Customer Relationship Management* application service rating would be 4.32, and rating of Enterprise Resource Planning would be 1.18, then the ranking of *E-commerce* service would be higher than the ranking of *Customer Relationship Management*, whereas the ranking of *Enterprise Resource Planning* would be above either of these services. The overall ranking of the services when sorted would be ERP:1, E-commerce:2, and CRM:3.

[72] Please note that other important criteria are proposed in the fifth phase of the framework. This is due to the fact, that the other criteria are more relevant for comparison of specific variants of application services within

- Importance of the service for business.
- Requirements for service maintenance and changes.

Importance of the service for business highly depends on the relation specified in the business and IT strategy. This relation has to reflect the view presented by Lacity, Willcocks, and Feeny [108] where they divide IT functions into differentiators and commodities. In case of differentiators the service importance is high, whereas with commodities it is lower. For our aims we think that using the traditional division into strategic and supportive services is insufficient. One problem is that it implies a false impression that the supportive services are not needed by the organization. Another problem is that this view also neglects that there is a large group of services that are in fact supportive but their importance is significantly higher than other, while at the same time not posses a strategic nature. Therefore our division uses three basic variations, where the importance is: *hight* (critical for enterprise operations), *medium* (supportive services of a considerable importance for the enterprise), and *low* (services of minor importance, such as supportive tools that might be useful but that do not bring any real business value).

Requirements for service maintenance and changes in relation to the dynamic nature of the industry where the organization operates and the particular functional area covered by the service. In order to remain competitive and keep up with the ever-changing market trends, organization has to spend its financial, personal, and other resources. Another amount of resources is used to ensure service operation. An organization has to contrast these resource requirements with relative requirements considered with other alternatives and also with other services in the portfolio. Using this criterion we can distinguish two categories of resource requirements: *high* (costs for maintenance and changes are expected to be high), and *low* (apart from occasional exceptions there are no significant costs expected).

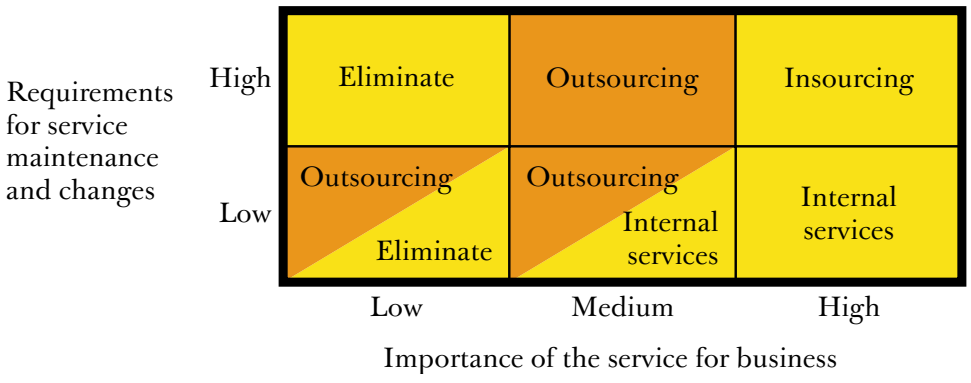

Figure 3.4: Matrix for identifying the most suited IT service sourcing practices. [author]

each application type.

The identified services are positioned within a decision-making matrix according to these criteria in order to identify suggested sourcing practices (see Figure 3.5).

As we can see from the matrix, we may identify the following six segments with various outcomes. Within these segments we point out compatible sourcing strategies:

- Segment of medium importance for business and high requirements for maintenance and changes can be deemed the most important for outsourcing option. These services are not business critical, but at the same time not insignificant. Their requirements are generally higher than of the services in other segments and therefore their outsourcing is favourable. Sourcing strategies: Singlesourcing, Multisourcing, Consortium Sourcing, Prime Contractor Sourcing.

- In case of low requirements together with medium importance it is possible to include not only outsourcing options, but also various forms of internal services. Low requirements for maintenance and changes imply not very demanding service that can however bring in some business value. Sourcing strategies: Shared Services Centre, Independent Service Organization, Genuine Internal Services, Joint Venture, Singlesourcing, Multisourcing, Consortium Sourcing, Prime Contractor Sourcing.

- When the service is positioned in low requirements together with low importance segment, a more complicated situation occurs, which adds an option of complete elimination of the particular service from the organization. Apart from that, another option might be outsourcing. In this case, factors for consideration are the costs associated with the service compared with overall benefits and value for the business. Elimination can be prevented using Business Process Reengineering techniques to better focus the related process on the defined business needs.[73] Sourcing strategies (if not selected for elimination): Singlesourcing, Multisourcing, Consortium Sourcing, Prime Contractor Sourcing.

- In case of low importance together with high requirements, the organization should consider either the service elimination, or Business Process Reengineering approach. Services in this segment were usually added organically without preceding in-depth analysis, or the analysis within framework phases of strategy and business processes was done poorly. Sourcing strategies: none (suggested elimination or Business Process Reengineering).

[73] This way the service would be repositioned to the segment of medium importance for business. However, the reengineering itself can not be performed on an ad-hoc basis and separately for the selected process. It is necessary to re-run the framework and begin with the first phase, where the organization can better reflect strategic goals with the overall business and processes structure.

- With high importance for business together with low requirements for maintenance and changes, the suggested practice is using the internal services sourcing. Sourcing strategies: Genuine Internal Services, Shared Services Centre, Independent Service Organization.

- In case of high importance and high requirements it is suggested to utilize internal service sourcing. Preferably the internal services should be boosted by insourcing in order to allow the organization gaining more detailed expertise in the area. This process could be further supported by investments into new ICT resources in order to obtain cutting-edge technologies together with the required know-how. Sourcing strategies: Shared Services Centre, Independent Service Organization.

Positioning of particular application services within the matrix should be based on strategy, as well as on preceding experience of the organization. The responsible IT manager should perform these actions in close cooperation with the rest of the executive board [168]. Ideally, this co-operation should include general manager and external advisers experienced in the particular functional areas.

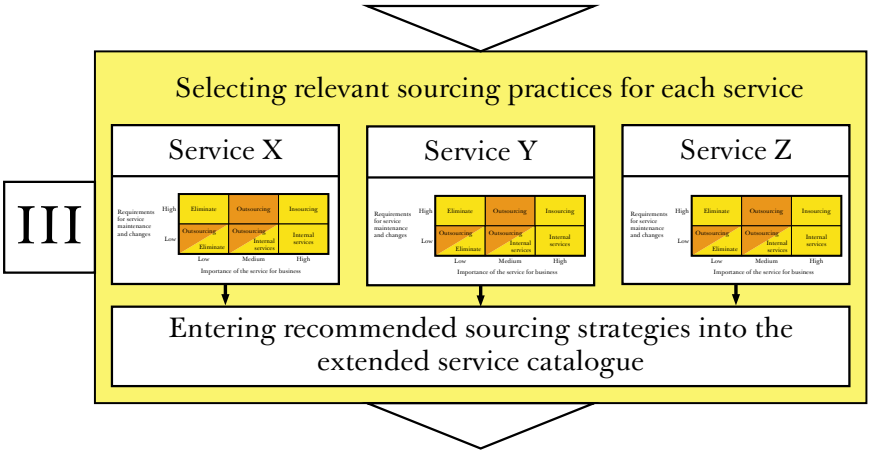

Figure 3.5: The SOURCER framework - phase III. [author]

If an elimination of the service is suggested, it is because the service demands medium to high maintenance while being insignificant to the support of organizational goals. It could also signalise that the ICT service architecture has possibly some overlaps. Although the overlapping services mentioned by Vorisek and Pour [199] are not as critical as missing functionality, we may define the overlaps as unnecessary costs that can be spared and used on something else. Ideally should the organization inspect its processes and modify its enterprise architecture in order to restructure its whole ICT service architecture. After this reconstruction, the mentioned service should be eliminated and some of the associated needs transferred onto other services.

Outcome of this phase is a selection of suitable sourcing variants to the particular service, and an indication of compatible sourcing strategies. These strategies were already discussed in Chapter 2.

3.4 Identifying relevant services on the market

Based on the recommended sourcing practices and current sourcing strategy, this phase of the framework comprises preliminary market evaluation for particular application services in the ICT service architecture.[74] According to the recommended sourcing practices marked in the extended service catalogue and the chosen sourcing strategy, the organization pre-selects particular application services for further evaluation within the next phase.

We can identify the following initial situations:

- In case of exclusive recommendation of outsourcing, the organization should examine SaaS, as well as traditional outsourcing providers.
- Recommendation of internal services should imply examination of possible internal service variants.
- In case of insourcing recommendation, the organization should consider possible internal service variants while focusing on shared services centre and independent service organization.
- Additional options might be added depending on the sourcing strategy regarding the particular service.

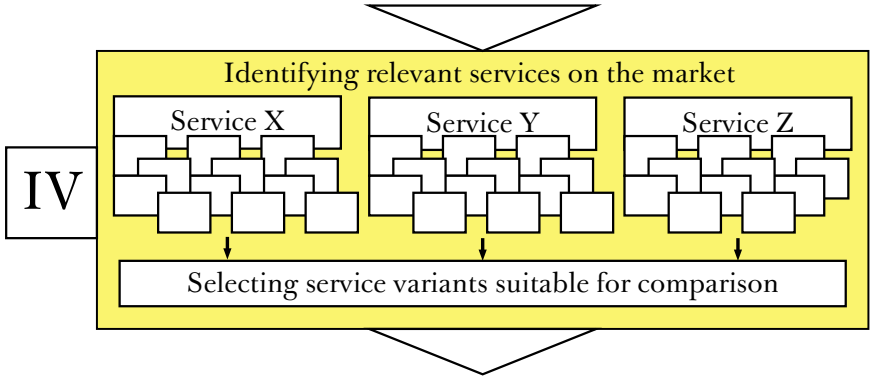

Figure 3.6: The SOURCER framework - phase IV. [author]

[74] A situation that might occur is the case of an ICT service that is highly specific or unique and thus very hard to find or not available on the market. In these cases the organization adds internal services to the decision and focuses on individual development of the service, which also influences the attributes of the particular solution.

If the service catalogue comprises multiple practices within one application service, all of the recommended markets should be included in the examination. For instance, in case of outsourcing/internal services mark, the organization should examine SaaS, outsourcing market, as well as possible variants of internal services, including joint ventures.

In case of the traditional outsourcing market the organization sends out the Request for Information (RFI). This way it may be able to gather enough information from the providers and available services.

With the SaaS market, the organization has to find available services itself. Therefore, it is suggested to gather information on the Internet and on the specialized service repositories.

Main use of the framework is with multisourcing strategy, where an organization selects best of breed services for each application service. However, as discussed in the previous chapter, there can be other strategies in the organization. When the current sourcing strategy involving the particular application service in question is consortium sourcing or prime contractor sourcing an organization can add the related application service options to consideration (generally in cases where the recommended sourcing practice is outsourcing). Regarding joint venture strategy, recommended can be adding related application service options in case of segment with outsourcing/internal services sourcing practices.

Another consideration for selecting services suitable for comparison is application of minimal levels required for the particular service within the service quality attributes. These attributes are specified further in the framework. It is probable that the organization does not set the minimal levels for all attributes. However, in case of those attributes that have the minimal level specified, this practically means that all alternatives not meeting this level are excluded from the considered alternatives.

The output of this phase is a list of possible sourcing alternatives within each type of application service existing in the IT service architecture. Ideally, these surveys should be carried out in form of a preliminary market analysis.

3.5 Analysing selected services and recommending best options

This phase covers possibly the most important goal of the framework. The organization should compare alternatives that were included in the list mentioned within previous phase. Separate scoring should be used for each existing application service. The results are then compared with emphasis on possible interconnections.

Output of this phase is a list of the most suited application sourcing variants. Its aim is to cover the whole IT service architecture with suggestion of the most appropriate solutions.

This phase contains the following steps:

- *Determining significance coefficients for particular metrics within each type of application service,* whereas these coefficients influence the overall quality scores. The domain significance coefficients act together with criteria weights, and are further described in Chapter 5, where we want to create a recommended weight set that would enable extensions for various industries according to their previous outsourcing experience. These predefined weights can be taken as they are or they can be further tailored to the organizational needs.

- *Comparison of solutions separately for each application service.* In this step the organization compares application service variants using selected criteria and weights. The decision has four viewpoints that have to be taken into account: functions, costs, service quality, and implementation time. We discuss this step further in this section.

- *Marking preferred options for each application service.* In this step the organization marks the preferred option on the basis of its decision within the previous step. Preferably, this should be the best service available. However, the framework is open to select any option that is offered. This might be any exceptional case, such as strategic partnership with a provider that might include using a particular IT service by both organizations, or a requirement to be able to participate within a supply chain of a major customer.

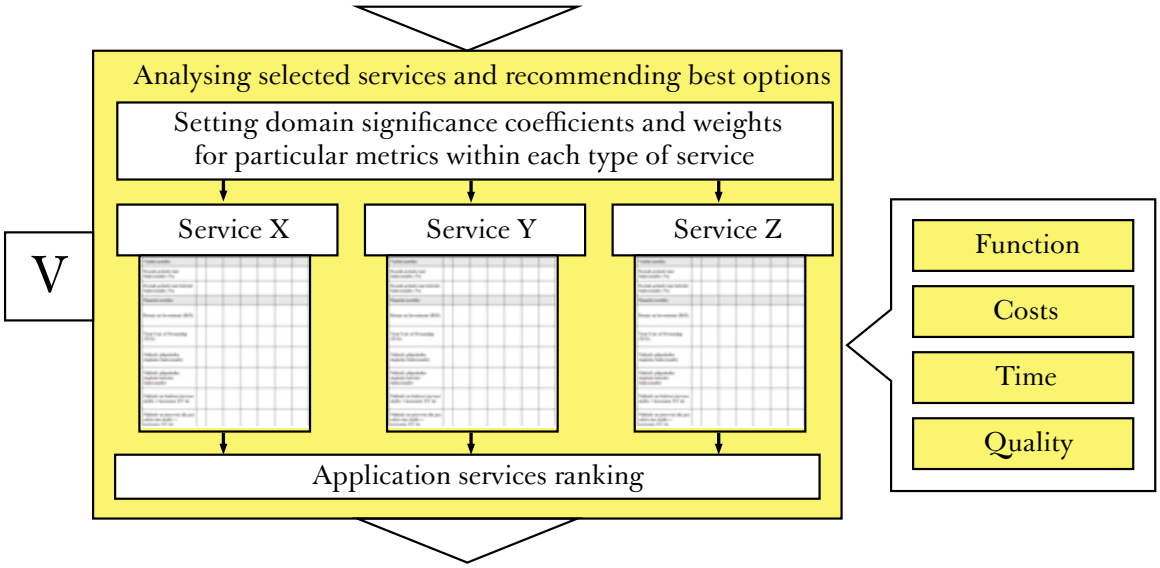

Figure 3.7: The SOURCER framework - phase V. [author]

Application service variants comparison within the SOURCER framework is performed using the metrics[75] shown in Table 3.1. For a better orientation, we may divide these criteria into four groups, as proposed in Sebesta [165]: internal, external, business, and financial.

[75] In the text we will also use the term criteria.

Apart from these four groups, there is a special category of metrics. Moreover, further usage principles apply. See the following sub-sections for additional information.

In order to structure the identified criteria, we have also added a *viewpoint-based* taxonomy that covers the particular metric. More detailed description of the metrics is included in the subsequent chapter. Section 4.1 covers the functional view and how to map functions required and offered in the information system, Section 4.2 covers cost-related metrics and various approaches to financial comparison of services, and Section 4.3 deals with the metrics related to the service quality. This structure connects to the viewpoints utilized within this phase of the framework, but also discusses the time viewpoint, and the special category that consists of the extent of outsourcing criterion.

Table 3.1: Metrics for application service variants comparison. [author]

Category	Metric	References	View
Internal metrics	Extent of desired functionality	[200, 26]	Function
	Extent of desired critical functionality	Author	
Financial metrics	Return on Investment	[200]	Costs
	Total Cost of Ownership	[59]	
	Net Present Value	[116, 200]	
	Internal Rate of Return	[116]	
	Payback Period	[116]	
	Economic Value Added	[200]	
	Net Present Value + Real Options	Author	
Business metrics	Implementation time	[200]	Time
	Scalability	[26, 200, 203]	Quality
	Integrability	[26]	
	Customisation	[26, 200, 203]	
	Reliability	[26, 49, 102, 200]	
	Accessibility	[26, 102, 200, 203]	
	Performance	[26, 49, 102]	
	Pre-sales testability	[200, 203]	
	Credibility of the provider	Author	
	Data security	[26, 200]	
	Service quality safeguarding	Author	
	Extent of SLA use	[49, 200, 203]	
	Emergency preparedness	[49, 203]	
	Maintenance	[26, 102, 203]	
	Training	[203]	
	Innovation	[203]	
External metrics	Geographical proximity	Author	Quality
	Cultural proximity	Author	
	Language skills	Author	
	Political and economic stability[76]	Author	
	Quality of the infrastructure	Author	
Special category	Extent of outsourcing	Author	

3.5.1 Four decision-making viewpoints

In the SOURCER framework we utilize four viewpoints that can influence overall IT outsourcing success – function, quality, time, and costs. This model follows loosely the works published in general management literature by Morris and Hough [132], Turner [191], Nevan Wright [138], and by Atkinson [8] with his Iron Triange focused on IT project management, and extends these to deliver results that can be utilized by framework users.

These viewpoint have to be considered individually by every organization. An organization has to identify its preferences between these viewpoints and reflect them in the decision. For better assessment of the problem, another original model introduced in this doctoral thesis is the *Tear-drop model* depicted on Figure 3.8.

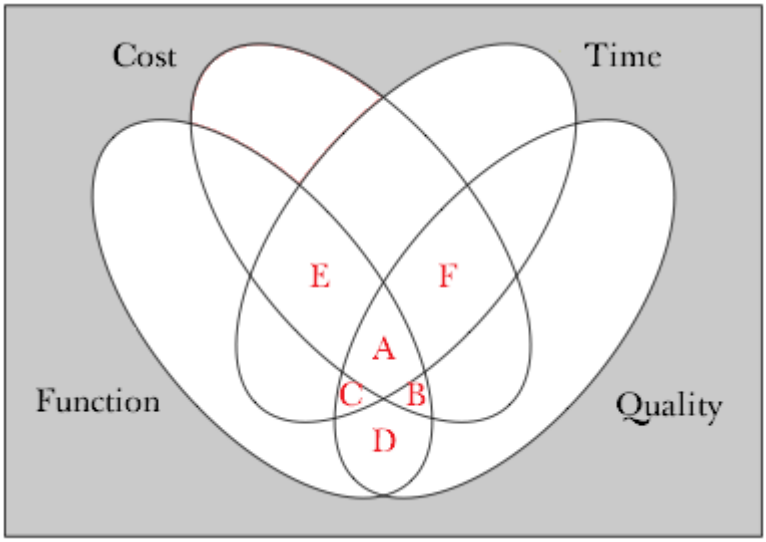

Figure 3.8: Tear-drop model for assessing outsourcing decision viewpoints. [author]

This model illustrates categorization of service comparison decisions. It is formulated on a four-set Venn diagram, where our previously mentioned decision-making views figure as separate sets. Venn diagrams were originally proposed by John Venn [195] in the nineteenth century and are since used to illustrate set relationships within various fields of study. The diagram principles seem to provide the most appropriate base for our aims. After we have structured sets of services in this phase of the SOURCER framework, we can further examine these sets from the mentioned viewpoints. Aim of our model is to help assessing outsourcing decision viewpoints as described earlier.

Looking at these sets and their intersections we may identify fifteen decision-making options. To point out some of the most important for our aims:

- The *intersection A* labels a situation where all the preferences are reflected, and therefore it is the situation where a set of solutions reflects all viewpoints of the decision-making.

Such service covers the most functions, offers highest service quality, it is the fastest to implement, and its cost is the best according to the chosen financial criteria. If there exists a set of such offerings, an organization is suggested to choose one of the services contained in this set.[77]

- The *intersection B* depicts a set of solutions that reflect all viewpoint preferences except of implementation time. In this case the organization sacrifices a preference of time in favour of function, cost, and quality. This could be a good option for situations where time is not a constraint.

- In *intersection C* we may find a set of solutions reflecting all viewpoint preferences except the service costs view. This case labels a situation where the organization has to choose a solution that will be timely, covers most functions that are demanded, and at the same time provides the highest quality. This decision is favourable in case of critical solutions with unlimited budget.

- The *intersection D* is a prime two-set intersection. It labels a situation where the preferences of function coverage and service quality are reflected. In this case the other two views are sacrificed. The decision in this intersection might be appropriate in case where the organization wants a solution that mainly covers much of the demanded functions and imposes a enough quality disregarding service costs and implementation time.

- The *intersection E* applies to solutions diminishing emphasis on service quality, while reflecting function, cost, and time viewpoint. This is scenario when the organization does not rely on the service too much in the particular service type – these are typically non-critical nice-to-have services.

- The *intersection F* is a three-set intersection consisting of solutions with the best cost, timely, and of best service quality. However, in case of sacrificing critical functionality this can lead to serious issues in the organizational architecture and its business continuity. An option from this set depends largely on strategy of the organization and can be recommended as an option with sacrificing on non-critical functional coverage only.

- Other options form various types of two-set intersections. In their case we may identify various preference combinations such as cost and functions, cost and service quality, cost and implementation time, time and functions, or time and service quality. They

[77] This may include function viewpoint reflecting critical functionality only. Alternatively, this may include function viewpoint reflecting all functions. This depends on the viewpoint an organization wants to take prefer in its strategy.

might be the next preference when there are not any appropriate solutions within higher intersections.

- No intersection options are the last four segments left on the diagram. In those cases the organization selects the service from a unique set depending on its preference. The service comparison happens just according to one of the views neglecting the other three views.

Main information in the model is that the organization should preferably focus on the options concentrated within the inner tear-drop, and should try to avoid the other options due to risks associated with them.[78]

In case that the service function is so specific that no suitable services were identified on the market, or there exist other significant obstacles with the service selection, the organization should opt for the internal services or in-sourcing service provision.

3.5.2 Implementation time

Separate issue is the implementation time, which has its own category. Various solutions bear different complexity. While in one case the implementation itself takes only days or hours, in other cases the same might take weeks or months.

Shorter implementation time is specific for SaaS solutions, especially application services with limited functionality. Although this is not a rule and there might be exceptions. This situation is thanks to the fact that the organization does not have to deal with problems associated with IT resources. It similarly applies when using services on the same platform (PaaS) or infrastructure (IaaS).

However, when dealing with purely internal resources, it should be assumed that a certain amount of time has to be spent on these problems. Therefore with internal services the implementation time tends to be longer.

When choosing completely individual solution, time needed to implement the required functionality might be even longer than in case of complex ready-made software packages. This situation has been discussed many times in the literature. For instance Vorisek et al. [200] name the variations IASW (individual application software) and TASW (typified application software), and in this context also point out the time differences.

In our case within this framework, the organization has to approximate time needed for implementation according to its own aims and base this approximation on the information from the provider. A good source for this might be the references, or case studies and whitepapers[79].

[78] Which is one of the reasons that led us to the name Tear-drop model. Another reason, quite accurately reflecting the reality of decision-making, was that an organization usually has to sacrifice some viewpoint in favour of other viewpoints.

[79] Although in this case one has to be careful about the bias the creator of these documents might have had.

Hypothesis for our research regarding the time view is that:

H_{CT1}: Short service implementation time is likely to have positive impact on perceived IT outsourcing success.

3.5.3 Special category of metrics

A criterion that is separated from the mentioned four groups is the extent of outsourcing. It measures a percentage of services provided externally. Unlike other metrics, it does not influence the evaluation directly. Rather it continuously ensures that the overall rate of external service provision would not exceed an appropriate limit.

As mentioned by Kern, Lacity, and Willcocks [97], only about 38 % of large-scale IT outsourcing cases succeed, while in case of the selective sourcing (multisourcing) the success rate was more than 77 %. Interestingly also the number of mixed results in the latter case got minimised to 3 %. Higher success rate was also identified with total in-house sourcing (76 %). Thanks to these results, and other studies that led to similar findings, a connection between the extent of outsourcing and outsourcing success is a fact that has to be projected in decision-making about outsourcing of every organization.

Based on the mentioned studies ([38, 97]), and on a common perception within our field, we may set the border between total IT outsourcing and selective IT outsourcing to 80 %. It has to be noted that this is a limit suggested generally. Thanks to technological progress and the changes in business environment, the actual outsourcing experiences can change in the long run. Therefore, we can expect that future studies will be slightly altering the advised level, but probably not very significantly.

However, the framework reflects that an organization should be able to modify the limit itself in order to reflect its own experience with the problem or in order to execute its own specific strategic intentions.

3.5.4 Further usage principles

Due to the differences between various industrial sectors, and with consideration of the diverse requirements of individual businesses, the framework reflects this uniqueness of particular requirements by implementing a significance factor already mentioned above. Each metric has its significance coefficient set directly by the end user organization. Subsequently, this coefficient determines how the particular metric influences the overall evaluation. A recommended set of significance coefficients is presented further in Chapter 5.2.

3.6 Sourcing, Integration, and Execution

This phase consists of a final decision on the sourcing of services, preparation of integration and implementation plan, followed by negotiations, and signing contracts with the relev-

ant providers, and subsequently final design and integration of the selected services into the organization's information system. An organization may also use the framework to observe some options for service sourcing without implementing them. Also some services might proceed to implementation and launch immediately, whereas other services might be delayed, or not launched in the end. In these situations the organization proceeds onto the next phase of the framework in parallel to processes related to the current phase. In case of services selected for implementation,[80] this phase is completed after successfully launching all selected services in its new configuration.

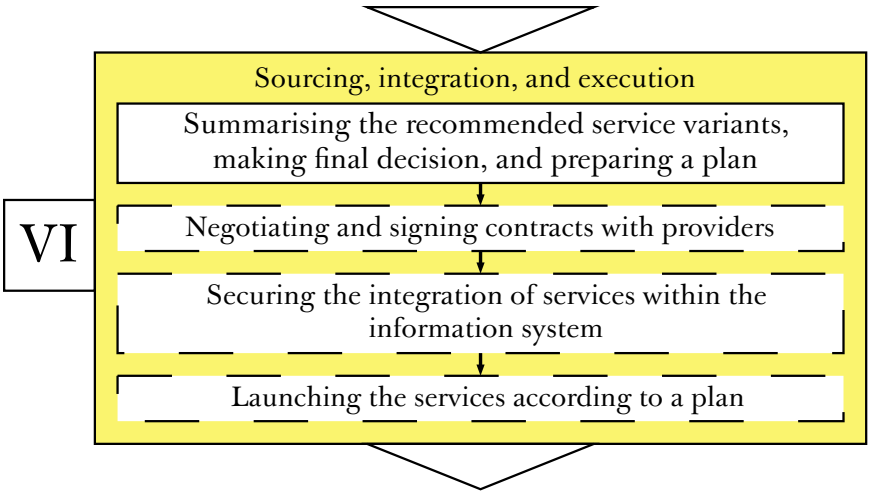

Figure 3.9: The SOURCER framework - phase VI. [author]

More concretely:

- On the basis of the recommended variants for each service, the organization makes a *final decision about sourcing its services*, and prepares a plan for integration and implementation of the services. This plan should be prepared on the basis of limitations[81] and relevant strategic decisions of the organization. The following steps are performed individually for each service in parallel, while the organization continuously proceeds onto the next phase of the framework with each service where it decides that the process is completed.

- Where applicable, the *organization negotiates the service contracts* including fines for not meeting the set service level targets[82] and other contract details. This is not applicable for the SaaS markets since a majority of the services on these markets have contracts that are fixed for all customers and therefore individually inflexible. Important part

[80] And also from the viewpoint of the whole service portfolio.

[81] Such limitations can be limited capacity for solving the integration of the particular service into existing information system, schedule of license expirations of services going to be replaced, or effective terms and conditions of existing services and resources (databases, servers, etc.).

[82] Meaning not providing the service level targets agreed in the contract.

is a statement on the measurement of selected quality indicators, i.e. how to measure availability, reliability or overall service performance.[83] Moreover, it is necessary to agree on fines in case of not delivering the service in the declared quality. Important part is also agreeing on implementation schedule and responsibilities of customer and provider. Such responsibilities can be end-user training or systems integration.

- *Securing the integration of the service within the organization's information system* is the next step of this phase. Ideally this task has to be assigned to a project manager. This manager should propose a schedule for the implementation project including the desired level of integration with other ICT services. He should be held responsible for adherence to the schedule, communication with suppliers and developers (in case these are needed) and overall successful completion of the project.

- Last step of this phase is *launching the services according to a plan*. It is suggested that the individual service launches should be scheduled in a time and dates that are not expected to be business critical for the organization or its parts.[84]

3.7 Monitoring, Control, and Response to Changes

Last phase in the framework serves mostly as a standby regime. The organization has to monitor existing alternatives in terms of particular metrics compared to real service operation and performance. Aside from that, organization should observe the market for any breakthrough technologies or new services with better service level offerings.

Regarding the business-IT cooperation, an open-door policy should be used. Particularly it is suggested to gather incoming requests and to evaluate them in order to improve service quality / alter service levels requirements, and possibly revise the sourcing strategies and relevant sourcing practices in the next framework cycle.

To sum up the mentioned framework-related requirements, a crucial part of this phase consists of the following four groups of parallel activities: Monitoring the quality of services, monitoring the cost of services, monitoring application services market, and appraisal of the incoming business requests/suggestions that might have impact on ICT services quality and performance.

These activities can be described as follows:

- *Monitoring the quality of services.* The organization should regularly monitor or check the quality of its ICT services. Measurements should be based on previously defined

[83] For instance whether there will be any indicators measured on the provider side, or on the side of the customer. Answer to this question can be significant for the service quality as perceived by the end-user organization. A provider that does not get enough contracted connectivity will have high performance measures on his side, while on side of the end-user organization can be the performance only mediocre.

[84] Periods that are business critical depend highly on the industry and customer segment in which the organization operates.

metrics, and should take into account the service levels agreed with the providers.[85] This control should ensure optimal service quality levels, and prevent emergence of business-critical issues. If the service is not performing well in the long-term perspective, such as it does not attain its agreed service level targets, it should be a signal to change provider and add the current provider to the black list.[86]

- *Monitoring the cost of services.* Another activity should be monitoring of service costs in specified intervals. These intervals should be compared with other available options and in case of significant difference submit a suggestion to change service provider.

- *Monitoring application services market.* Activities of high importance are observations of new trends on the application service markets, and monitoring the average costs and quality measures of services offered on these markets. A significant decline in service prices, as well as emergence of any breakthrough service innovation, the organization should consider re-evaluating its strategy and subsequent ICT service architecture including sourcing of the utilized services.

- *Appraisal of the incoming business requests/suggestions that might affect application services.* Regular evaluation of end-user requests and suggestions ensures overview of known issues and potential innovation of current solutions. This feedback shall be gathered via the service desk or informally during the regular team meetings or board meetings. After gathering the feedback, it should be analysed and to a certain extent reflected in the next framework cycle, particularly in the first phase of the framework. This way the suggestions considered relevant should be projected into the organizational strategy and through this strategy into next service selection.

The last step in this phase is the *response to changes*, which succeeds the above-mentioned activities. In this phase, there is an option to utilize various strategies.[87]

As mentioned before, to prevent the case of service irregularities both parties usually agree on associated fines. If these irregularities occur more often or for a certain period, it is possible to renegotiate the contract.[88]

[85] Preferably in a form of service level targets within Service Level Agreement.

[86] The black list is useful for creating own database of under-performing providers. Running the framework next time, the organization could check the option against this black list and remove services offered by these providers from the considered options.

[87] One particular example that can be utilized by the framework is the Long-Tail strategy for IT Outsourcing recently published by Su, Levina, and Ross [180], where there is a focus on trying innovative solutions, experimental project, and subsequently choosing the best to transform into long-term partnerships. In this case, that will also be involved in some previous phases of the framework, coming top-down from strategy, to service definition. Also, these strategies can be driven by various strategic drivers, such as new opportunities, less risks, or other strategically percieved benefits, as mentioned by Hannu Kivijärvi and Jussi Toikkanen [80].

[88] These irregularities might be measured with the metrics used in ITIL[92] Mean Time Between Failures, Mean Time Between Service Incidents, Mean Time To Repair, or Mean Time to Restore Service.

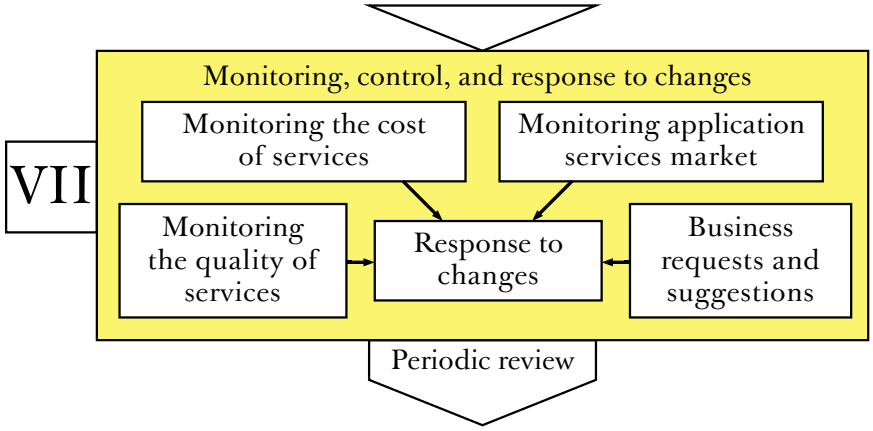

Figure 3.10: The SOURCER framework - phase VII. [author]

However, if any problems of higher extent emerge, it is advised to run a new framework cycle immediately and re-evaluate the whole situation. Such problems could be critical service delays, bankruptcy of the provider, rapid change of business/IT conditions, or major reorganization happening within the enterprise. The problems experienced with the particular service or service provider should be also reflected in the next framework cycle.

Last step in the whole cycle is the *periodic review* of service sourcing. Apart from these emergency runs, the organization should re-run the framework at least annually in order to re-evaluate its ICT service portfolio. The next cycle of the framework should start again from the first phase reflecting the identified problems in its strategy, processes, service structure, and other related parts of the framework.

It is advisable to form a team that would formulate changes, and required functions needed to be covered by the service. This team should not only include business consultants, managers, and members of the IT department, but also selection of regular staff members. This policy should ensure that the people involved in the process of formulation are the same people that will use the particular ICT services after their implementation and deployment.

3.8 Approach prerequisites and limitations

To make the description complete, we have to point out some of the prerequisites and limitations of the presented approach. These are needed to be considered before utilizing the approach in order to prevent failures and ensure overall efficient use of the framework.

Prerequisites:

- Organization is able to define its business and IT strategy.
- Organization is able to define the needed functionality.
- Organization is able to identify its core and supporting processes, as well as the importance of the related services.
- Organization has enough resources to utilize the framework in practice. This means especially financial resources, and sufficient number of qualified workers.[89]
- Organization is flexible enough regarding organizational changes.
- Organization is able to evaluate process and service significance regarding the business operations and business strategy.
- Organization is able to estimate requirements for maintenance and changes of separate services.

Limitations:

- The approach itself is a service-based IT management concept and therefore there might arise issues when combined with process-based IT management. The problem of co-existence of these approaches might be a potential future research direction.
- The framework aims on the Information Technology Outsourcing, particularly the ICT service Outsourcing. The Software Development Outsourcing and Business Process Outsourcing are not taken into consideration, although they influence decision-making in the particular phases to some extent.
- The framework was constructed for comparing application services. Therefore using it on services of fine-granularity might cause issues in significance determination and other parts of the framework. Although it is possible to use its principles with all kinds of services of coarse and fine granularity, it is not suggested. Large number of small services would also cause an exponential growth in decision-making complexity.

[89] It is advisable to create a special team focused just on utilizing the framework.

3.9 Chapter summary and proposal of the four views on service selection

In this chapter we presented essential design of the SOURCER framework. This original approach consists of a methodology and criteria for decision making about IT outsourcing. Using the framework, end-user organization is able to identify potential services on the market and subsequently analyse and evaluate these services using the suggested criteria. According to the needs of the particular organization, a unique ICT service portfolio is created and subsequently managed and monitored.

ICT services within the portfolio are the ones selected as most suitable within the previous process. Service selection is however only a portion of the whole framework. The approach is designed as a repeating cycle of seven phases, where every phase has its specific outcome which is linked to other decisions and outcomes within the framework. Together these phases provide integrated guidelines for management and outsourcing of ICT services. In order provide more guidance for use of the framework in practice, its parts are specified in more depth further in the thesis.

As we have mentioned, four different views are used regarding the decision-making about ICT services outsourcing: function, costs, quality, and implementation time. For assessing these outsourcing decision viewpoints we have presented an original Tear-drop model that we incorporated in our approach.

These four viewpoints form a decision-making base in the SOURCER framework, particularly in the service selection phase. We already discussed implementation time view in this chapter. The following chapter deals with three of the four viewpoints of decision-making individually: function (Section 4.1), costs (Section 4.2), and quality (Section 4.3).

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Chapter 4

Framework settings

This chapter further extends the SOURCER framework design that was described in the previous chapter, whereas this chapter focuses on discussion of various settings that can be used within the framework. Important aspect of the framework is its flexibility in terms of its use. It is expected that in certain cases, the framework settings may be modified according to the actual context of the decision-making process [90]

This chapter presents recommended framework settings in typical IT outsourcing decision-making situation, and its constructed on the basis of current academic and practitioner literature. The views covered in this chapter are: function (Section 4.1), costs (Section 4.2), and quality (Section 4.3).[91]

4.1 Functions of ICT Services

Functional areas of information systems are a topic that are highly relevant to our aims. The topic itself has been discussed for many years, although its nature changed with different paradigms adopted at the time. A good summary of a functional taxonomy designs outline Glass and Vessey [72], while they present a comprehensive view on taxonomies used by major IT companies such as IBM or Digital[92].

Other approaches might be found in the Commercial Off-The-Shelf (COTS) research area [23]. These approaches focused mainly on component-based engineering and offered some extent of categorization of mostly technical nature. Excellent overview of this area provide Heineman and Councill [82].

Component Business Model approach, in its later years followed by the Component Business Model for the Business of IT as described by Ernest and Nisavic [56] focused

[90] For instance, there may be potential use of the framework in a unique context, where the organization still wants to have some guide for the IT outsourcing related problem, but would prefer not to rely solely on the suggestions included by someone else, and would rather modify the framework to suit its needs. Given the artifact design, this is completely possible to achieve.

[91] Whereas time view has been discussed in the previous chapter (Section 3.5.2).

[92] Also known as Digital Equipment Corporation, or as DEC.

mainly on technical aspects and the Service Oriented Architecture (SOA). However, it contained some link to business needs through business building blocks. This approach was rather bounded to the technical view of services and therefore not very usable for our aims.

Finally the so called Enterprise Software[93] and Enterprise Resource Planning utilized some linkage on business needs classification. However, which inherited much of the problem of components, because they kept dealing with the problem of standardization and reusability under a roof of an integrated information system as mentioned by Rettig [152]. Overview of these functions has been discussed by Møller [131] in his paper about the next generation of Enterprise Resource Planning (ERP II).

An extreme case of functional diversification is the SAP/R3 system which covers a large extent of possible functionalities within its modules. Some parts of this classification might be utilized to a limited extent. However, a majority of business functions in SAP reflects too much of the SAP software architecture, and includes the best-practice approach for particular industries. This might be good for SAP implementation efficiency, but makes any usage of the classification outside SAP ecosystem very complicated.

On the contrary, the industry differentiation is an important aspect that we can utilize in our classification. While some business functions might be common for some of the industries, other functions might be industry-specific or even completely unique.[94] In case of industry-specific functions we provide a selection of major function and keep the framework open for potential inclusion of newly emerging markets. The case of unique functions is specific and in case the organization does not find any appropriate service it should choose the internal services or in-sourcing service provision automatically.

In order to get the most of IT outsourcing, we have to search for better coverage of our business functions rather than just outsourcing the whole IT operations. As emphasized by Lacity, Willcocks, and Feeny [108] the selective sourcing is about answering the question 'Where and how can we take advantage of the developing market for ICT services?'

How can an organization assess the needed functionality and structure its services is a crucial question. According to our analysis the best way would be utilizing architectural principles similar to the ones offered within Enterprise Architecture frameworks. The view contained in this chapter reflects on the fact that current Enterprise Architecture frameworks either do not utilize any service architecture, or their relation to services is only partial. Much of the approaches then focus solely on technical nature of services, as used in the Service Oriented Architecture (SOA) paradigm.

[93] We can also encounter the name Enterprise Application Software as used by Gartner [70].

[94] Even for the common functions, different organization have different requirements. For instance SME has different functional requirements than large organization, and also manufacturing organization has different requirements than medical facility or a law firm.

In order to construct a comprehensive taxonomy of service functions, we have examined the above-mentioned concepts, and examined the existing ICT service markets to identify intersections.

The finding was that much of the structures need to be tailored to better fit current market situation. In some cases the functional structure reflected too much of the particular software solution, was defined inefficiently, or was illogically bounded to other functional area. Another problem was that some of the functional areas were depreciated or were reflecting popular buzzwords emerging throughout the IS history.

General classification of IS that can be used for our purpose of service categorization is still missing. In our approach we loosely link our taxonomy on the classifications used within Enterprise Application Software and ERP II, while restructuring and adding functions to better reflect the situation on the ICT service market.

Our classification is therefore mainly market-based. Using this approach, we aim to create a base of a potential reference service architecture on similar principles as used in the EA frameworks.

In the following sections we deal with the functional areas individually. Apart from introducing the particular area we also propose a sample functional taxonomy. These taxonomies can be used as is or could be further changed by the organization. They may serve for better assessment of the services in their functionality coverage. It is important to mention that final utilization of the various areas is also influenced by the industry in which the organization operates and its overall business strategy.

In this chapter, we further discuss the following functional areas:

- Enterprise Resource Planning,
- Customer Relationship Management,
- Business Intelligence,
- Master Data Management,
- Project Management,
- IT Management,
- Enterprise Content Management,
- E-commerce,
- and other functions.

Also, we discuss the impact of industry on functional requirements of the organization. For our aims of defining the various industries and mapping their functional requirements, we outline some of the possible industry specific functions. These are namely:

- Manufacturing,
- Supply Chain Management,
- Computer Aided Software Engineering,
- and Software Development

4.1.1 Enterprise Resource Planning

The Enterprise Resource Planning (ERP) is a group of core functional areas focused on enterprise operations that basically form a heart of the organizational IT.

Møller [131] defines ERP as 'a standardized software package designed to integrate the internal value chain of an enterprise. An ERP system is based on an integrated database and consists of several modules aimed at specific business functions.' Pour, Gala, and Toman [149] also emphasize the ERP ability to automatize and integrate key business processes.

As mentioned by Gupta and Kohli [77], the ERP mainly focuses on the operations management within the organization. However, unlike the case of SAP/R3 where much of the functions are bound together to transfer the SAP best practice, in case of ICT service markets the functional areas are sometimes scattered among multiple functions within the ERP function.

The term ERP itself is fuzzy as authors in the academic literature such as Davenport, Harris, and Cantrell [41] sometimes refer to ERP as to an unified information system with all the integrated functions on one place. That might encompass as well the function areas that we treat separately.

In our case we present the following areas of functions, however, the contents of the ERP could differ according to organization structure, and its business and IT strategies.

The functional areas we include in our perspective of ERP are namely: Finance and accounting, Asset management, Sales, and Human resources. Within each of these areas we may identify several functions.

- Finance and accounting: ranging from core functions, such as Financial accounting, Cost management, Payroll, and Banking operations, to advisory functions such as Forecasting, Cash-flow management, and Risk management.
- Asset management: functions dealing with various levels for managing assets, such as Inventory management, Warehouse management, or Property management.
- Sales: functions encompassing order-related management issues and relevant activities, such as Order management, Order automation, Invoice management, Logistics, or International trade.

- Human resources: functions focused around employees and their management, such as Recruitment, Career management, Assessment management, and Meeting management.

Table 4.1: ERP services. [author]

Enterprise Resource Planning		
Code	Service	Group
FI01	Financial accounting	Finance and accounting
FI02	Cost management	Finance and accounting
FI03	Forecasting	Finance and accounting
FI04	Payroll	Finance and accounting
FI05	Cash-flow management	Finance and accounting
FI06	Risk management	Finance and accounting
FI07	Banking operations	Finance and accounting
AM01	Inventory management	Asset management
AM02	Warehouse management	Asset management
AM03	Property management	Asset management
SA01	Order management	Sales
SA02	Order automation	Sales
SA03	Invoice management	Sales
SA04	Logistics	Sales
SA05	International trade	Sales
HR01	Recruitment	Human resources
HR02	Career management	Human resources
HR03	Assessment management	Human resources
HR04	Meeting management	Human resources

4.1.2 Customer Relationship Management

Customer Relationship Management (CRM) is an umbrella term for functional areas surrounding various activities regarding customer life cycle. Also, as mentioned by Møller [131], 'CRM systems facilitate the managing of a broad set of functions that primarily include the customer identification process and customer service management.'

More precisely, as mentioned by Gartner [70] 'CRM addresses customer life cycle management business processes, and provides functionality to enterprises in sales, marketing and customer service (including call and contact centres) through collaborative, operational and analytical components.'

A number of functions can be identified. CRM is specific with higher degree of standardization thanks to its aim which is straightforward and focused on customer communication and analysis. Given its relatively low complexity[95] it is currently the functional area that has the biggest portion on the SaaS market.

[95] But also thanks to a number of other factors.

We can distinguish the following two function groups: focusing on solution and focusing on process.

More precisely:

- Focusing on concrete solution: Call centre management, Field applications, and Interaction centre.
- Focusing on customer relationship process: Lead management, Segment management, Channel management, Warranty management, and Service contract management.

Table 4.2: Customer Relationship Management services. [author]

Customer Relationship Management	
Code	Service
CRM01	Call centre management
CRM02	Lead management
CRM03	Segment management
CRM04	Field applications
CRM05	Interaction centre
CRM06	Channel management
CRM07	Warranty management
CRM08	Service contract management

4.1.3 Business Intelligence

Business Intelligence (BI) covers variety of functions around data analysis and their presentation where its main aim is to provide sound base for efficient management decision-making. According to Novotny, Pour, and Slansky [139], it is a 'Set of processes, applications, and technologies, where its aim is to effectively and efficiently support the decision-making process in the firm.'

As pointed out by Gartner [70] 'Business Intelligence is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance.' As apparent, this functional area is loosely connected to the Customer Relationship Management area discussed above.

In our case, we constructed the Business Intelligence area around various stages of the BI process and outputs, and around the specific techniques used within the analyses.

More precisely:

- Process and outputs: Data analysis, Reporting, Dashboards, Performance management, and Advanced forecasting.

- Specific analyses techniques: Real-time analysis, Unstructured data analysis, Audio analysis, Video analysis, and Sentiment analysis.

Table 4.3: Business Intelligence services. [author]

Business Intelligence	
Code	Service
BI01	Data analysis
BI02	Reporting
BI03	Dashboards
BI04	Scorecarding
BI05	Performance management
BI06	Advanced forecasting
BI07	Real-time analysis
BI08	Unstructured data analysis
BI09	Audio analysis
BI10	Video analysis
BI11	Sentiment analysis

4.1.4 Master Data Management

The Master Data Management (MDM) functional area includes main functions that relate to data in the organization. Its aim is to ensure sufficient data quality in order to improve management decisions.

We may further broaden the definition using the view proposed by Gartner [70]: 'MDM is a technology-enabled discipline in which business and IT work together to ensure the uniformity, accuracy, stewardship, semantic consistency and accountability of the enterprise's official shared master data assets. Master data is the consistent and uniform set of identifiers and extended attributes that describes the core entities of the enterprise including customers, prospects, citizens, suppliers, sites, hierarchies and chart of accounts.'

While dealing with the information and data quality, this area is crucial for other areas that provide any form of analyses or any type of information based on the organizational data. From the mentioned areas the most crucial is the of Business Intelligence and Customer Relationship Management.

We can identify the following function groups: data operation, data control, and data management group.

More precisely:

- Data management group: Data management, Meta-data management.
- Data operation: Data filtering and unification, Data profiling, Data identification, Data approximation.

- Data control: Process Input data quality control, Output data quality control.

Table 4.4: Master Data Management services. [author]

Master Data Management	
Code	Service
MDM01	Data management
MDM02	Data filtering and unification
MDM03	Data profiling
MDM04	Data identification
MDM05	Data approximation
MDM06	Input data quality control
MDM07	Output data quality control

4.1.5 Project Management

According to Gartner [70]: 'Project management (PM) is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements.'

Current demand also suggests that an ICT service supporting the project management function has to reflect a variety of alternative project management approaches. Apart from others the most notable is the Agile, and Kanban. An organization may, however, consider other systems according to its industry standards and own expertise.

Our observations show that the functions covered in this area can be differentiated using three groups: project management process-related functions, support of various project management approaches, and project portfolio management

These groups include:

- Project management process-related functions: Task tracking, Time tracking, Expenses tracking, Collaboration, Resource scheduling.
- Support of various project management approaches: Traditional project management, Agile project management, Kanban project management.
- Project portfolio management.

Table 4.5: Project Management services. [author]

Project Management	
Code	Service
PM01	Task tracking
PM02	Time tracking
PM03	Expenses tracking
PM04	Collaboration
PM05	Resource scheduling
PM06	Traditional project management
PM07	Agile project management
PM08	Kanban project management
PM09	Project portfolio management

4.1.6 IT Management

The IT management functional area focuses on a variety of activities relating to information technologies within the organization.

Mainly the activities relate to day-to-day IT operations, but also involve a degree of planning and communication. Central application in this regard is the Help desk that provides means of communication with the rest of the organization. In ITIL [92] it is defined as 'a point of contact for users to log incidents'. The term help desk itself is often used as a synonym for Service desk, however, in ITIL it is defined as its sub-type.

Other two functions, IT monitoring and Resource management, relate to the layers depicted in the SPSPR model. The former provides means of getting information about ICT resources, services, and processes, while allowing various views on these layers and their interconnection. The latter then allows managing these resources directly from the service. Database administration function relates to the resources layer and focuses on administration of structure, roles, technical solutions, responsibilities, and various attributes of the database.

Integration management is a function that ensures integration of various services, resources, and processes across the organization.

Service portfolio management then ensures coverage of activities relating to service level management and service catalogue.

This functional area is distinctive in a sense that some functions from this category might not relate directly to business processes, but might rather relate to ICT processes layer as depicted in the SPSPR model. In this case, the demand for their adoption in the organization usually emerges from the operational technical needs and from their linkage to the previously defined IT strategy.

As discussed earlier, the SOURCER framework is open to various functional settings as long as they are consistent within the use in the particular organization at a time. Apart from

Table 4.6: IT Management services. [author]

IT Management	
Code	Service
ITM01	Help desk
ITM02	IT monitoring
ITM03	Resource management
ITM04	Database administration
ITM05	Integration management
ITM06	Backup and recovery
ITM07	Information security management
ITM08	Service portfolio management

the above-mentioned IT Management services, we may define a different set of services depending on which approach does the organization use in its IT management practice – i.e. ITIL, or MBI. An alternative IT Management functional area based on ITIL can be set as described on Table F.1.

4.1.7 Enterprise Content Management

Enterprise Content Management (ECM) is a function in whose center of interest is a document.

As mentioned by Smith and McKeen [176] the ECM could be defined as 'the strategies, tools, processes and skills an organization needs to manage all its information assets (regardless of type) over their life-cycle.'

Gartner [70] provides more detailed definition: 'ECM is used to create, store, distribute, discover, archive and manage unstructured content (such as scanned documents, email, reports, medical images and office documents), and ultimately analyse usage to enable organizations to deliver relevant content to users where and when they need it.'

As pointed out by Alalwan and Weistroffer [1] the ECM functions can be viewed as the evolution of document management, records management, workflow (business process) management, and web content management systems.

Functions that we utilize in our case reflect this view and also add into account current market offerings.

Table 4.7: Enterprise Content Management services. [author]

Enterprise Content Management	
Code	Service
ECM01	Digital depository management
ECM02	Document digitalization
ECM03	Document manipulation
ECM04	Document life-cycle management
ECM05	Web content maintenance
ECM06	E-documents management
ECM07	Communication management
ECM08	Records archiving management
ECM09	Workflow

4.1.8 E-commerce

As mentioned by Møller [131] 'E-commerce denotes commercial sales transactions either with businesses or with individual customers over the electronic medium, usually the internet.'

It is a functional area that covers a variety of functions around its core, which is the E-shop and Electronic payment system.

These functions can support various activities. Apart from the core, we may distinguish two related groups: connecting functions, and advertising functions.

More concretely these contain:

- Connecting functions: auction management providing the auction functionality and social commerce that establishes the organization channel linkages to social networks.
- Advertising functions: affiliate programme management, customer club management, and advertisement management which all form a way of getting customer attention.

Table 4.8: E-commerce services. [author]

E-business	
Code	Service
EB01	E-shop
EB02	Auction management
EB03	Affiliate programme management
EB04	Customer club management
EB05	Electronic payment system
EB06	Advertisement management
EB07	Social commerce

4.1.9 Other functions

Other general functions might be various service categories not fitting in the above mentioned, or services traditionally distributed separately. Unlike the above-mentioned functional areas, the comparison of services is separate for every function. They may also serve as an add-on to the existing ICT services in order to broaden their functionality.

- Productivity-related services: Calendar, Task tracking, Charting, Bookmarking.
- Communication-related services: VoIP telephony, PBX system, Fax system, Instant Messaging, Email, Video conference service.
- Content-related services: Wiki management, Content management service (CMS), Publishing, Book-printing, Conference submission management, Resume management.
- E-business related services: E-procurement system, Web analytics, Social network management, Gamification system, Subscription management.
- CRM-related services: Newsletter management, Customer helpdesk, Call-center service, Real-time chat, Survey management.
- Digital content creation services: Computer-aided design (CAD), Photo editing, Video editing.
- Office automation services: Word processing, Spreadsheets, Presentations.

4.1.10 Industry specific functions

Establishing a precise taxonomy of various functional areas is crucial for further framework operations. However, some of the functions are not generalizable and are very specific. Therefore to make the functional coverage better, we would like to present foundations of our approach to deal with these types of services.

A good starting point are the statistical classifications of industries. Mainly we can identify the NACE system in European Union, and the NAICS in the United States. However, there is a number of other national classifications, such as ОКВЭД in Russian Federation. We sum up some of the classifications used in major world economies in Table 4.9.

For our research aims we decided to use the *International Standard Industrial Classification of all Economic Activities* in its fourth revision[96] which is the classification maintained by the United Nations Statistics Division. Reason for this is that this classification serves as a reference for most of the national taxonomies currently used. This includes NACE Rev.2 which is a

[96] ISIC Rev.4.

classification of economic activities in the European Union[97]. Moreover, most of the statistics provided by organizations such as OECD are provided with the ISIC classification. Using the ISIC Rev.4 enables us to compare our results with other studies conducted in the EU-27 area and with other studies in various regions.

The ISIC classification has 21 sections further extended into 88 divisions, 238 groups, and finally into 419 classes.

Much of these industries have an industry-specific function that is typically covered by a special software. However, not many of these applications are provided using SaaS and therefore identifying the market might be complicated. Also, adoption of the above-mentioned general functions varies according to the particular practices used in the organization.

Comparison of these functions and their distribution within industries could be interesting information for future use of the framework.

The applications pose often a specific structure and functionality. It might be therefore problematic to identify standardized functions. Needless to say that analysing the complete range of 238 industry groups is a potential task for separate research project. Organization choosing the industry-specific application could construct similar table for its own use and utilize this in the SOURCER framework the same way as the ones proposed in this chapter. The framework is also open for future functional additions and amendments according to the market development.

In the following subsections we present a selection of prominent industry-specific functional areas. These are namely: Manufacturing, Supply Chain Management, Computer Aided Software Engineering, and Software Development.

4.1.10.1 Manufacturing

This functional area is usual for industries dealing with goods or materials production. In the ISIC industry classification this is especially the Manufacturing industry (C). A number of other industries might utilize parts of this functional area depending on their operations.

Base of this functional area is the Material requirements planning function, which encompasses essential activities regarding the material, its use in the manufacturing process, and planning of its supply.

Another core function is the product life-cycle management (PLM) which according to Møller [131] 'enables enterprises to bring innovative and profitable products to market more effectively, especially in the evolving e-business environment. PLM enables extended enterprises to harness their innovation process through the effective management of the full product definition life-cycle.'

[97] Adapted in the Czech Republic as CZ NACE (see http://www.nace.cz/)

Specific is the bill of materials function, often considered as one of the information center-points. Gartner [70] defines it as 'providing structured list of the materials, parts and assemblies that constitute a manufactured product.'

Functions connect to the base function by adding more information, or by adding process support. Therefore we further divide them to two groups: information-related and process related. More contretely:

- Information-related: Bill of materials, Master production schedule, and Product data management.
- Process-related: Shop floor control, Manufacturing process management, Total production optimization, Capacity requirements planning, Purchasing management, and Computer-aided manufacturing.

Table 4.9: Industry classification taxonomies. [author]

Abbreviation	Name	Countries
ANZSIC	Australian and New Zealand Standard Industrial Classification	Australia, New Zealand
ICNEA	Industrial Classification for National Economic Activities	China
JSIC	Japan Standard Industrial Classification	Japan
NACE	National Classification of Economic Activities	European Union
NAICS	North American Industry Classification System	USA, Canada, Mexico
ОКВЭД	Общероссийский классификатор видов экономической деятельности	Russia
SIC	Standard Industrial Classification	USA
UKSIC	United Kingdom Standard Industrial Classification of Economic Activities	United Kingdom
ISIC	International Standard Industrial Classification of all Economic Activities	multiple countries

Table 4.10: Industry classification used in our research. [88]

ISIC Code	Industry
A	Agriculture, forestry and fishing
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam and air conditioning supply
E	Water supply; sewerage, waste management and remediation activities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific and technical activities
N	Administrative and support service activities
O	Public administration and defence; compulsory social security
P	Education
Q	Human health and social work activities
R	Arts, entertainment and recreation
S	Other service activities
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	Activities of extraterritorial organizations and bodies

Table 4.11: Manufacturing services. [author]

Manufacturing	
Code	Service
MAN01	Material requirements planning
MAN02	Master production schedule
MAN03	Shop floor control
MAN04	Purchasing management
MAN05	Product data management
MAN06	Bill of materials
MAN07	Manufacturing process management
MAN08	Product life-cycle management
MAN09	Computer-aided manufacturing
MAN10	Total production optimization
MAN11	Capacity requirements planning
MAN12	Demand driven planning

4.1.10.2 Supply Chain Management

The Supply Chain Management (SCM) functional area is specific mainly for Manufacturing (C) and Transportation and storage (H) industries. Similarly as with the manufacturing, this does not exclude other industries for potential utilization of this functional area or its parts.

Although much of the research on SCM happen to be in the field of logistics, its role in the information systems research has been also widely discussed. Essential is its focus on supporting various stages and positions in the so called supply chain. A most precise definition of supply chain is provided by Christopher [31] who defines it as a 'network of organizations that are involved, through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hand of the ultimate consumer.'

Interestingly, as Christopher [30] also argues in his recent book the SCM should be better termed 'demand chain management' since the chain should be driven by the market, not by suppliers.

Modern supply chains as we may observe have mostly forms of a network rather than a linear chain. The reason is that as noted by Christopher [30] 'there will normally be multiple suppliers and, indeed, suppliers to suppliers.'. This involves multiple branching on various parts of the chain and therefore facilitates a multifaceted network.

The assumptions about the demand aspect of supply chain is also indirectly coined in the definition by Gartner [70], where they present that 'SCM refers to the processes of creating and fulfilling demands for goods and services. It encompasses a trading partner community engaged in the common goal of satisfying end customers.'

More precisely is the functional area defined by Møller [131] who focuses more on the IS aspect of the term. He utilizes a view that 'the Supply Chain Management systems support the planning and production of goods. For instance, they provide information such as where the product is to be produced, the procurement of parts and delivery schedules.'

The functional area as we see it after analysing the market can be divided into several parts. The essential part is the manufacturing and supply planning.

Other functions encompass various areas mentioned in the definitions. Special emphasis is then put on various approaches to the supply chain management as discussed in the literature. These are: CPFR, CRP, ECR, VMI, and Kanban. The reason to cover these approaches separately is that these systems demand different management styles and many services provide only limited number of these methods.

Table 4.12: Supply Chain Management services. [author]

Supply Chain Management	
Code	Service
SCM01	Manufacturing and supply planning
SCM02	Supply chain modelling
SCM03	Supply chain optimization
SCM04	Electronic Data Interchange
SCM05	Management according to Collaborative Planning, Forecast and Replenishment
SCM06	Management according to Continuous Replenishment Planning
SCM07	Management according to Efficient Consumer Response
SCM08	Management according to Vendor Managed Inventory
SCM09	Kanban system

4.1.10.3 Computer Aided Software Engineering

The functional area Computer Aided Software Engineering (CASE) is typical for organizations dealing with in-house development of informations systems. This is typical but not exclusive to the Information and communication industry (J).

Gartner [70] defines CASE as 'an umbrella term for a collection of application development tools designed to increase programmer productivity.' The included functions cover various types of services that can be divided into three groups: modelling, automatic generation, and archiving.

The modelling encompasses various models ranging from class diagrams to more complex enterprise architectures. Special type is then the meta-CASE service function that allows definition of organization's own modelling method.

Organizations can utilize the automatic generation function in order to generate programming code, databases and their structures, and documentation (which links to the next industry-specific function which is the Development). Special case of automatic generation is the reverse engineering. According to Chikofsky and Cross [29] 'Reverse engineering is the process of analysing a subject system to identify the system's components and their interrelationships and create representations of the system in another form or at a higher level of abstraction.' In our case, the reverse engineering function assists in re-creation of models on the basis of programming code.

The archiving function in the CASE functional area then covers archiving to a repository.

Table 4.13: Computer Aided Software Engineering services. [author]

Computer Aided Software Engineering	
Code	Service
CAS01	Class diagram modelling
CAS02	Object diagram modelling
CAS03	Composite structure diagram modelling
CAS04	Deployment diagram modelling
CAS05	Package diagram modelling
CAS06	Profile diagram modelling
CAS07	Use Case diagram modelling
CAS08	Data Flow diagram modelling
CAS09	Component diagram modelling
CAS10	Business Process Modelling
CAS11	Service Modelling
CAS12	Enterprise Architecture Modelling
CAS13	Custom diagram modelling
CAS14	meta-CASE
CAS15	Code generation
CAS16	Database generation
CAS17	Reverse engineering
CAS18	Documentation generation

4.1.10.4 Software Development

This functional area is typical to the Information and communication industry (J), mainly for the organizations developing their own services, systems, or applications. Its main aim is to assist with this process, and therefore covers a variety of functions needed.

On the market, we have identified a variety of services, whose functionalities can be summed up to the following functions: programming, bug-tracking, revision control, application testing, and database management.

Programming, Bug-tracking, and application testing functions ensure the essential environment for developing and compiling, and basically follow the elementary programming process. Application testing is focused on a range of test-based approaches to software development. Whereas the revision control allows tracking version history and allows code roll-backing.

Repository archiving is a separate case and can be described as remote storage and management of the code using repositories such as GitHub, Bitbucket, or Launchpad.

This functional area is specific in a way that its functionality requirements also depend on supported programming languages. An organization have to therefore consider this aspect when selecting services for the comparison.

Table 4.14: Software Development services. [author]

Software Development	
Code	Service
DEV01	Programming
DEV02	Bug-tracking
DEV03	Revision control
DEV04	Application testing
DEV05	Repository archiving

4.1.11 Section summary

Within this section, we discussed historical approaches to business functions. Based on the examination of current ICT service markets, we presented a coherent view on enterprise functions classification. Moreover, we placed an outline for industry-specific solutions, while defining some of the most prominent industry-specific functional areas. In the end we also outlined other services that might be described as small services with specific functionality.

The classification serves as a basis for the SOURCER framework. Namely for the function view on decision-making about outsourcing.[98]

Hypothesis that we form for our research regarding the function view is that:

H_{CF1}: High service functionality coverage is likely to have positive impact on perceived IT outsourcing success.

In the SOURCER framework, we distinguish between functionality and critical functionality. Utilizing the critical functionality in our approach, the organization can define which functions are most important for business operations or strategy, and can therefore get more diversified set of suitable ICT services options.

The final decision can then be based either on functionality, only on critical functionality coverage, or their combination. This depends on the organizational strategic intentions.

[98] Which is utilized in the Tear-drop model included in the SOURCER framwork.

4.2 Costs of ICT Services

According to the functionality requirements the organization has to calculate costs relating to the considered alternatives. In this section, we discuss various pricing models available on the ICT service market and further extend the discussion onto the financial metrics and their possible use when deciding about IT outsourcing. From the financial viewpoint are the considered IT outsourcing alternatives regarded simply as investment alternatives. Their specific IT nature then influences the financial decision-making exclusively from the inside through the particular calculations.

Pricing models help the organization with distinguishing ICT service price and its various parts, which in the end influence the financial view. We also specify general costs and gains related to IT outsourcing. Subsequently, financial metrics and their examination then serve as a guidance for financial decision-making focusing more on significance of information provided[99] and impact of these metrics on business operations.

Hypothesis for our research regarding the costs view is that:

H_{CC1}: Favourable financial metrics are likely to have positive impact on perceived IT outsourcing success.

4.2.1 ICT service pricing models

ICT services on the market currently have various pricing models, which could significantly differ. When comparing these services it might be complicated to tell, which service is more and which is less expensive. This might bring unwanted confusion to the decision-making process. Therefore, a precise knowledge about these models is important for correct estimation of the overall service price, and for calculation within the various financial metrics discussed further in this chapter.

Thanks to the fact that the ICT services are provided over the Internet they generally share many attributes with e-business applications. In contrary, their pricing models highly differ due to the business-orientation of ICT services on which we focus within this thesis. Therefore, it might be useful to sum up possible pricing models for ICT services in our specified context and use this classification in our research.

As mentioned in the NIST definition [127] in case of the Cloud Computing services the computing capabilities are provided on-demand. However, there is a prevalent belief that the Software-as-a-Service concept is at the same time built on the utility pricing model. In some cases this is true, but in most of the cases there exists a combination of various pricing approaches. These approaches have their pros and cons, which we sum up in this section.

[99] Which depend on organizational output expectations.

On the current market we may identify the following possible pricing models: subscription model, on-demand model, set-up fee model, tier-based model, freemium model, and hybrid model.

In this section we describe the models in more detail. Also, we present an evaluation of these models for better orientation on Table 4.15.

Subscription model is a pricing model where the customer pays a fixed fee for a specified time when the service should be provided. During the time specified in his contract he can use the service without any restrictions.
Example: 1000 EUR per month for an unlimited use of the service.

Pay-as-you-go model stands for an approach when the customer pays only for the amount of service that was actually consumed. This could be either an amount of data transferred, number of transactions[100], or time when the service was directly consumed.
Example: 0.0062 USD per successful transaction.

Set-up fee model is an approach when the customer pays a one time fee for registration. This fee might be fixed for all customers, or might have a flexible part which is based on the level of services demanded by the particular customer. This flexible part might be formed by extent of service, functions, number of users, and other attributes. This model is used almost exclusively in combination with other pricing models so its pros and cons are relative.
Example: Set-up fee 200 EUR per user, with restriction to minimal amount paid 600 EUR. Fee covers unlimited access to the service.

Tier-based model is a model where the customer has multiple options of service-tiers. These tiers differ in various attributes such as maximal number of users, invoices, or individual customers per month, transactions per month, or a maximal amount of data transferred in a specified period.[101] A customer uses the service at the chosen service-tier, whereas after overcoming the limit the service gets delayed or additional individual fees are applied. Other option is that the customer signs up for a service-tier, but the actual service level depends on reaching the limits specified for the particular level. Such customer is usually transferred into the higher service-tier and charged accordingly.
Example: Gold tier priced at 50 USD per month for up to 20000 transactions, 200 users, 5TB data transferred. Silver tier priced at 30 USD per month for up to 10000 transactions, 50 users, 2TB data transferred. Blue tier priced at 10 USD per month for up to 3000 transactions, 20 users, 500GB data transferred.

Freemium model is an approach when basic level of the service is provided for free. This level has limited functionality or may have tight restrictions on service use or service-levels. The customer has an option to buy premium services on top of the basic offering. These

[100] Pay-per-transaction variation of the model.
[101] Apart from the different attributes, the tiers might also differ in service level targets offered.

payments might be of fixed amount or flexible. This model operates with an assumption that the basic level is unusable for most of the organizations in the long-term perspective. On the other hand it provides potential premium customers a preview of the service quality. Example: Basic service free of charge that includes up to 200 transaction per month, 1 user, 100GB data transferred, limited functionality. Premium service priced at 700 EUR per month, with unlimited transactions, data and users.

Free service might have other means of financing. This might be based on commercial data-sharing, or advertisements. Customers have to be aware that in some cases the service-levels might not be enforceable. Also, displaying ads might distract employees from using the service efficiently. Another issue in case of commercial data-sharing and use by the provider, might be other limitations in terms of existing legislative boundaries.
Example: Service is free of charge. Clickable banner-style ads are displayed to users at the bottom of the service dashboard.

Hybrid model is an approach where a provider uses a combination of the above-mentioned models. The combinations may be various with one of the models as prevailing or more balanced with approximately equal share of the combined models.
Example might be a combination of tier-based and freemium models: Basic service is free of charge with option to upgrade to gold, silver or blue tier.

Table 4.15: ICT service pricing models. [author]

Pricing model	Evaluation of the model	Other information
Subscription model	+ Clear information about the final price. + Exclusion of hidden price increases. – Even in case of low frequency in using the service the customer still pays the full subscription.	None
Pay-as-you-go model	+ Transparent accounting of the service cost. – In case of incorrect prediction of service consumption the total cost of the service can get higher than expected .	There is a risk that services billed would not reflect amount of services consumed.
Set-up fee model	+ Clear information about the final price. + Exclusion of hidden price increases. – Set-up fee is usually high. This can become an issue when the service is used in amount lower than was initially expected. – In case where this model is used exclusively there is a risk that the provider will not be capable to provide the service in the demanded quality. We have to point out that exclusive use of this model is rather unusual for this type of services.	The model in its purest form is reasonable for the provider only in situation where there is enough intake of new contracts that cover the running cost for the whole service. As mentioned before, this model tends to appear in combination with other models (in form of a hybrid pricing model).
Tier-based model	+ In case of utilizing the whole limit assigned to the particular tier, it can be much cheaper than other alternatives. – Not utilizing the whole limit may result in worse price than with other alternatives.	None
Freemium model	+ Basic version of the service is free of charge. This can be beneficial if the customer just uses the service occasionally. + Ability to try the service before buying the premium service add-on. – Basic service in most cases does not offer a robust solution. – Non-enforceable Service Level Agreement.	None
Free model	+ Service is provided free of charge. – Non-enforceable Service Level Agreement. – Presence of advertisements (in case of ad-based model).	Revenue of the provider might be ad-based, whereas the ads might be a distraction for service users. Also there is a risk that the provider will use the data added by customers for its advertising and commercial needs.
Hybrid model	+ Offers advantages of particular models that are combined. – Complicated 'decyphering' of total service price by the customer organization.	None

4.2.2 Costs and gains related to ICT services

In this section, we describe various types of costs and gains related to ICT services and their outsourcing.

4.2.2.1 Costs related to ICT service life-cycle

The actual costs of individual IT outsourcing options can be identified emphasizing the life-cycle principle of an ICT service. From this viewpoint we may see the following cost areas as the most relevant: costs associated with search for the service, with service acquisition, with the service contract, with service implementation and the actual change, with service use, and with retirement of the service.

Reason why this view is presented in this section is that this overview of costs may help organization to identify costs used within the various metrics discussed in following sections.

Related to *Search* for the service are: cost of up-front evaluation study, cost of up-front proof of concept implementation.

Acquisition of the service (service purchase) encompasses the following: cost of service[102], cost of customisation to meet the business needs, and cost of integration (to current platform).

Cost of service contract in a sense that the contract itself may cause costs, where these may be namely: cost of actual contract creation[103], cost of contract evaluation[104], cost of legal advisory.[105]

Implementation and change related costs are as follows: cost of migration (data and users), cost of training, cost of business processes changes[106], and opportunity cost[107]

Costs related to *Use* of the service are namely: cost of support services (in house), cost of support services (contracted), cost of maintenance and upgrades, service scaling costs (cost of change in user or transaction volumes), and contract maintenance costs.[108]

Costs related to *Retirement* of the service are as follows: exit costs (in relation to hardware, software, and data), and exit costs (in relation to changeover, re-training, and legal

[102] In most cases of external provision this will be the purchase price, subscription price, or the price specified within its pricing model as discussed in previous section. In case of a service provided internally, the cost of service consists of price of the IT resources, people, and other costs that are necessary for the service operation and sourcing.

[103] In a case the service is purely custom, provided in-house, or demands special conditions.

[104] In a sense of evaluation of business impact.

[105] Consultation with lawyers regarding the contract and its changes.

[106] These changes occur thanks to adopting best practice of the specific solution.

[107] For instance services that are going to be retired and their actual exit costs. These might also encompass the net book value of resources that are going to be excluded or sold.

[108] This might be for instance re-evaluation of the contract.

matters).[109]

Typical cost structure for SaaS (public cloud) and in-house solutions are described in Table 4.16. Organizations may use this table to indicate whether they need to calculate the separate costs or not.[110]

Table 4.16: Usual costs in case of SaaS and in-house solution service models. [author]

Cost	SaaS (public cloud)	In-house
Search		
Cost of up-front evaluation study	Yes	Yes
Cost of up-front proof of concept implementation	Yes	Yes
Acquisition of service		
Cost of service	Yes	Yes
Cost of customisation to meet the business needs	Sometimes	Yes
Cost of integration (to current platform)	Yes	Yes
Cost of service contract		
Cost of actual contract creation	No	Sometimes
Cost of contract evaluation	Yes	No
Cost of legal advisory	Yes	No
Implementation and change		
Cost of migration (data and users)	Yes	Yes
Cost of training	Yes	Yes
Cost of business processes changes	Yes	Yes
Opportunity cost	Yes	Yes
Use		
Cost of support services – in house	Sometimes	Yes
Cost of support services – contracted	Sometimes	Sometimes
Cost of maintenance and upgrades	No	Yes
Service scaling cost (for change in user or transaction volumes)	No	Yes
Contract maintenance cost	Sometimes	Yes
Retirement		
Exit cost (in relation to hardware and software)	No	Yes
Exit cost (in relation to changeover, re-training)	Yes	Yes

An organization has to be aware of the fact that there might appear other *unpredictable costs* throughout the contract duration. These are mainly *costs for possible damage* by unexpected service outage, malfunction of the service resulting that provided false information affecting important business decisions, or loss of important company data. In order to lower their effect, some of the providers specify fines in their contracts for situations where these issues

[109]Costs related to retirement are sometimes not included in calculation. Whether these costs are taken into consideration or not depends on availability of related information, and specific decision-making processes in each organization.

[110]While labels *yes* and *no* describe whether or not to include the cost in the calculation, the label *sometimes* means that the cost is included only *in some cases*.

occur. These costs from our viewpoint form a risk factor when calculating the benefits of the solution and as such are complicated to implement in the cost calculation.

The possibility of these outages has to be reduced by evaluating services on basis of the profile of the provider and service operation history. We implement the service quality safeguarding metric that considers this and has an overall impact on service quality evaluation.

4.2.2.2 Gains related to ICT service life-cycle

The quantification of gains associated with IT outsourcing itself is a complicated task. As pointed out by Lucas [118], the profits from IT investments are often not evident. Moreover, some things can not be assessed by ROI due to its structure and mainly financial nature. An example of this can be the non-financial benefits such as the increase of service quality associated with the investment. The situation gets even more complicated in a situation, where multiple projects take place at the same time, and where the organization has to separate effects caused by individual investment decisions.

Generally, we may identify the following financial benefits that can be regarded as gains of IT investment:

- *Revenue increase* as an effect of increased sales that occur thanks to non-financial gains. In such cases the outsourcing might have an indirect effect on higher sales within existing customers, or on gaining additional customers on the existing or a completely new market.
- *Cost reduction*, which might be for instance reduction in maintenance costs associated with the service.
- *Cost elimination* that might happen in case of choosing an external provider, thus reducing staff count thanks to elimination of related IT resources.
- *Capital expenditure reduction* that occur when choosing solution less demanding on fixed assets.
- *Capital expenditure elimination* when choosing the external provision that eliminates the need to invest into fixed assets.

Non-financial gains may be for instance: increase of service quality, business innovation, better integration of services, improved customer support, improved forecasting, better decision-making, improved data quality, or increased customer satisfaction.

It has to be emphasized that these non-financial gains might or might not have an indirect impact on financial benefits. The level of influence has to be assessed by the organization itself and the actual situation in which the outsourcing decision takes place.

4.2.3 Financial metrics

In this section, we discuss selected financial metrics that can be used for decision-making about IT outsourcing. These are namely:

- Return on Investment (ROI),
- Total Cost of Ownership (TCO),
- Net Present Value (NPV),
- Internal Rate of Return (IRR),
- Payback Period (PP),
- Economic Value Added (EVA),
- and Net Present Value + Real Options (NPV+RO).

4.2.3.1 Return on Investment

The Return on Investment (ROI) is an evergreen among financial metrics used in the IS/ICT practice. The metric itself has a very long history. It belongs to a family of metrics focusing on return rate (such as ROE, ROI, or ROA). Long tradition of this approach is represented by its early use in the literature at the beginning of the 20th century, particularly by Richardson [153] in 1912, although not named ROI that time.

Return on Investment is based on the consideration that the investment is subsequently reflected in the organizational profits. The metric itself indicates how much profit is brought to the organization per one single unit of currency spent within the investment. ROI shows how efficient is the organization at investing its assets in the long-term perspective. This measure is typical in the banking industry where it serves the banks for evaluation of its customer organizations.

We may outline the general Return on Investment calculation as follows:

$$ROI = \frac{P}{IN} \tag{4.1}$$

In this formula, the P stands for Profit associated with the investment, while the IN stands for Cost of the investment.

Nowadays, we may find number of approaches to ROI and its uses, which varies among organizations. Certain disadvantage is an inconsistent interpretation of the Profit in the formula. Although some authors such as Knapkova, Pavelkova, and Steker [103] recommend using the EBIT[111] measure, in our case this is not possible since we do not focus on the whole organizational performance, but rather aim on the effect of particular investment

[111] Earnings Before Interest and Taxes.

variants. Generally speaking the Profit in our case can be further defined by the following formula:

$$P = G - IN \tag{4.2}$$

In this formula, we get the Profit associated with the investment P after deducting Cost of the investment IN from Gains associated with the investment G. These possible costs associated with the investment and the related gains have been discussed earlier in this chapter.

Time frame aspect is very important for ROI calculation, since changes in time frame can make significant difference of the results and would render the whole metric not comparable and practically unusable.[112] Therefore it is needed to assure consistency when utilizing it in our approach. Most common is the time frame of three to five years, however, we may find ROI calculations for ten and more years in some cases.

Important thing to mention is that the basic ROI calculation for investments is not discounted and as such does not reflect the general time aspect of money. As mentioned by Jeffery [93], ROI is complicated to use because costs and benefits might not be consistent in the whole duration. This is especially valid in our case when dealing with IT outsourcing arrangements, where the subsequent maintenance fee might exceed the initial purchase cost, and where the benefits may also come in irregular intervals and various quantities.

Regarding the Return on Investment use we may sum up the essential principles as follows. From the selection of options under consideration, the investment with the highest ROI is deemed the most favourable from this viewpoint. In order to thoroughly decide on investment feasibility, as mentioned by Valach [193] it is suggested that the minimal investment return is at least the same as the profitability of organization as a whole. On the other hand, this approach might lead to a situation where organizations with high profitability rejects reasonable investments, and at the same time low profitability organizations accept investments that are mediocre at best.

4.2.3.2 Total Cost of Ownership

Total Cost of Ownership can be described as an approach to quantify all expenses associated with a particular investment variant. The concept in its current form was introduced in the 1987 by Gartner Inc., but was soon followed by several other TCO approaches introduced by various organizations. However, as mentioned by Ellram and Siferd [54] in the field of purchasing the issues related to total cost of a product were known long time before. For instance Harriman [81] discussed this topic already in 1928. Also, sometimes these concepts are being referred to as life cycle costing models.

[112] For instance, counting three years ROI for one investment and ten years ROI for another investment would prevent comparison of these investments.

Important thing to mention is that the Total Cost of Ownership is focused solely on the costs side of the investment and entirely neglects gains from the investment. This might be an issue with IT outsourcing decisions which are of a more strategic nature, and as such might demand more information apart the costs view.

Nowadays, there exist various concepts on how to calculate and use the TCO, namely the approach used by Garther Inc. as described by Mieritz and Kirwin [130], or the TCO calculation components presented by David, Schuff, and St. Louis [43].

Wouters, Anderson, and Wynstra [207] also point out the close ties of the TCO method to the Activity Based Costing (ABC) frequently used within the management accounting field. They argue that the TCO is a specific application of ABC method and further discuss the differences and variation of uses of these methods.

It has to be noted that the problem of TCO calculation is very broad and its use depends entirely on cost priorities of the organization. Moreover, the TCO is often considered as comparative advantage and a sort of trade secret of many consulting organizations. Finding a precise description is complicated. We therefore present the general description and further tailor the approach to the IT outsourcing problem.

As defined by Ellram [53] the term Total Cost of Ownership describes 'all costs associated with the acquisition, use, and maintenance of a good or service.' In our case the investment is formed around an ICT service. We may therefore present the formula usually used in this context:

$$TCO = C_{II} + C_O + C_M \tag{4.3}$$

In this general TCO formula the C_{II} stands for the Cost of Investment and Implementation, the C_O are the Operational Costs and the C_M are the Maintenance Costs.

The approaches used in practice often go to a greater detail. For instance David, Schuff, and St. Louis [43] propose the following TCO structure consisting of three cost categories further divided into thirteen cost factors: Acquisition costs (hardware, software), Control costs (centralisation, standardisation), and Operations costs (support, evaluation, installation/upgrade, training, downtime, futz, auditing, virus, power consumption).

From our viewpoint regarding the IT outsourcing, the following costs are necessary to be taken into account in the TCO calculation:

- *Cost of excess capacity of resources*, which relate to the opportunity costs.
- *Integration costs* meaning the costs associated with integrating the service in the demanded extent into organizational IT.
- *Future service innovation costs* that describe costs necessary to establish required level of innovation, and which relate to the maintenance and upgrades cost.

- *Labour costs related to service maintenance*, which are mainly the costs needed to maintain the service up to date and usable that relate as well to the maintenance and upgrades.
- *Costs of potential future service sourcing changes* focusing mainly on costs associated with the vendor lock-in in the particular outsourcing variant and its quantification when deciding to change ICT service provider. These costs are generally the exit costs.

Integration costs relate to the C_{II} part of the formula, whereas *Future service innovation costs* and *Labour costs related to service maintenance* relate to the C_M.

Cost of excess capacity of resources (C_{ECR}) can be then described as cost of maintaining resources that are partially freed up when outsourcing the service to another provider. Such resources can not be simply removed from the organization, because they are partially used by other services. In case these resources are not scalable, the organization has to pay for the operations and maintenance of these resources as a whole. Therefore, such resources form another indirect cost of the IT outsourcing-related investment. Another slightly different case might occur when freeing up a resource that has been recently acquired and its removal would therefore make the resource investment inefficient. These intangible costs have to be calculated in the TCO formula as well. Ideally, in case of outsourcing an ICT service, should the organization restructure its resources and remodel their utilization by ICT services in a way that the resources made available might be re-used for a different service.

Costs of potential future service sourcing changes (C_{CH}) relates to the vendor lock-in within the particular outsourcing variant and costs. The lock-in depends on future operative flexibility associated with this variant and the associated costs to overcome a certain extent of possible inflexibility. This inflexibility may be characterized by a number of requirements, such as a proprietary data structures used by the provider, mandatory integration with certain systems, compliance with standards, or transferring part of the system entirely to the provider. This may lead to losing own expertise in the area and thus limit future options to use other solutions on the market.

In case of IT outsourcing the C_{ECR} and C_{CH} could be either included in the previously mentioned general approach, or they may form a separate additional parts of the formula as follows:

$$TCO_{ITO} = C_{II} + C_O + C_M + C_{ECR} + C_{CH} \tag{4.4}$$

This separation helps getting a more structured overview of costs associated with the ICT service. However, as emphasized earlier, choosing the exact form of TCO calculation depends completely on the preferences of the particular organization. These preferences are most typically led by the requirements set by the financial department within the organization.

4.2.3.3 Net Present Value

Net Present Value (NPV) is formed by the difference between expected profits discounted to the present value and estimated investments. Although there exist multiple ways to calculate NPV, we may utilize the following formula.

$$NPV = \sum_{t=1}^{T} C_t \frac{1}{(1+r)^t} - C_0 \tag{4.5}$$

In this formula, the C_0 stands for the initial investment, whereas the $C_1 \dots C_t$ stand for the expected cash flows of investment. The r is the discount rate, and t depicts the time periods predicted for the investment.

The calculation itself takes into account all incomes and expenses that occur in time. Estimated investments mainly include the initial investments, but also additional expenses throughout the expected life of the investment. This fact makes the NPV suitable for various investment structures.

As mentioned above, the metric itself utilizes the view of incomes and expenses in their present value at the time of calculation. In case of additional expenses throughout the years following initial investment, it is necessary to discount these expenses to their current values.

Brealey and Myers [17] point out that in order to calculate the NPV the organization has to 'discount expected cash flows by the rate of return offered by equivalent investment alternatives in the capital market.' The mentioned rate of return is in the accounting literature often referred as the discount rate, hurdle rate, or sometimes also opportunity cost of capital, which are separately used depending on the context solved by the particular publication. In our case, we use the discount rate in order to emphasize the nature of the process of discounting future spendings and incomes.

Discount rate can be calculated as a risk-free interest rate increased by a premium for the risk the organization undertakes when accepting the investment. As of the discount rate, in case the organization wants to take into account the differences in methods of financing we can also use the *Weighted Average Cost of Capital (WACC)*. This way both cost of equity and cost of debt are reflected within the calculation. Another option is to use current level of *Return of Equity (ROE)*, which reduces the risk of accepting an investment that would impair attained profitability of equity. Overall, the Net Present Value is significantly influenced by the amount of the discount parameter, which can be for instance an amount of required profitability rate for the selected investment.

For the actual investment decision while utilizing the NPV it is essential to estimate the calculations of expected cash flows realistically as mentioned by Valach [193]. The Net Present Value itself as pointed out by Brealey and Myers [17] presents the net contribution

of the investment to the shareholders' wealth. The organization should therefore realize those investments that have positive Net Present Value.

The Net Present Value is an absolute value, which can be obtained by the organization through selection and realization of the particular investment. In its calculation, it takes into account the factor of time, and the differences among methods of financing. Important aspect is that it is based on the cash flow measures during the whole lifetime of the investment.

4.2.3.4 Internal Rate of Return

Internal Rate of Return (IRR) is a metric that measures the expected return of invested resources related to the particular investment.

Brigham and Houston [18] point out an important aspect of the Net Present Value and Internal Rate of Return relation: 'A project's IRR is the discount rate that forces the NPV of the inflows to equal the cost. This is equivalent to forcing the NPV to equal zero.'

The calculation of Internal Rate of Return is more difficult than of the Net Present Value. Therefore, as emphasized by Valach [193] and Kislingerova [100] it is suggested to use the linear extrapolation as described in the following equation:

$$IRR = i_l + \frac{NPV_l}{NPV_l - NPV_h} * (i_h - i_l) \tag{4.6}$$

The i_l stands for lower discount rate, whereas the i_h stands for higher discount rate. The NPV_l then depicts NPV of the investment when using lower discount rate, and respectively the NPV_h depicts NPV using the higher discount rate. It is important to keep the NPV in its absolute form throughout the calculation.[113]

The metric itself reflects the real profitability of the particular investment, and at the same time it sets the highest possible discount rate burden. The actual level of IRR alone does not offer any information about whether the investment is acceptable or not. However, this can be changed using it in comparison with the required investment efficiency, which can be estimated with the Weighted Average Cost of Capital (WACC) metric. Therefore, when deciding about IT outsourcing variants an organization has to utilize the IRR and WACC comparison, which in the end provides a usable relative measure of investment efficiency. When the $IRR > WACC$ we can consider the investment acceptable and proceed to further comparison of multiple options according to the IRR value.

The IRR itself is not practical when used for evaluation of investments with non-conventional cash flow. This type of cash flow can be described by the situation, where there exist more than one change of cash flow direction during the whole investment life-cycle. As supported by Valach [193], such situation might be an investment where apart from the beginning

[113] We emphasize this especially due to the form of the the i_l and i_h variables, which might in the end confuse users of the IRR metric.

major spendings take place at the end of the life-cycle, and where these cash flows occur inconsistently with several changes between negative and positive cash flow. Reason for this is that in case of non-conventional cash flow, there exist multiple IRR for one particular investment.

Use of Internal Rate of Return is limited when applied on the mutually exclusive investments, and also when applied on group of investments that differ in time-distribution of incomes and expenses. Valach [193] also mentions that in case of mutually exclusive investments the IRR results are mostly giving incorrect solutions. Therefore, in such cases it is more appropriate to use other metrics presented in this chapter.

Overall, the Internal Rate of Return is a measure that might be useful for some investment decisions. However, its use is not very suitable in some specific situations as we mentioned above in this section. In our case of IT outsourcing the results should be interpreted in context of other measures such as the WACC in order to ensure feasibility of the investment.

4.2.3.5 Payback Period

Payback Period (PP) is a metric that measures the time to cover initial expenses within the investment. In our case this relates to initial investment to particular IT outsourcing solution.

According to Renkema and Berghout [151] the Payback Period is 'the period between the moment that the IS investment is made and the moment that the total sum of the investment is recovered through the incoming cash flows.' During the decision-making, this period is then compared with the time expected for investment payback. Investments whose payback periods are better than expectations can be considered acceptable. However, the organization might use these period to further compare options between each other.

As mentioned by Valach [193], the expected period highly differs between industries. Commonly in case of industries with high innovation dynamics this period tends to be shorter (3 – 4 years), whereas in case of industries and areas with long innovation cycle this period tends to be longer (8 – 10 years). From our viewpoint, we might also expect differences according to the ICT service functional area. The decision about the expected time for investment payback is to be decided entirely by the organization according to its financial needs and therefore there is no universally applicable rule on how to set this requirement.

General formula for Payback Period calculation is as follows:

$$PP = \frac{I}{CF} \tag{4.7}$$

In this formula, the I stands for Initial investment (capital expenditures), whereas the CF means Cash inflow per period.

It is important to emphasize the fact that the Payback Period is not a measure of efficiency, and rather represents a measure of liquidity. Disadvantage of the PP metric is that it ignores all incomes that might occur after the payback period itself.

When used within decision-making process, Payback Period favours investments with short financial payback. This leads to a general tendency with PP metric, where organizations accept short-term investments and reject investments that are long-term. For IT outsourcing decisions, this can be considered an issue since these decisions tend to be on the long-term side.

The Payback Period itself is easy to comprehend and generally straightforward, which adds to its overall easiness of use. When used alone, it is not very reliable criterion and as such has to be used in combination with other financial metrics focusing on investment evaluation.

4.2.3.6 Economic Value Added

The Economic Value Added (EVA) metric aims on the measurement of *value creation*. Apart from traditional metrics such as ROE or ROA there is an increasing trend in the performance management field, which utilize measurement of the value that the organization delivers. The traditional metrics usually focus on financial or accounting information. Unlike them the EVA combines market, economic and financial information.

Drucker [48] further discusses foundations of the Economic Value Added measure, where he points out its relation to organizational profits. He emphasizes that '*EVA is based upon something we have known for a long time: What we call profits, the money left to service equity, is usually not profit at all. Until a business returns a profit that is greater than its cost of capital, it operates at a loss. Never mind that it pays taxes as if it had a genuine profit. The enterprise still returns less to the economy than it devours in resources…Until then it does not create wealth; it destroys it.*'

Shared belief nowadays is that the delivered value is the real economic profit that the organization generates. Therefore lot of the managers started to utilize EVA for the financial performance evaluation. The managers utilize EVA for project evaluation in order to asses the added value for the organization. Projects that do not meet certain level of added value are not implemented.

$$EVA = NOPAT - (WACC * C) \tag{4.8}$$

EVA shows the difference between net profit coming from enterprise operation reduced by the value of related long-term capital expenditures.

Result $EVA > 0$ may be generally considered as a successful project. In this case the added value exceeds the value of capital expenditures, and therefore there is an additional value gathered by the organization.

Result $EVA < 0$ may indicate a reduction of overall value for the owner (or shareholders).

We may further discuss parts of the EVA equation. For the calculation itself we need to determine three separate parts: Capital (C), Net Operating Profit After Taxes ($NOPAT$), and Weighted Average Cost of Capital ($WACC$).

Stewart [179] defines Capital (C) in the EVA as total assets after deduction of non-interest bearing liabilities in the particular accounting period. To better asses the position of the Capital within this measure, we may use interpretation by Synek [183], which adds that it can be understood as Net Operating Assets (NOA). The mentioned Net Operating Assets can be further defined as the value invested into assets that are necessary for business operations. Therefore, we may utilize the following equation.

$$C = NOA \tag{4.9}$$

Net Operating Profit After Taxes ($NOPAT$) consists of total Earnings Before Interest and Taxes ($EBIT$) and Taxes (T), whereas the calculation is as follows:

$$NOPAT = EBIT * (1 - T) \tag{4.10}$$

The guiding principle for $NOPAT$ determination is to achieve symmetry between NOA and $NOPAT$. As mentioned by Kislingerova [101], it is necessary that the same operations included in the NOA calculation are also included in the calculation of $NOPAT$ and vice versa. More precisely, during the $NOPAT$ calculation the organization has to take into account only the costs and revenues produced by the NOA.

Important aspect affecting the actual amount of Economic Value Added is the average cost of capital Weighted Average Cost of Capital ($WACC$). There exist various approaches covering the WACC calculation, traditional model and gradually constructed rating model. The latter is built on a method utilizing gradually constructed surcharges that are calculated for each specific business risk.[114] Problem of this approach is that it does not reflect internal structure of the capital. The former, described here as the traditional model reflects this structure and is therefore more suitable considering our aims.

The Weighted Average Cost of Capital in the traditional model includes the amount of capital related to the business operations and its internal structure. This structure is generally speaking the shareholder capital and debt capital. The $WACC$ itself describes the price needed to be paid for use of the resources. To be more specific, it is the average price that the organization pays for creation of a financial liability mix.

[114] This method is used by the Ministry of Industry and Trade of the Czech Republic.

Regarding this measure, we may utilize the following formula:[115]

$$WACC = r_e * \frac{E}{C} + r_d * (1 - T) * \frac{D}{C} \tag{4.11}$$

Where the D stands for Debt bearing interest, E is the Equity, C stands for Capital[116], and T means the Tax[117]. Apart from that, we also use the r_d that is the Return on Debt, and r_e that stands for Return on Equity.

Most commonly, in cases where the Debt bearing interest encompasses a form of a credit, the Return on Debt (r_d) is the interest rate related to this credit involved in the calculation.

Return on Equity (r_e) can be determined using various models, such as Dividend Capitalization Model (DCM), Capital Asset Pricing Model (CAPM), or Market Derived Capital Asset Pricing Model (MCPM). Its results are always of subjective nature. The latter model, MCPM originally introduced by McNulty et al. [126], is a relatively new approach that uses options-pricing. Although the initial academic responses are rather positive, a significant risk associated with its use is that due to its short history, possible negative influences are not entirely documented. Also, its use among practitioners is limited. On the contrary, the former two approaches (DCM and CAPM) are most widely used in practice. The downside of Dividend Capitalization Model is that it requires the organization to pay dividends in order to be properly calculated. While not many organizations are able to do so, we incline to use the Capital Asset Pricing Model. Formula we use is the following:

$$r_e = r_f + \beta_s * (r_m - r_f) \tag{4.12}$$

The CAPM calculation of Return on Equity is based on the risk-free rate of return r_f increased by the premium expected for risk $\beta_s * (r_m - r_f)$. The premium determination is generally considered the hardest part of the whole WACC formula. This is mainly because the required information suggested as a base for calculation of Return on Equity are available only on developed stock markets.[118] It consists of the sensitivity to market risk B_s, the expected risk-free return in this market r_f, and the historical return of the equity market r_m.

Particular values used in the calculation can be either estimated by the organization, or adapted from the existing research. In our case, we may suggest utilizing the measurements database published periodically by Prof. Aswath Damodaran from Stern School of

[115] This formula is also suggested by Valach [193].

[116] As mentioned earlier in this section, the Capital (C) can be further extended by the formula $NOA = C = D + E$.

[117] Tax rate on corporate income.

[118] This is relevant especially for the *sensitivity to market risk*, and the *historical return of the equity market*.

Business at New York University.[119] This database offers current data across various countries and industries. Utilizing these data may greatly help with using the Economic Value Added metric, as well as with other metrics used in the investment decision-making.

Weighted Average Cost of Capital is further influenced by several aspects, such as the business risks, current level of interest rates, investors' expectations, or volatility of income. As we mentioned earlier, its results mainly in the Return on Equity part are rather subjective.

The key principle behind the WACC is that it has to reflect not only the expected return for owners and creditors, but also the amount of risk taken for the particular investment variant.

Overall, Economic Value Added is a concept that is based on value creation for shareholders, and which is highly comprehensive for managers as pointed out by Drucker [48]. Thanks to this fact it is widely used in organizations around the world. As apparent from the current research such as by Drury [50], the EVA is used frequently in the United States, where the organizations are traditionally focused more on value maximisation rather than revenue maximisation.

4.2.3.7 Net Present Value + Real Options

From our viewpoint, for decision-making about IT outsourcing, it might be interesting to utilize an approach based on real options concept. Considering our aims, such approach might be constructed combining Net Present Value with Real Options.

Real Options come with an idea to build-in the aspect of flexibility into investment decisions. Flexibility might be defined as an ability to adjust to changes that happen over time in the business environment. Existence of flexibility and its further evaluation adds overall value to the particular investment for the organization.

Our approach is based on the assumption that the value of this flexibility might be used in conjunction with the Net Present Value (NPV) described earlier in this chapter. In our case we might present the following formula, where the V_{IN} describes the Value of Investment, and the Value of flexibility (real option V_{COE}[120]):

$$V_I = NPV + V_{COE} \tag{4.13}$$

We refer to this further as to the *Net Present Value + Real Options* (NPV+RO) approach.

As mentioned by Scholleova [162], Real Options approach includes the value of rights to make investment-related changes during the whole life-cycle of the investment. Their main potential is in case of investment decisions with high degree of uncertainty, where this uncertainty relates to the future events, and also development or changes in the business environment.

[119] For current values please see http://pages.stern.nyu.edu/~adamodar/.

[120] As described further in this section, this formula describes the Call Option value which we suggest for our aims.

The problem of Real Options is very wide and therefore complicated to assess completely within this thesis. However, outlining its main characteristics might be helpful for its potential use within the framework.

Important principle is that the Real Option itself is a right, but not an obligation to execute defined future decisions regarding real assets. Real Options are based on a consideration that establishing certain flexibility enables opportunity to utilize this flexibility in the future. They are created as either *call options* (right to buy) or *put options* (right to sell).

Valuation of the real option is obtained using one of the two available models as mentioned by Scholleova [162]. These are the Black-Scholes model, or binomial options pricing model (BOPM). We suggest using the BOPM, while it is frequently used in practice and its results are easier to interpret.

For calculating the real option value, it is necessary to determine the following:

- *Spot price* (S), which is based on estimation of future cash flow established by the investment.
- *Strike price* (X) that can be described as a spending during the investment project initiation or expansion.
- *Volatility of the underlying asset* that is the volatility of the expected future cash flows described as variance σ^2 or standard deviation σ.
- *Risk-free interest rate* (r), which is derived from government bonds.
- *Time to maturity* (T) described as the time period during which the organization might exercise the option.

In our case, an organization might mainly utilize the call option, which is focused on the right to buy. The Binomial Option Pricing Model as described by Scholleova [162] anticipates that the price of the underlying asset evolves discretely and its useful life can be decomposed into a finite number of periods. Within these periods, the price of the underlying assets is increasing (u) with a probability (p) or it is decreasing (d) with probability $(1-p)$.

The formula for calculating basic Value of Call Option (V_{CO}) is the following:

$$V_{CO} = p * max[u * (S - X), 0] + (1 - p) * max[d * (S - X), 0] \tag{4.14}$$

Furthermore, we can extend this calculation by adding the present value aspect and multiple periods (n) while using the variables defined above:

$$V_{COE} = \frac{1}{1+r} * \sum_{i=0}^{n} \frac{n!}{i! * (n-i)!} * p^i * (1-p)^{n-i} * max(S * u^i * d^{n-1} - X, 0) \tag{4.15}$$

For determining the increasing coefficient (u) we have to use the volatility of the underlying asset and time to maturity:

$$u = e^{\sigma\sqrt{\frac{T}{n}}} \tag{4.16}$$

Likewise for determining the decreasing coefficient (d) we have to use the same variables with slightly different arrangement:

$$d = e^{-\sigma\sqrt{\frac{T}{n}}} \tag{4.17}$$

Real options typology may be further differentiated into various option types. The most appropriate for our aims seems to be the approach by Fichman, Keil, and Tiwana [64], who distinguish six types of real options: Stage, Abandon, Defer, Strategic Growth, Change Scale, and Switch. Further analysis of these types and their impact on the IT field is then provided by Tiwana, Keil, and Fichman [187]. In the following Table 4.17 we present the relation of these six types to the general option forms outlined earlier in this section. This may help organizations with identification of the real option approach to be used within this metric.

Table 4.17: Typology of real options. [64]

Option type	General option form
Stage	Compound (call option bounded to another call option)
Abandon	Put option
Defer	Call option
Strategic Growth	Call option or compound
Change Scale	Call option or put option
Switch	Call option and put option

Further description of these option types is provided on Figure G.1, which summarizes the view of Fichman, Keil, and Tiwana [64].

The Real Options approach to investment decisions is a relatively new concept. Given its background, its strengths stand out especially in case of areas with high dynamics, and with capital-intensive investments. As such, the decision-making about investments into IT is from our viewpoint ideal for its application. Using this approach the organization adds flexibility aspect to its investment decision, while reflecting on the possible scenarios in future development.

4.2.4 Section summary

Main information included in this section is that there exist a number of financial methods that can be used to evaluate IT outsourcing variants. These methods are available to be

used within the SOURCER framework, and their use depends highly on preference of the organization. This preference might be driven by available information, required outcomes, organizational regulations, legal requirements, skills of the particular manager using the framework, or his individual preferences.

Therefore, we presented a selection of methods that can be considered the most appropriate for our aims. We also further discussed and analysed these methods individually regarding their use in the framework including the particular formulas used for their calculation. In order to make these calculations easier, we summed up the existing ICT service pricing models.

Most importantly, when utilizing various financial metrics it is necessary to take into account their specific characteristics and provided outcomes to meet organizational expectations. Consequently, the set of financial metrics used in the organization might vary from only one single financial metric that might be deemed the most important to a set of metrics that complement to the overall financial view of various IT outsourcing variants.

On Table 4.18 we present the mentioned characteristics that distinguish selected metrics from each other. These characteristics used for comparison are: type of the metric (whether it is traditional, value-based or specific), denomination (whether the information provided is in absolute numbers or percentage), whether it considers cost of debt and cost of equity, basis of calculation (whether it is based on cash flow or accounting), and its overall difficulty of calculation.

Table 4.18: Comparison of major financial metrics. [author]

Metric	Type	Denomination	Includes cost of debt	Includes cost of equity	Basis of calculation	Difficulty of calculation
NPV	Traditional	Currency	Yes	No	Cash flow	Low
IRR	Traditional	%	No	No	Cash flow	Medium
ROI	Traditional	%	Yes	No	Accounting	Low
PP	Traditional	Time period	No	No	Cash flow	Low
EVA	Value-based	Currency	Yes	Yes	Accounting	High
TCO	Traditional	Currency	No	No	Accounting	Medium
NPV+RO	Specific	Currency	Yes	No	Cash flow	High

Furthermore, on Table 4.19 we present the metrics together with the suggested outcome expectations. This information serves to organizations as an additional guidance for decision whether to include the particular financial metric into consideration or not.

In case of application in the Information Systems field, majority of financial metrics are not able to capture all benefits of non-financial character. This problem has been discussed numerous times in the academic and practitioner literature and is still not completely resolved.

Table 4.19: Major financial metrics and suggested outcome expectations. [author]

Metric	Suggested outcome expectations
NPV	Contribution of investment counted in present value.
IRR	Percentage based internal rate of return.
ROI	Percentage based rate of return.
PP	Liquidity of assets.
EVA	Value created for the shareholders.
TCO	Total costs related to the investment.
NPV+RO	Contribution of investment counted in present value while considering flexibility related to the investment.

Reflecting this situation, we separated the non-financial aspects in the framework utilizing other views on the decision-making process. As presented earlier in the thesis, these are mainly the service quality, implementation time, and functional view. Further analysis of the various service-quality aspects follows within the next section.

4.3 Quality of ICT Services

Service quality has been a hot research topic for several decades in the social science community. Generally accepted approach used within a range of disciplines has been SERVQUAL. This approach originally introduced by Parasuraman, Zeithaml, and Berry [143] has been also adopted in the research field of information systems and is still referred by some researchers as a golden standard of service quality. It consists of five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. These dimensions are used within comparison of organization expectations and performance. Therefore, a total number of ten dimensions is measured.

Although further refined by the same group of authors [142] it has been a topic of critical discussion by numerous other researchers such as Buttle [20], Asubonteng, McCleary, and Swan [7], Jiang, Klein, and Carr [95], Ladhari [110] or Tate and Evermann [184]. This discussion spanned across number of disciplines and the discussion is still going on.

Throughout this academic debate other similar concepts appeared, like the SERVPERF proposed by Cronin and Taylor [36]. The SERVPERF consists of the same dimensions as SERVQUAL. However, it utilizes only the performance dimensions while abandoning the expectations part, and therefore reduces the number of measurements by 50 %. Alternative to these models has been the Magal's model [121] which uses the service quality, quality of end product, and user self-efficiency to evaluate success of information centres. Although appreciated by some researchers such as by Landrum, Prybutok, and Zhang [111], much of its service quality measure is built around information center staff and therefore is not very usable in our case.

Another approaches to service quality are the E-S-QUAL[121] and E-RecS-Qual[122] proposed both in the same publication by Parasuraman, Zeithaml, and Malhotra [144]. These two new approaches focus on electronic services and their quality measures. The E-S-QUAL domains are: efficiency, fulfilment, system availability, and privacy. Whereas the E-RecS-Qual includes three domains: responsiveness, compensation, and contact. The difference between these approaches is that the latter focuses on service quality regarding handling service problems and inquiries, thus being typical only to customers who had non-routine encounters[123] with the particular electronic service. The E-S-QUAL then contains factors influencing quality regarding regular use of the service.

Similarly the WebQual model proposed by Loiacono, Watson, and Goodhue [115] focuses on services provided by electronic means, more concretely on website quality. It

[121] E-core service quality scale.

[122] E-recovery service quality scale.

[123] Meaning that these customers were not regular users of the service but rather used the service in response to some event.

Table 4.20: Comparison of major service quality models. [author]

Model	Author(s)	Year published	Domains
SERVQUAL	Parasuraman, Zeithaml, and Berry [143]	1988	Tangibles, reliability, responsiveness, assurance, and empathy. Measured by expectations and performance.
Magal's model	Magal [121]	1991	Service quality, quality of end product, and user self-efficiency.
SERVPERF	Cronin and Taylor [36]	1992	Same as SERVQUAL while excluding the expectations view.
E-S-QUAL	Parasuraman, Zeithaml, and Malhotra [144]	2005	Efficiency, fulfilment, system availability, and privacy.
E-RecS-Qual	Parasuraman, Zeithaml, and Malhotra [144]	2005	Responsiveness, compensation, and contact.
Fassnacht's model	Fassnacht and Koese [60]	2006	Environment quality, delivery quality, and outcome quality.
WebQual	Loiacono, Watson, and Goodhue [115]	2007	Usefulness, ease of use, and entertainment

consists of twelve constructs grouped into three factors: usefulness, ease of use, and entertainment. Although the ICT services often have web interface, they significantly differ given their utilization in the organization. They do not serve for entertainment, but focus on a specific business need. Therefore, this approach does not reflect much of the aims of measuring the quality of ICT services used in corporate segment.

Interesting model for service quality evaluation was developed by Fassnacht and Koese [60]. It consists of three dimensions, namely: environment quality, delivery quality, and outcome quality. These dimensions further split into nine sub-dimensions. This model, however, projects the functional coverage directly into quality and does not evaluate the success of such implementation.

As we can see from this analysis, there is a number of ways how to interpret service quality, which also sums up our overview presented on Table 4.20. Much of the approaches with exception of the Magal's model [121] disregard the role of service quality in the IS success. Furthermore, none of the approaches focuses on service quality in context of success of IT outsourcing.

Factors influencing service quality can be divided into several categories. Looking at the options available, the most promising looks the division into separate parts of the sourcing process, which may in the end influence the quality. At the same time, they would be influenced by various factors. From this perspective, interesting starting point for our research is the study by Mahnke, Wareham, and Bjørn-Andersen [122]. Also the logic behind the mentioned model by Fassnacht and Koese [60] suggests that dividing the quality into several separate quality measures might be useful. Althought considering IT outsourcing these quality measures has to be different to better reflect the outsourcing phases and process.

Mahnke, Wareham, and Bjørn-Andersen [122] distinguish two phases within the outsourcing process – pre-contractual and post-contractual. Although their article is mostly interested in intermediary role in sourcing arrangements, we may utilize these categories in our view of ICT service outsourcing.

We further reflect on the partition mentioned by Fassnacht and Koese [60] in a sense that the ICT service outsourcing and its quality perception might be divided into separate domains, and also build on the view of extended outsourcing process partition outlined by Mahnke, Wareham, and Bjørn-Andersen [122]. The domains we utilize in our research are:

- Architectural fit.
- Quality of service operation.
- Pre-contractual preparedness.
- Contract strength.
- Post-contractual service quality.
- Stability.
- Understanding.

These domains are considered to contain additional factors influencing them, whereas these factors were initially introduced within the SOURCER framework outline in Chapter 3.

The main hypothesis concerning the service quality view is that:

H_{CQ1}: High service quality is likely to have positive impact on perceived IT outsourcing success.

Following sections deal with these domains in more detail. Within each domain, a separate evaluation scale is introduced for each included factor.[124]

4.3.1 Architectural fit

The first domain we use for service quality is the architectural fit of the service. It has been noted that the

We have to distinguish this dimension from the functional viewpoint described earlier.

[124]The evaluation scales are all equally structured, and they have a form of eleven point scale ranging from zero to ten points. Description provided is a support for the organization to better assess the particular levels. Please note that most of the options do not have all the ratings described. To avoid confusion with skipping the options within individual factors, a unified description was chosen. Moreover, in some cases, there is a symbol ↕ instead of a description. This sign means that the organization should assess the between options individually according to the specified boundaries of the surrounding options.

The functional view presented in Section 4.1 describes to what extent are the demanded functions covered. In this sense the functional fit is purely focused on business needs and their functional coverage by using the service. Its extent is highly influenced by the preceding definition of business strategy, and analyses leading to appropriate business-IT alignment.

On the contrary, the architectural fit addresses the technical dimension within Enterprise Architecture.

More concretely this architectural fit domain describes how well the service blends into the overall information system of the organization. This does not encompass how the service integrates into organization processes which has to be solved in previous phases of the SOURCER framework. Rather it deals with the technical dimension and specifically the technological integration as depicted by Vorisek et al. [200].

We may define the following hypothesis:

H_{CQ01}: High level of architectural fit is likely to have positive impact on overall service quality.

This domain might be further divided into two parts: integrability and accessibility of the service.

The *integrability* describes to what extent is the service able to integrate into the organizational IT, whereas the *accessibility* focuses on the question by what means is the service accessible.

4.3.1.1 Integrability

Crucial quality factor of the IT outsourcing is the integrability of services. In case where the organization has only one provider of its ICT services, these services are in most cases already integrated on his side. However, having an information system from just one provider is an uncommon situation in practice. Every organization has its unique needs and quality expectations and therefore not many IT solutions fit the organization perfectly.

Another reason for having multiple providers of ICT services is broadening the functionality throughout years of operation. The situation with two or more providers is much more typical and establishing seamless interoperability adds to overall quality of the service.

Integration was pointed out many times in our research field. Its foundations can be found in the term Systems Integration. Another term for integrating various IT systems under one roof is the ERP, which we use in different connotation. We will stick to the viewpoint of Systems Integration since it is a traditional view developed on our department.

According to Vorisek et al. [200], we can differentiate four levels of integration:

- Integration of vision, values and goals.

- External integration (Integration of the enterprise with its surroundings).
- Internal integration.
- Technological integration.

Furthermore, we can differentiate two integration types that connect the mentioned four levels of integration:

- Integration of processes, services, and values.
- Methodical integration.

The whole integration model depicted on Figure 4.1 shows us that we can further distinguish integration areas within each level.

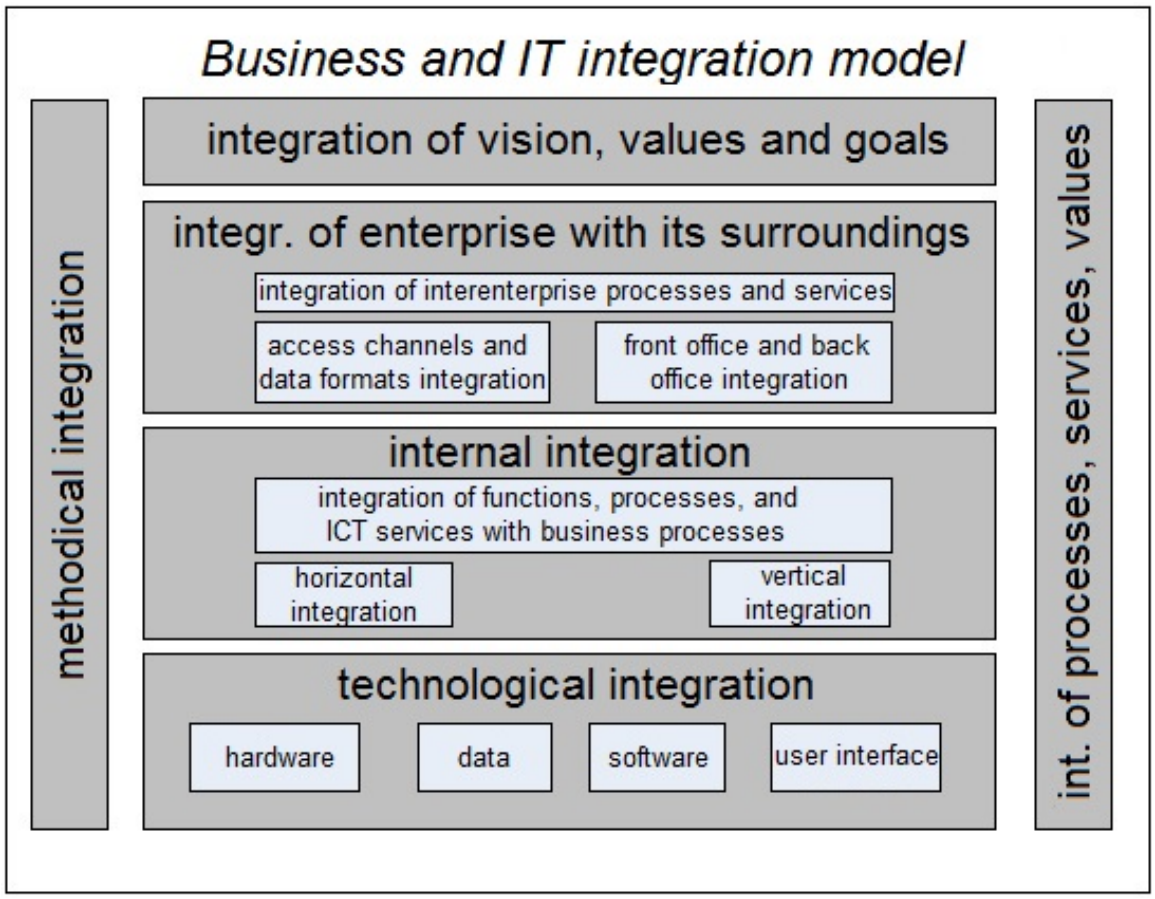

Figure 4.1: Model of IS/ICT integration.[200]

In our case the SOURCER framework itself assists in managing the Internal integration, and also the Integration of processes, services, and values. However, as a quality attribute it covers mainly the Technological integration which forms a bottom layer in the integration model.

In the commoditized ICT service markets we deal mainly with the technological integration. The questions asked here are mainly how the service gets integrated in the information system, and whether there are any means of integration available.

Table 4.21: Integrability. [author]

Level	Description	Points
Outstanding	Dedicated connectors to most of the major third party applications are provided. Other options covered by REST API (or fully customizable XML export). Support with the integration.	10
Very high	Dedicated connectors to most of the major third party applications are provided, and documented REST API in place.	9
High	Documented REST API in place.	7
Medium	Documented API in place.	5
Low	Some integration available.	3
Very low	Some integration available under closed platform.	1
Non-existent	No integration options available.	0

Given ICT service markets situation we identified a variety of options regarding technical integration. These means differ significantly in the overall easiness of the integration, and deployment difficulty.

In case the integration is ensured by the service provider directly in the service settings, there is generally no major problem with interconnecting the application with other selected applications, as this needs only few clicks in the user interface. Problem with these integrations in practice is that they are not extensively available, and even the best providers provide integration with only a selection of other providers. Most of the times this excludes competing service providers, so provider-ensured integration between certain major applications does not exist. This integration might be also ensured on the level of platform.

Another option is that there exist third party connectors or services[125] that can be used with the provided service.

If the dedicated connector is not available, there is another option for technical integration, either in a form of a REST API, or alternatively in a form of eXtensible Markup Language (XML) exports. Using these exports, an organization might connect separate applications by sending data converted to the XML format. Some services offer full customization of the exports in order to ensure the customer gets transferred any information that might be needed. This customization might be in some cases enabled by a graphical interface, which is easier to comprehend. Other option is purely textual settings, which

[125] Such as Zapier, ifttt, CloudWork, elastic.io, OneSaas or snapLogic. In this case the external integration services have to be added to the ICT service layer of architecture and to the service catalogue with special designation. In this case their function does not serve any business function, however, they form a special type of ICT service affecting other services. They are linked to ICT processes, and although they in some cases do not relate directly to business processes, their adoption should be confirmed with the IT strategy.

might need some technical expertise. The XML exports might be in some cases restricted by extent, or by frequency. The frequency aspect is important in case the organization wants a timely synchronization of its separate systems. It also depends whether these exports enable push or pull regime. In case of push export, the service actively pushes the message to the other service. In case of pull export, the service waits for message from the other service to send the required message.

Another option where the customizable exports do not exist but still the service offers some information about integrability is offering a documented Application programming interface (API). This API might be restricted by communication format or by other attributes. Currently, we can consider the above-mentioned XML to be a golden standard of ICT service communication. Therefore the more general documented API with no automation options forms a lower-center option on our scale.

Other options of integration based on our observation are possible, but they pose a risk that some of these services may not be possible to integrate comfortably. However, these exports can still be accomplished with a considerable amount of effort or previous expertise.[126]

It is worth to mention that exports defined by the customer demand re-checking and updating in case the service changes its API. This might be a complication for systems with higher extent of integrations. Although these changes are not very frequent and when they happen, they are usually announced well ahead by the provider. In most cases this ensures that organizations affected by this change adapt their systems to the new API definitions in advance.

From the viewpoint of integrability, we may define the following hypothesis:

H_{CQ001}: High service integrability is likely to have positive impact on architectural fit of the service.

4.3.1.2 Accessibility

Other attribute affecting the architectural fit is the accessibility. Essentially, this factor describes what methods can be used for accessing the service. It reflects the overall easiness of use, and also takes into account whether the service has comprehensible user interface adapted to current devices used in organizations.

Essentially, we can distinguish several types of access: web browser, native mobile applications, dedicated applications, or terminal access. This division covers a variety of thin and thick clients, which also influences to what extent is the application able to operate independently on Internet connection access.

[126] Possible solution could be utilizing various web scraping techniques.

The service can be most typically accessed using the web browser. Another option is the mobile access using a native mobile application forming a thin or thick client, or a tailored mobile interface for communication via the web browser. This tailoring is usually done using advanced responsive web design principles. Other means of access might include terminal access which enables seamless architectural integration.

Another limitation might be a forced need to use certain third party plug-ins, applications, or environments such as the Java, or .NET framework. These might form an obstacle for using the service given the escalating security problems associated with Java environment in the recent years. Mainly they form another layer between the service provider and customer thus affecting the architectural fit.

The highest levels of accessibility are devoted to native mobile applications and optimized responsive web browser access, where the organization benefits the most from an optimized user interface tailored to various types of devices.[127]

Table 4.22: Accessibility. [author]

Level	Description	Points
Outstanding	Service covers all means of access including optimized web browser, terminal access, and native mobile applications for most of the major mobile OS.	10
Very high	Service provides optimized web browser access, and native mobile application(s).	9
High	Service provides web browser access and tailored mobile web-interface.	7
Medium	Service provides web browser access.	5
Low	Service offers access with limitation to third party plug-ins, applications, or environments.	3
Very low	Service is accessible using a thick client with major limitations.	1
Non-existent	Service is accessible only locally.	0

From the viewpoint of accessibility, we may define the following hypothesis:

H_{CQ002}: High service accessibility is likely to have positive impact on service architectural fit of the service.

4.3.2 Quality of service operation

Other domain we use in our model is the quality of service operation which mainly encompasses factors that relate to actual operation of the service after the contract signature and service implementation.

These factors are mainly technical: service performance, service reliability, and service scalability.

[127] Such as to tablets or mobile phones.

Many of the operation measures are specified in the contract, or in Service Level Agreement where they are formed by *service level targets* as mentioned in ITIL [89]. The organization should also specify so-called *service level requirements* in order to be able to assess the required service quality attributes when choosing the services.

We define the following hypothesis for this domain:

H_{CQ02}: High quality of service operation is likely to have positive impact on overall service quality.

In the following sections we deal with the factors independently and in more detail.

4.3.2.1 Performance

The performance factor is mostly characterized by responsiveness of the services, which has been generally quoted as important by Parasuraman, Zeithaml, and Malhotra [144].

Responsiveness can be in our case characterized by speed of response in reaction to user commands. This has an immediate impact on the effectiveness of overall use of the service and therefore directly influences overall performance of the particular business unit.

We may point out some of the points where the problems might emerge. These are characterized by various layers of the service:

- Performance of the presentation layer which might be badly designed or contain unnecessary elements.
- Performance of the client which is highly affected by architecture of the service user interface in case of web-browser access, and by the poor client-side code in case of an access using dedicated application.
- Performance of the network connecting the user with the service that might be in poor condition.
- Performance of the service server side, which might be affected by low quality of the server-side code.
- Performance of the service-related ICT resource, which might be related to performance of the web server, the database, or hardware failure.

Important aspect is that ICT service providers on the market, if they do guarantee the service-level targets, they do so on side of the provider's servers. Therefore ensuring a good connectivity is a crucial IT management task. Much of the critical services in practice are connected using a dedicated connection. The service options considered and compared within the framework should be calculated for availability on the side of the customer.

Therefore, it is also suggested to monitor service performance on the client side, and on various points between the two parties. This could enable the organization claiming the service level targets that were not met.

Table 4.23: Performance. [author]

Level	Description	Points
Outstanding	Excellent service performance providing immediate response with no lags.	10
Very high	Generally good performance with almost none responsiveness issues.	9
High	Generally good performance, with minimal responsiveness issues.	7
Medium	Generally good performance with occasional responsiveness issues.	5
Low	Service performance inconsistent, lagging.	3
Very low	Lot of lags, long waiting time regarding screen loading.	1
Non-existent	Service not usable because of critically low performance characterized by total unresponsiveness.	0

Our hypothesis regarding performance is:

H_{CQ003}: High performance is likely to have positive impact on quality of service operation.

4.3.2.2 Reliability

Reliability of the service is identified as a second factor that might influence the quality of service operations. It is often described by the percentage of time in a certain period in which the service is running and therefore is available for use.

A good definition of reliability provides ITIL [74], where it is described as 'A measure of how long an ICT service or other configuration item can perform its agreed function without interruption. Usually measured as Mean Time Between Failures or Mean Time Between Service Incidents. The term can also be used to state how likely it is that a process, function etc. will deliver its required outputs. See also availability.'

To better reflect our need, which is mostly the up-time and down-time of the service, we have to calculate availability index suitable for measuring ICT services on the SaaS market. These services often do not provide all information defined in ITIL. Therefore we utilize the Mean Time to Restore Service (MTRS) measure as proposed by ITIL multiplied by the number of failure occurrences. This number is then compared with the total time of the service specified in the contract.

In our case, as apparent from the above-mentioned definition, we treat the reliability as a purely technical case. Therefore its actual measurement is very straightforward.

The required measures might differ depending on industry, business function, or individual preferences. Business critical service will be more demanding in regard to its up-time, while the service not that critical might be more flexible in terms of reliability requirements.

Table 4.24: Reliability. [author]

Level	Description	Points
Outstanding	99.99 % and above	10
Very high	99 – 99.99 %	9
	98 – 98.99 %	8
High	97 – 97.99 %	7
Medium	95 – 96.99 %	6
	93 – 94.99 %	5
	90 – 92.99 %	4
Low	85 – 89.99 %	3
	80.01 – 84.99 %	2
Very low	80 % and below	1
Non-existent	Information not available.	0

Our hypothesis regarding reliability is:

H_{CQ004}: High reliability is likely to have positive impact on quality of service operation.

4.3.2.3 Scalability

Scalability is another important factor for quality of service operation. Mainly in case of industries with high variability in ICT service use during the year.

Easily can be this problem depicted on industries dealing with high seasonal sales differences. For instance much of the retailers face sudden increase of sales in November and December before Christmas. This includes increase of incoming E-commerce system connections. In case of specific niche segments such as travel agencies the seasonal difference might be during Summer months.[128]

In case of a service that is not scalable, overcoming the maximum number of simultaneous connection causes the service to crash turning the service irresponsible even for a couple of hours and days. This means a number of missed sales opportunities, and in some cases may even cause bankruptcy of the whole organization.

But this situation is not limited to E-commerce systems. Although the changes are most typical to be caused by the change of customer demand and sales, they also gradually transfer to next systems affecting Enterprise Resource Planning and Customer Relationship Management. The actual outage does not only mean losing the revenue. For instance a

[128] And we may point out many other similar examples, such as the case of China, where most of the customer demand grows traditionally in December and January before the Chinese New Year.

manufacturing system that stops for an hour could cause losing a production window of thousands of EUR that can not be undone. This is due to the management system applied in this type of industries is in most cases set to use every minute of production machinery operation.

In some industries, the differences might be not measured between months, but rather between days or hours. For instance auction systems might be overwhelmed and become unresponsive few minutes before a popular auction ends (due to last minute bidding). This may affect overall service operation.

The scalability might be in some cases critical part of the whole business model. On the other hand, in some industries or services it might be insignificant.

Table 4.25: Scalability. [author]

Level	Description	Points
Outstanding	Unlimited scalability.	10
Very high	↕	9
High		7
Medium	Scalability available but limited.	5
Low	↕	3
Very low		1
Non-existent	Scalability is not possible.	0

Our hypothesis for scalability is therefore:

H_{CQ005}: High scalability is likely to have positive impact on quality of service operation.

4.3.3 Pre-contractual preparedness

Another domain we use in our model regarding quality is the pre-contractual preparedness. This domain reflects how easily can the organization prepare for the outsourcing arrangement.

From our viewpoint, we may identify two main factors influencing this preparedness: customisation and pre-sales testability. We discuss these factors in separate sections.

Our hypothesis for this domain is that:

H_{CQ03}: High pre-contractual preparedness is likely to have positive impact on overall service quality.

4.3.3.1 Customisation

We may define customisation in relation to SaaS solutions as an ability of the service to be changed by the organization to better fit its individual needs. In practice this might involve a range of changes from simple change of appearance to greater changes of service infrastructure.

Another term used in relation with customisation is configuration. Although some authors distinguish customization and configuration as two separate issues, we do not think that it is the case. Given the factual implications for the service customer in the ICT services context, the configuration is a sub-type of customization.

As mentioned by Sun et al. [181] 'Configuration can support tailoring requirements within pre-defined configurable limit.' The relation between customisation and configuration are discussed by the same authors, whereas they also present their configuration competency model.

Customisation is an issue of the Cloud concept. Many providers try to maximize their economies of scale using the concept of shared-instances. This results in so-called multi-tenancy model of service sourcing, where multiple tenants share the same system. As pointed out by Wilder [204] the option of multi-tenancy can apply for all, or only for selected functions. The multi-tenancy aspect relates highly to the the technical part of the SaaS solution – it relies on the platforms and infrastructures adopted on the back-end of the particular service.

Most of the ICT services on the SaaS market is of a standardized nature. However, in some cases there may be a certain extent of customisation options. These might include a range of customisation starting with the appearance, functionality, and down to the process behind the service.

With consideration of the model proposed by Sun et al. [181] and the situation on the market, we may distinguish the following general means of customisation:

- Customisable business process logic behind the service.
- Configurable functionality.
- Customisable appearance of service interface.

Table 4.26: Customisation. [author]

Level	Description	Points
Outstanding	Fully customisable service including appearance, functionality, and logic of processes behind the service.	10
Very high	Customisable and programmable service in terms of appearance and functionality	9
High	Customisable appearance, greater extent of functionality configuration.	7
Medium	Limited customisation of appearance and configuration of functionality.	5
Low	Limited configuration of appearance.	3
Very low	Pre-defined templates to configure the service.	1
Non-existent	No customisation available.	0

Regarding customisation, we define the following hypothesis:

H_{CQ006}: High degree of customisation is likely to have positive impact on pre-contractual preparedness.

4.3.3.2 Pre-sales testability

This criterion deals mainly with the question, whether there is opportunity to try application service prior to signing the contract. As we have already mentioned, the shift to a new service encompasses significant costs for the organization. Moreover, the service might advertise information which is not true or is misleading.

It might be therefore significant for the organization to have a chance of trying the service before transferring its function to the new provider. An organization might in some cases test the service, its functionality, interface and assess integrability of the solution. These activities may add to better decision and also to preparation for potentially implementing the service.

We may divide this testing period aims into several layers:

- *Trial version* that might allow full use of the service with own data and settings.
- *Demo version* allowing limited usage with pre-defined or restricted settings.
- Other information such as *instructional videos*.
- Existence of pre-sales *customer support* that can assist with potential questions.

Table 4.27: Pre-sales testability. [author]

Level	Description	Points
Outstanding	Trial version of the service for at least one month with unrestricted functionality and full customer support.	10
Very high	Trial version of the service for up to one month with unrestricted functionality and full customer support.	9
High	Trial version of the service with restricted functionality available on request.	7
Medium	Demo version of the service available.	5
Low	Demo version available on request.	3
Very low	Instructional videos available.	1
Non-existent	No trial/demo versions of the service, nor any videos are available.	0

Our hypothesis regarding testability is:

H_{CQ007}: High extent of pre-sales testability is likely to have positive impact on pre-contractual preparedness.

4.3.4 Contract strength

Contract strength relates to the contract and its significance for the two parties, customer and provider. The contract in our case is an agreement between provider[129] and customer, where customer pays for a service and is entitled to receive an agreed amount of service, and at the same time the vendor has to provide a service in agreed quantity and quality.

In practice, even though the service operations and other attributes might be favourable, strength of the contract influences the overall position of customer against the provider. Having the contract defined, and secured with a provider that possess high credibility certainly is an asset in the outsourcing relationship.

Our hypothesis regarding the contract strength is:

H_{CQ04}: High contract strength is likely to have positive impact on service quality.

From our viewpoint, we may identify three factors influencing the contract strength for the customer: credibility of the provider, extent of Service Level Agreement use, and service quality safeguarding. We discuss these factors in the following sections separately.

4.3.4.1 Credibility of the provider

Credibility of the provider is an important part of the contract strength. Even in case of correct settings of service levels, if the provider is not honest, all the previously made agreements might be turned invalid from the viewpoint of real impact on actual service operation and performance.

From this viewpoint it is suggested to utilize standard due diligence process.

The importance of due diligence in relation to outsourcing contracts is crucial as pointed out by Alborz, Seddon, and Scheepers [2]. Given the form of services provided on current ICT service markets, especially in case of SaaS, the arrangements before signing the contract mostly lack negotiations aspect. Contract development is therefore limited. Also developing a sustainable working relationship with the provider is a task limited by a standardized contract.

Therefore in case of most ICT service providers we mainly utilize its part of credibility assessment.

In this regard, we may distinguish several attributes:

- *Years on the market.*
- *Feedback from customers.*
- *Reference installations.*
- *Financial profile.*

[129] Sometimes also referred as vendor.

For analysis of these attributes an organization may use public resources combined with specialized databases such as Dun&Bradstreet[130], BusinessProfiles[131], AiHit[132], OpenCorporates[133] or CrunchBase[134].

Table 4.28: Credibility of the provider. [author]

Level	Description	Points
Outstanding	Provider is an established player on the market with excellent reputation, sound financial profile, and many high-profile reference installations with highly positive feedback from its customers.	10
Very high	Established player on the market with sound financial profile, many reference installations and generally positive feedback from customers.	9
High	Established player on the market with good financial profile, and many reference installations.	7
Medium	Provider with traceable history, reference installations, and mixed references by its customers.	5
Low	New player on the market with hard to find business history, lack of positive references.	3
Very low	Bad financial profile, and negative customer feedback.	1
Non-existent	Unknown financial profile, customer feedback, and reference installations.	0

Our hypothesis regarding the credibility of the provider is:

H_{CQ008}: High credibility of the provider is likely to have positive impact on contract strength.

[130] http://www.dnb.com/
[131] http://www.businessprofiles.com/
[132] http://endb-consolidated.aihit.com/
[133] http://www.opencorporates.com/
[134] http://www.crunchbase.com/

4.3.4.2 Extent of SLA use

Taking the ITIL [159] as a base for our viewpoint, Service Level Agreement (SLA) can be defined as a written agreement that describes the service, documents service level targets, and specifies the responsibilities between the ICT service provider and the customer. Typically the agreement involves one service and one customer, however, as mentioned in ITIL, a single SLA may cover multiple ICT services or multiple customers.

Having a proper Service Level Agreement applied is still not standard policy for many providers on most ICT service markets. The SLAs are often included within the standard service Terms and Conditions. Much of the providers commonly specify general responsibilities, describe the service in their Terms and Conditions, but rarely do they specify precise service level targets.

These targets specify an agreed levels of service within the defined measurable areas. The general problem of measurement in the information systems field has been discussed by Singleton, McLean, and Altman [174]. Crucial is a proper selection of criteria to measure and evaluate. In case of ICT service markets we may identify the attributes related to our previously defined domains: architectural fit (integrability, accessibility), quality of service operations (performance, reliability, scalability), and post-contractual service quality (data security, emergency preparedness, maintenance, training, and innovation).

The SLA in practice might not cover all these criteria, however, having certain attributes documented might be crucial for some industries, service functions or just because of individual organizational preferences.

Table 4.29: Extent of SLA use. [author]

Level	Description	Points
Outstanding	Service Level Targets are precisely documented in all aspects, clear responsibilities between parties, detailed service description.	10
Very high	↕	9
High	Detailed general description of the service containing some of the Service Level Targets and clear responsibilities.	7
Medium	General service description provided together with clear responsibilities.	5
Low	↕	3
Very low	Confusing terms and conditions, unclear service description and responsibilities.	1
Non-existent	Non-existent terms and conditions, Service Level Agreement does not exist in any form.	0

Our hypothesis regarding extent of SLA use is:

H_{CQ009}: High extent of SLA use is likely to have positive impact on contract strength.

4.3.4.3 Service quality safeguarding

Service level safeguarding encompasses rating a way of compensation when the declared service-levels differ from the service level targets specified in the contract.[135]

The organization has to pay attention to the actual contract signed with the provider. This is due to the fact that many providers declare certain service levels on their web-page, but in reality these service levels may not be included in the official contract. Example may be declaring availability (such as 99.5%), but offering actual lower availability. The popular way to obfuscate these measures is using different time-scale for measurement, or using average availability of all service instances including the ones not used by the customer.

The recommended way of measurement is relating the treatment of outages and the associated costs to the level of compensation.

We may distinguish several ways of compensation on existing ICT service markets:

- Reimbursing the full service fee.
- Compensation in form of a percentage, fraction, or specified amount from the service fees.
- Discounts towards the future use of the service, temporary upgrade of customer level, or vouchers valid for the same or other services.
- Compensation of expenses associated with the outage.
- Compensation fairly exceeding the fees and associated expenses with the outage (in case of business-critical service).

Some of these compensations are more common while some others are rather an exception. Generally speaking the higher the compensation the more critical process does the service support, and the higher are the customer fees for the service.

Our hypothesis regarding the service quality safeguarding is:

H_{CQ010}: High service quality safeguarding is likely to have positive impact on contract strength.

4.3.5 Post-contractual service quality

Post-contractual service quality encompasses factors that have impact after the organization implements the service but not directly related to the service operations. These factors also relate to potential future changes of the context within which the organization uses the particular service.

[135] In case where the targets are not precisely specified, more general service level description might be used in the comparison.

Table 4.30: Service quality safeguarding. [author]

Level	Description	Points
Outstanding	Service levels backed by fines that would fairly exceed expenses with outages.	10
Very high	Service levels backed by fines that would fully cover expenses with outages.	9
High	↕	7
Medium	Service levels guarded by fines up to the price paid for the service.	5
Low	↕	3
Very low	Service levels guarded by fines accounted as a potential discount for next service licence period.	1
Non-existent	No safeguarding of the service levels.	0

In this regard, the factors we identified are mainly: data security, emergency preparedness, maintenance, training, and innovation. In the following sections we deal with these factors independently.

Our hypothesis defined for this domain is:

H_{CQ05}: High post-contractual service quality is likely to have positive impact on overall service quality.

4.3.5.1 Data security

Question whether provider guarantees sufficient data security is one of the most important when deciding about IT outsourcing. The problem can be divided into two parts. Foremost is the ability of business to impose and maintain sufficient data security framework. Industry dependent aspect is then the nature of data gathered, operated and administered.

Industries dealing with sensitive information such as banking, insurance, financial accounting, auditing, or public sector, it is crucial to ensure data security. In some cases, this information might be even at a center point of the business model. When those organizations fail to ensure enough security, they might also lose reputation in an extent that prevents them continuing their business operations. Industries such as retail, or manufacturing might be less sensitive to data loss. However, it may be noted that the level of data security applies to all organizations to some extent.

Classifications used by the government and its agencies, secret services, and military have elaborative nature. Overall, as pointed out by Chadwick and Otenko [25], we can generally distinguish the following types of classified information:

- top secret,
- secret,

- confidential,
- restricted,
- unclassified,
- and unmarked.

Although not all organizations utilize such detailed classification, the organizations within corporate world often at least distinguish the *trade secrets*. These so called trade secrets might be formulas, designs, patterns, business processes, practices, or any other information relating to their business model, strategy, and operations.

Some of the data with which the organization operates might be protected according to legislative regulations. Example might be customer data that are gathered by means described in the contract. Terms and conditions of the service often impose limits on data manipulation within certain legislative and contract boundaries.

A sign that the provider cares about data security might be his compliance with the standard ISO/IEC 27001. This norm particularly its latest version ISO/IEC 27001:2013 ensures high level of security when successfully adopted.

Table 4.31: Data security. [author]

Level	Description	Points
Outstanding	Provider complies to standard ISO/IEC 27001, has valid data security certification and successfully passed security audits without objections.	10
Very high	Provider complies to standard ISO/IEC 27001, has valid data security certification.	9
High	Provider de facto complies to standard ISO/IEC 27001, legislatively and contractually defined rules for data management, ownership, and security.	7
Medium	Legislatively and contractually defined rules for data management, ownership, and security.	5
Low	Rules for data security not clearly stated.	3
Very low	Rules for data security not clearly stated, risk of use of the data by the provider.	1
Non-existent	Security errors in the system, risk of data theft by the provider or a third party.	0

The cloud services often operate on a multi-tenant basis. As mentioned by Sun et al. [181] 'Any individual tenant on a multi-tenant service is placed in a security sandbox that limits its ability to know anything about the other tenants, event the existence of other tenants.' Argument often used in favour of the cloud services is that they centralize the data-storage function and through utilizing economies of scale generally provide better security measures than in-house solutions.

On the other hand, risk of losing data in cloud might be illustrated by numerous data-storage services that during the last few years closed their business with generally no compensation to its users. Notable example is *Megaupload*, which as a service itself might be controversial, but it was also used by some of the users and organizations as an on demand storage solution. Other similar examples might be *Filesonic*, *Hotfile*, or *Oron*. Aspect to consider is that even though new on-demand data-storage solution have more strict policies regarding their content and its sharing, there does not exist any barrier or drawn line, where these potential future closures have an end.

The data security should be therefore treated as a relative aspect. One option is using the on-demand solution only for replaceable and unclassified data, as presented in the classification above. In case of business-critical data, a compliance with a major standard is strongly suggested, together with guarantees like existence of emergency plan and service quality safeguarding discussed further in this chapter.

Case of *Evernote* corporation on the other hand shows us that organizations sometimes survive security breach. Despite losing data of about 50 million users [65], most of the users did not close their accounts and simply continued with using the service. This might be enough for individual users. But as an organization, there have to be concerns regarding the security aspect. Again, in relation to the the particular type of data stored or used in the service.

In our case, we use the above-mentioned standard ISO/IEC 27001 and selection of practices that we identified as important for data security.

Our hypothesis regarding data security is:

H_{CQ011}: High level of data security is likely to have positive impact on post-contractual service quality.

4.3.5.2 Emergency preparedness

Emergency preparedness factor aims mostly on ensuring business continuity. The business continuity itself has been a popular topic among practitioners for quite a few years. As mentioned by Cerullo and Cerullo [24] business continuity planning process should address three objectives: identify major risks of business interruption, develop a plan to mitigate or reduce the impact of the identified risk, and train employees and test the plan to ensure that it is effective.

In our case we may identify the following risk of business interruption, which we define as emergency situations:

- Server destruction caused by conflagration, flooding, or other disaster.
- Long-term service outage.

- Provider bankruptcy.
- Loss of data.

Mitigation or reduction of these risks might be ensured by:

- Existence of detailed emergency plans for every defined risk situation (disaster recovery, exit strategy).
- Availability of data backup and recovery solutions.
- Securing that detailed information about the outlined emergency solutions is available to users.
- Specification of an exit strategy.

Table 4.32: Emergency preparedness. [author]

Level	Description	Points
Outstanding	Offers seamless backup solution for its clients. Existence of emergency solution for all scenarios covered in the contract and documented in detail. Special tools and services available. Very high probability that the business continuity will not be affected.	10
Very high	Existence of emergency solution for most of the scenarios covered in the contract and documented in detail. Special tools and services available. High probability that the business continuity will not be affected.	9
High	Existence of emergency solution covered in the contract and documented to some extent. High probability that the business continuity will not be affected.	7
Medium	Functional emergency solution existing, but not grounded in contract. Some probability that the business continuity will not be affected.	5
Low	General outline about the emergency plan available but not offering a sufficient solution.	3
Very low	Confusing or conflicting information about emergency plans, not offering a sufficient solution.	1
Non-existent	Emergency solution does not exist.	0

Regarding the emergency preparedness we define hypothesis:

H_{CQ012}: High emergency preparedness is likely to have positive impact on post-contractual service quality.

4.3.5.3 Maintenance

Maintenance in case of ICT services has a meaning of provider operativeness in repairing errors, bugs, and dealing with necessary service changes and updates. This necessarily has

to include means of collecting the customer reports for these changes, repairs, and additions.

Existence of maintenance covered by the provider can significantly reduce time needed to spent on the service workarounds on side of the service customer. This might improve the overall post-contractual service quality.

We may distinguish two relative parts included in maintenance:

- Maintenance and its extent.
- Existence of customer support.

Table 4.33: Maintenance. [author]

Level	Description	Points
Outstanding	Full maintenance and support included, prompt reactions, excellent coverage of requests.	10
Very high	↕	9
High	Maintenance and support existing with generally good performance.	7
Medium	Some degree of provider maintenance included.	5
Low	Existence of reporting form to contact the provider.	3
Very low	Provider offers an email to contact him in case of an issue.	1
Non-existent	Maintenance and support is non-existent.	0

Regarding the maintenance we define our hypothesis as follows:

H_{CQ013}: High level of maintenance is likely to have positive impact on post-contractual service quality.

4.3.5.4 Training

End-user training is a long discussed topic in the IS field. Also it is an aspect frequently mentioned within the practitioner field.

Extensive study by Gupta, Bostrom, and Huber [78] shows a variety of training methods and approaches. However, in case of ICT services the situation is more complicated. Much of the end-user training occurs electronically and therefore in most cases lacks the interaction aspect. With the emergence of web-based learning platforms and social networking websites, this slowly changes and some services gain a significant coverage by these systems.

Therefore this factor is built around three cornerstones:

- User-community on the Internet.
- Offering of online-training courses.

- Face-to-face training.

Minimal level then in practice forms an offer of self-study user tutorials, or presence of manuals and FAQ on the service webpage. Mostly these are regarded not very useful compared to the above-mentioned means of end-user training.

Table 4.34: Training. [author]

Level	Description	Points
Outstanding	Established user community on the Internet. Range of online and face-to-face training course offerings.	10
Very high	Range of on-line and face-to-face training course offerings.	9
High	Range of on-line training courses available.	7
Medium	Some on-line training courses available.	5
Low	Training only in form of limited number of user tutorials.	3
Very low	Provides only user manual or FAQ.	1
Non-existent	Training does not exist in any form.	0

Hypothesis we define regarding the training is:

H_{CQ014}: High level of training is likely to have positive impact on post-contractual service quality.

4.3.5.5 Innovation

Level of service innovation is a based on the assumption that the ICT service markets consistently evolve. In order to stay competitive the organization has to keep pace with other players in their industry. Therefore keeping the information system updated with the newest features might have an impact on post-contractual service quality.

While some providers add new features every month, others keep the service the same for several years. The need of innovativeness is individual to each organization and business function, however, some extent of innovation is generally more favourable than no innovation.[136]

We may distinguish several levels of possible service innovation:

- *Innovation of business processes* behind the service reflecting the best-practice of the industry.
- *Functional innovation* in terms of enabling new service features.
- *Innovation of user interface* meaning keeping up to date with recent web interface principles in terms of usability and accessibility.

[136]The problem of integration when the service changes its structure due to its innovation is discussed earlier in this chapter.

- *Innovation of access channels* focusing especially on mobile interfaces, and other means of access to the service.
- *Progress in adding integrations with other services* describing overall speed and effort to add the demanded interconnections.

Some of these factors might be also expressed by speed of service updates.

Given the nature of innovation, the best way how to measure it is using the segment benchmark, and compare the service with other services in the particular functional area.

Table 4.35: Innovation. [author]

Level	Description	Points
Outstanding	Absolutely exceeds the innovation factor of all players on the market in all aspects.	10
Very high	Highly exceeds average innovation in the segment.	9
High	↕	7
Medium	Average innovation. Positioned in the exact mean of other services in most of the measures.	5
Low	↕	3
Very low	Significantly low innovation, is not able to keep pace with other players on the market.	1
Non-existent	Service does not pose any innovation at all.	0

In terms of innovation our hypothesis is as follows:

H_{CQ015}: High level of service innovation is likely to have positive impact on post-contractual service quality.

4.3.6 Stability

The stability domain is focused on possible stability outlook regarding external factors that indirectly influence service operations in the long run. It is expected that stable environment surrounding the service and its provider might add to the overall service quality.

Our hypothesis is therefore:

H_{CQ06}: High level of service stability outlook is likely to have positive impact on service quality.

From the viewpoint of stability we may distinguish the following factors which we discuss in subsequent sections: geographical proximity, quality of the infrastructure, and political and economic stability.

4.3.6.1 Geographical proximity

Geographical proximity simply represents the distance between servers where the vendor provides the service, and the service customer.

Cloud vendors often have multiple servers on different locations which seamlessly share the information between each other, thus providing customer experience similar to working on one server.[137] Therefore the organization has to count distance to the server that is assigned by the provider in its particular case. In case this information is not provided to the organization has to count with the nearest server available. In some cases, customers may choose server themselves according to their location preference.

We generally distinguish the following high proximity server location situation. In order to better conceptualize the distance measures, these are:

- Servers are located in the same city as the organization. (approx. 0 – 100 km)
- Servers are located in the same region as the organization. (101 – 300 km)
- Servers are located in the same country as the organization. (301 – 1000 km)

However, we might encounter situations where the server distance is not as favourable. This can be mainly the two following:

- Servers are located on a very distant location on another continent.
- Server location is not disclosed by the provider.

[137] Earlier in the thesis, we mention this resource pooling principle as one of the essential characteristics of cloud computing.

Due to difference in country sizes and other factors, we may find measuring the exact distance between provider servers and customer as a best and most comfortable way to get this information. However, some organizations might be not able to determine the exact distance. Some providers do not disclose the exact server location. In these cases the primary aim has to be to at least approximate the distance from the information the customer has available.

Therefore we also provide a balanced scale constructed with consideration of the above-mentioned situations.

Table 4.36: Geographical proximity. [author]

Level	Description	Points
Outstanding	0 – 100 km	10
Very high	101 – 300 km	9
	301 – 600 km	8
High	601 – 1000 km	7
Medium	1001 – 1500 km	6
	1501 – 2000 km	5
	2001 – 4000 km	4
Low	4001 – 10000 km	3
	10001 – 15000 km	2
Very low	more than 15001 km	1
Non-existent	Server location is unknown.	0

Our hypothesis regarding the geographical proximity is:

H_{CQ016}: High geographical proximity is likely to have positive impact on service stability outlook.

4.3.6.2 Quality of the infrastructure

This attribute deals with the infrastructure quality between the service provider and the organization.

Regarding the infrastructure quality we build on the Global Information Technology Report [185]. Particularly we utilize its measure *infrastructure and digital content*, which captures the development of IT infrastructure and the digital content accessibility. The infrastructure measurements in this sub-rating encompass mobile network coverage, international Internet bandwidth, secure Internet servers, and electricity production.

In the calculation, the organization should not use the sub-rating directly. The organization should rather use the lowest rating from the countries the communication with the service passes.

It has to be noted that with some services a dedicated connectivity is guaranteed by the provider or by contracted third parties. Therefore using tracerouting is a recommended way

to get or confirm the information about which countries the communication signal passes on the way to and from the service.

Table 4.37: Quality of the infrastructure. [author]

Level	Description (GTIR infrastructure sub-rating)	Points
Outstanding	6.81 and higher	10
Very high	6.51 – 6.80	9
	6.01 – 6.51	8
High	5.51 – 6.01	7
Medium	5.01 – 5.50	6
	4.51 – 5.00	5
	4.01 – 4.50	4
Low	3.01 – 4.00	3
	2.01 – 3.00	2
Very low	2.00 and lower	1
Non-existent	Server location is unknown.	0

Regarding the infrastructure quality our hypothesis is:

H_{CQ017}: High quality of infrastructure is likely to have positive impact on service stability outlook.

4.3.6.3 Political and economic stability

Political and economic stability is another factor that we utilize in the framework. This measure connects to the country of provider residence and operations, whereas in case these ratings differ[138] the organization should pick the lowest rating from the selection.

In the case of political and economic stability the measurements have been already documented in practice in a quite detailed manner. For our aim we refer to the available country risk measures used in the segment of financial investments. These measures are published as country risk ratings by rating agencies such as Moody's, Fitch, or Standard&Poor's and are regularly updated.

In our case we utilize Standard&Poor's rating. This rating is quite easily adaptable to our framework, thanks to its rating scales construction. However, the organization might adapt any of the mentioned ratings.

The original S&P ratings utilize the plus and minus signs to show the relative standing within major categories. Given our aim with these ratings we just use the rating without these signs.

Hypothesis we define regarding the political and economic stability is:

H_{CQ018}: High political and economic stability is likely to have positive impact on service stability outlook.

[138] Such as in case where the servers are located in different country than the country of provider residence.

Table 4.38: Political and economic stability. [author]

Level	Description (Standard&Poor's rating)	Points
Outstanding	AAA	10
Very high	AA	9
	A	8
High	BBB	7
Medium	BB	6
	B	5
	CCC	4
Low	CC	3
	C	2
Very low	D	1
Non-existent	Provider location is unknown.	0

4.3.7 Understanding

Level of understanding describes an extent to which the two sides, the service provider and the service customer understand each other. This domain aims on the prevention of obstacles during post-contractual phase and respectively its high level is expected to positively influence the service quality.

Our hypothesis is that:

H_{CQ07}: High level of understanding with the provider is likely to have positive impact on service quality.

Given the experience from various contracts described in the literature, this problem can be from our viewpoint further divided into two parts:

- Cultural proximity of the two sides of the outsourcing contract.
- Language skills of the provider.

We discuss these parts in more detail within the following sections.

4.3.7.1 Cultural proximity

In 1997, pointed out by Michell and Fitzgerald [129] one of the most frequently quoted factors influencing outsourcing vendors selection was cultural match or cultural fit between the two parties - vendor (provider) and client (customer). This view persisted most of the time in the traditional outsourcing area, but surprisingly did not transfer to the Cloud Computing area. Although it may not be as surprising since the cultural influences mainly affects the relationship and communication. These in case of Cloud Computing do not exist in an extent we know from traditional outsourcing arrangements.

The cultural aspect might not be as significant in the case of SaaS, it is still an aspect that has to be taken into account. Mainly during the phase of post-contractual services, which involves communication and service support, the cultural proximity has certain impact on service quality.

Propositions mentioned by Mahnke, Wareham, and Bjørn-Andersen [122] for pre-contractual phases are ensuring cultural compatibility through informed search between available vendors, and through establishing communication channel and cultural liaisons. The informed search is one of the added values the framework brings through applying cultural proximity factor. Cultural liaisons in our case are applicable mainly in case of the traditional outsourcing forms.

In our case, we may recommend utilizing the approaches introduced by Hofstede, Hofstede, and Minkov [87] or Trompenaars and Hampden-Turner [190].

Trompenaars and Hampden-Turner [190] propose a model of national culture differences, which consists of seven dimensions: universalism/particularism, individualism/collectivism, neutral/emotional, specific/diffuse, achievement/ascription, sequential/synchronic, internal/external control.

Hofstede, Hofstede, and Minkov [87] propose a special cultural dimensions theory, where he utilizes the following cultural dimensions: individualism, uncertainty avoidance, masculinity/femininity, long-term orientation, and indulgence/restraint.

These factors might affect not only communication but also perception of the contractual terms and their validity for the business relationship.

Table 4.39: Cultural proximity. [author]

Level	Description	Points
Outstanding	Same culture.	10
Very high	Closely related culture.	9
High	↕	7
Medium	Cultures are different but the differences do not affect communication.	5
Low	↕	3
Very low	Cultures are different in much of the aspects affecting majority of communication and contract aspects.	1
Non-existent	Cultures have major differences that significantly distract the contract details perception and communication.	0

Propositions mentioned by Mahnke, Wareham, and Bjørn-Andersen [122] for post-contractual phases can be co-located cultural liaisons in order to mitigate misunderstanding, and clearly defined processes for communication and coordination. From our viewpoint having co-located cultural liaisons in case of commoditized ICT service markets is not possible.

Therefore, the only proposition that can be applied in our case in its full extent is to define processes for communication. To a limited extent, the cultural liaison might be a team member assigned on the side of the customer, where he could help anticipating cultural problems and offer possible solutions.

Our hypothesis regarding cultural proximity is:

H_{CQ019}: High cultural proximity is likely to have positive impact on level of understanding with the provider.

4.3.7.2 Language skills

Another point closely related to understanding domain are the language skills. The situation where the provider and customer do not understand each other due to insufficient language skills might be disastrous.

This quality metric is relative since it depends on the actual language of communication. Therefore before rating the provider capabilities, the organization should specify its needs regarding language within its operations.

Table 4.40: Language skills. [author]

Level	Description	Points
Outstanding	Excellent language skills, full language proficiency including detailed functional area expertise.	10
Very high	Excellent language skills.	9
High	No language barriers, most of the issues get resolved without needing additional support.	7
Medium	Language skills sufficient for resolving basic issues with the service.	5
Low	Complicated communication, basic issues get resolved over time but the resolution is not timely.	3
Very low	Communication on a basic level, most of the issues are hard to resolve due to frequent misunderstandings.	1
Non-existent	Language skills disastrous, communication in the required language is non-existent.	0

Our hypothesis regarding the language skills is:

H_{CQ020}: High language skills are likely to have positive impact on level of understanding with the provider.

4.3.8 Section summary

Within this section we discussed the term service quality and its potential impact on IT outsourcing success. Also, we analysed major service quality models in the academic literature and proposed own detailed approach for measuring service quality based on the phases of outsourcing. In the individual sections we outlined the factors that may be considered

important for the service quality in a form of larger domains and presented detailed set of hypotheses.

4.4 Chapter summary

This chapter summarizes further framework settings, whereas it focuses and analyzes three broad views utilized in the SOURCER framework in individual sections: functions, costs, and quality.

Section 4.1 deals with Functions of ICT Services, where it mainly presents a coherent view on enterprise functions classification, and emphasizes the industry-specificity of functional areas and associated demands in organizations, and the need to distinguish critical functionality for the particular organization.

Section 4.2 deals with Costs of ICT Services, and mainly it focuses on available ICT service pricing models and financial metrics possibly usable when dealing with IT outsourcing. It also presents a guideline on how to select financial metrics according to organizational strategy and related IT outsourcing outcome expectations.

Section 4.3 deals with Quality of ICT Services, where it summarizes major service quality models in the academic literature and subsequently proposes an own approach with emphasis on its relation with IT outsourcing success.

Individual detailed section summaries are included at the end of each section (Subsections 4.1.11, 4.2.4, and 4.3.8). Within the sections, a set of hypotheses was defined, whereas these hypotheses serve as a base in the survey that we outline in the next chapter.

Chapter 5

Survey and framework validation

This chapter deals with survey and framework validation. It consists of two sections. In the first section it focuses on setting the stage for data collection by explaining the methodology of the survey, which data do we need, and most importantly, how are the data going to be gathered and analyzed. Also, further extension[139] of the hypotheses is summarized and positioned in an overall model (see Appendix D and Figure 5.1). Apart from other, it sums up how the gathered data contribute to shaping the SOURCER framework. Outcome is the survey that helps to estimate impact of various areas on IT outsourcing success.

In the second section then follows the presentation of survey findings, discussion of these results, and validation of the SOURCER framework. The aim is to validate the framework design and provide further suggestions to framework settings and use in an organization. Outcome of this chapter is a validated framework, and a set of weights and suggestions regarding various criteria influencing success of IT outsourcing.

5.1 Methodology of the survey

Following the findings presented in previous chapter the next step is to test our assumptions in practice. Aim of the hypotheses is to evaluate factors influencing success of IT outsourcing. Getting an accurate image of the experience is important to predict possible obstacles in future projects.

Throughout the years I have been gathering contacts relevant for the study of IT outsourcing. These contacts were established either on conferences, using social networks, and through intermediaries. Result was a selected a set of respondents which were mainly IT managers, CIOs, and managers responsible for deciding about ICT resources and ICT services. Problem observed when preparing the sample was that not all IT managers were responsible for such decisions in an organization.

[139] Based on the analysis in Chapter 4

This is in accordance with the model presented by Weill and Ross [202], where they point out various decision domains and map these domains with six governance archetypes.[140] Within each archetype, different management positions get involved on the side of either input or decision. Therefore it was necessary to include also the process managers, operations managers, or project managers that were responsible for the particular project in an organization.

All together a set of 582 managers was pre-selected for filling out the survey. Distribution of these potential respondents was chosen to cover most of the industries and a variety of organization sizes with respect to available contacts. Also they were mainly from various countries within the European Union and from the United States. This way of construction of our survey sample ensured a certain extent of research reproducibility.

Two channels of the survey were used. Firstly, the on-line survey design which focused mainly on quantification of experiences, and take advantage of high number of respondents. Secondly, we selected a group of high profile respondents for an interview to get more insight to the problem. This second part focused on qualitative data and had a form of a semi-structured interview. All the interviews took place on personal basis.

Much of the respondents were contacted by an intermediary or by myself using email, whereas in some isolated cases the managers were contacted using telephone when the contact information was available. Due the sensitive nature of information on this level of management, and given the fact that large majority of respondents expressed their will to remain anonymous, all questionnaire results had to be anonymized.

Preparatory validation of the questionnaire took place at the beginning of February 2014 on a sample of selected respondents. Full survey began immediately after projecting the changes identified in this preparatory validation.

This part of the survey had a form of an on-line questionnaire hosted on the website: http://outsourcing.ifx.cz/. It was on-line for three months from February to the end of April 2014. Another part of the survey had a form of a set of interviews with selected IT managers and important Czech IT community personalities that agreed to share their experience with the topic. These interviews took place individually from November 2014 to January 2016.

With these interviews we mainly addressed our 31 working hypotheses, and aimed further shaping of framework settings. The overall survey model with highlighted individual hypotheses is depicted on Figure 5.1. In the following subsections, we define and discuss the hypotheses more closely.

[140] Business Monarchy, IT Monarchy, Feudal, Federal, IT Duopoly, and Anarchy.

Table 5.1: Questionnaire questions 1. [author]

What is your organization's industry? (Answers provided from our industry classifications as pointed earlier in the thesis (See 4.10).)
What is the size of your organization? (Answer in two parts as follows; Q1: Number of Employees – 1–49 employees, 50–249 employees, 250–1000 employees, more employess than 1000. — Q2 Annual turnover – Below 100 000 EUR, 100 001 EUR – 50 milion EUR, More than 50 milion EUR.) We categorized possible answers into three categories according to company size: Small, Medium, and Large.
Which position are you currently holding? (Single choice: Chief Information Officer, Chief Executive Officer, IT Manager, Process Manager, General Manager, Project Manager, Chief Strategist, Other)

5.1.1 Questionnaire

The questionnaire itself gathered information about the various viewpoints on ICT service outsourcing discussed earlier in the thesis.

We focused on the following areas of interest, broad questions, which were further shaped into concrete questions used in our questionnaire. The broad questions are:

- What are the financial methods usually used for ICT service outsourcing evaluation?[141]
- What domains influenced service quality the most?
- How high were the recommended levels regarding various service quality metrics?[142]
- Do the service costs, functions, quality and implementation time have its place in IT outsourcing decision-making?
- Is there a potential for specialized advanced tool dealing with IT outsourcing?

The questionnaire started with a couple of descriptive questions to get more information about the respondent (see Table 5.1).

The following questions (including possible answers) considered important for our framework aims, were then incorporated into the questionnaire (see Table 5.2).

[141] In order to get suggestions on which financial methods are used in organizations.
[142] To give some ideas about expected metrics by organizations with experience with outsourcing.

Table 5.2: Questionnaire questions 2. [author]

Which financial metrics did you use in your organization in relation to IT outsourcing? (Multiple choice: Net Present Value (NPV), Internal Rate of Return (IRR), Return on Investment (ROI), Payback Period (PP), Economic Value Added (EVA), Total Cost of Ownership (TCO), Net Present Value + Real Options (NPV+RO).)
Distribute the following 100 points according to how much (in percentage) you think the various domains influence service quality. You have to distribute the whole 100 percent in order to keep comparability of the domains. (Domains explained in the question user interface.) (Points distribution – sliders : Architectural fit, Quality of service operation, Pre-contractual preparedness, Contract strength, Post-contractual service quality, Stability, Understanding.)
Recommended sufficient rating of individual quality metric - XYZ (Total of 20 individual questions focused on recommending rating on scales as described in Chapter 4.3).
Which viewpoints from the following did you take into account when dealing with IT outsourcing? (Multiple choice: service functions, service costs, implementation time, service quality.)
Would you appreciate using a specilized advanced tool assisting you with IT outsourcing that would incorporate the viewpoints: service functions, service costs, implementation time, and service quality? (Single choice: Yes, No, Maybe, Do not know.)

5.1.2 Interviews

The defined hypotheses help us to indicate strength of various factors in the framework, whereas the interviews provide us insight into the global view of the problem by organizations.

Interviews following the survey took place individually from November 2014 to January 2016, when we tried to find out additional mostly qualitative information that might be useful for the subsequent research. Also these interviews provided us detailed insight to the survey results. The interviewees were four managers selected from the Czech IT community that agreed to share their experience with the topic. In order to leave enough space for the individual experiences, we used the semi-structured interview approach.

Our interviewees were namely:

- *Ing. Petr Křelina* – Head of IT Governance at Raiffeisen Bank a.s.[143] & 1st Vice-chairman of the Management Board at itSMF Czech Republic[144]. Formerly Project Manager at GE Money Bank.
- *Ing. Roman Albrecht* – Chairman of the Board at itSMF Czech Republic, former Project Director at DHL Czech (IT Services). Also currently Director of Consulting Services at GlideVision s.r.o.
- *Ing. Miroslav Hübner, MBA* – CIO at PRE a.s. & Chairman of the board at CACIO[145].

[143] At the time of the interview. As of 2016, he is a Pricipal Consultant and Project Manager at Devoteam s.r.o.

[144] The IT Service Management Forum Czech Republic

[145] Czech Association of CIOs

Table 5.3: Interview questions. [author]

Describe the company where you are working from the viewpoint of IT deparment. Explain specifics of your department. (i.e. Do you utilize Cloud services?)
Did you have any experience with outsourcing?
Do you consider the existing methods sufficient for decision-making about outsourcing? What are you missing? Is there any significant problem?
If you are dealing with outsourcing issues, could this framework potentially provide some help? Explain your thoughts on decision-making.
Verify the decision-making criteria of the framework, and the related hypothesis. When analyzing them individually, do you agree or disagree with these hypothesis? In case you disagree, explain in more detail.
If you have a look at the expertly-set weights of the criteria, do you consider them accurate? In case you disagree, explain in more detail.
What is your preference regarding price vs. time vs. function vs. quality? Could these be different with different service types? Is this viewpoint concept accurate?
Are there any financial metrics of interest for potential use in IT management.
Do you think that further development of this framework is worth it? Would it be interesting for you to potentially participate on its development to some extent?

- *Ing. Miroslav Marčan* – Director of the IT Department, Ministry of Industry and Trade & Deputy Chairman at CACIO.

Based on the defined questions and on the analysis in previous chapters, the following working hypotheses were further defined. Throughout the interviews we focused on potential confirmation of the 31 hypotheses summarized in Appendix D.

Also, we focused on the open questions presented in Table 5.3 throughout the interview. The questions were mostly aimed to keep the discussion open, potentially leading to various other topics. Important questions are marked with italics.

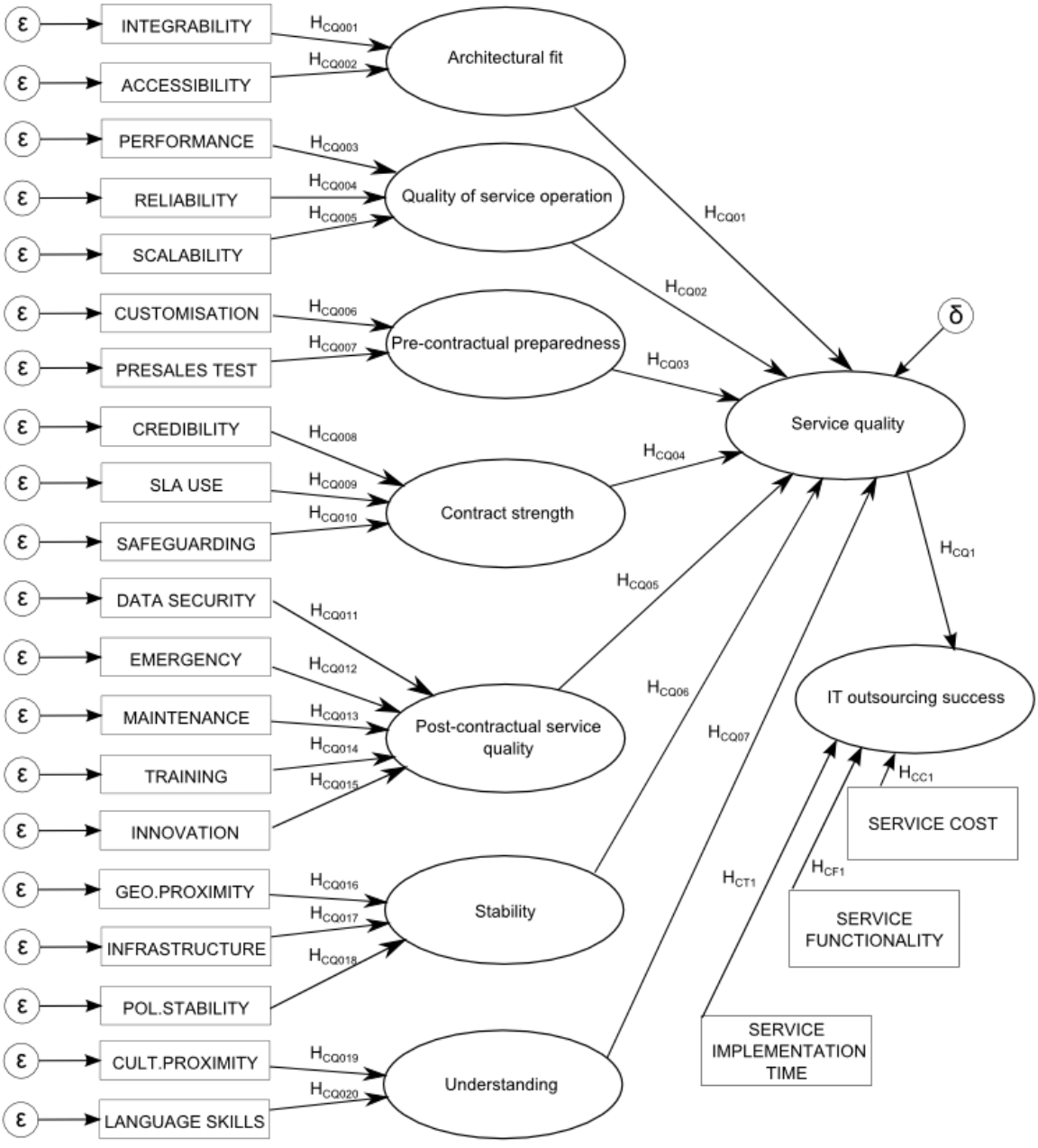

Figure 5.1: The overall model including hypotheses. [author]

5.2 Findings and discussion

Further in this chapter, we also present the survey results. The survey gave us a number of results that we either used for our purpose of further refining the model settings, or that identified broader context of the SOURCER framework in practice. As mentioned before, our survey was divided in two parts – the online questionnaire, and the interviews with selected important members of the Czech IT management community.

The questionnaire was on-line from February to April in 2014 on the webpage http://outsourcing.ifx.cz/. Invitations to participate were sent through an intermediary to 582 organizations and their IT managers that were invited to participate in the survey. The response rate was 25.43 %.

On top of that there was also a number of unfinished surveys, more concretely 32 surveys in total. We may anticipate that either these respondents tested the survey contents (i.e. from their mobile phone) for further finalization from different computer (and therefore different IP address), or they they were not finished due to lack of interest. However, we may only guess the real reason behind. Also there was a rather small number of respondents that checked right in the beginning that they do not have any experience with IT outsourcing whatsoever. Therefore, in both cases, we decided as suggested to remove these respondents from our further results. One of the reasons is that we aimed to gather experience only from managers with previous IT outsourcing experience.

Total 148 unique respondents with IT outsourcing experience participated in the survey.

Interviews following the survey took place individually from November 2014 to January 2016, where I tried to find out additional mostly qualitative information that might be useful for framework application in practice and future research. Also these interviews provided us detailed insight on top of the questionnaire results. The interviewees were four important managers selected from the Czech IT management community that agreed to share their experience with the topic.

5.2.1 Questionnaire results

This section covers descriptive statistics. More concretely the respondents position, organization size, industry, and other characteristics. In the next part it deals with the questionnaire results related to actual framework use.

A lot of organizations in our sample were medium sized. Most respondents were IT managers and CIOs, whereas there have been a couple of exceptions (CEOs, project managers, etc.). Regarding the industries, mainly these were Wholesale and retail trade, Manufacturing, or Information and Communication.

Table 5.4: Questionnaire – Respondents by industry. [author]

Industry	Respondents	
	Number	Percent
Agriculture, forestry and fishing	0	0.00 %
Mining and quarrying	0	0.00 %
Manufacturing	31	20.95 %
Electricity, gas, steam and air conditioning supply	5	3.38 %
Water supply; sewerage, waste management and remediation activities	0	0.00 %
Construction	0	0.00 %
Wholesale and retail trade; repair of motor vehicles and motorcycles	39	26.35 %
Transportation and storage	3	2.03 %
Accommodation and food service activities	10	6.76 %
Information and communication	57	38.51 %
Financial and insurance activities	3	2.03 %
Real estate activities	0	0.00 %
Professional, scientific and technical activities	0	0.00 %
Administrative and support service activities	0	0.00 %
Public administration and defence; compulsory social security	0	0.00 %
Education	0	0.00 %
Human health and social work activities	0	0.00 %
Arts, entertainment and recreation	0	0.00 %
Other service activities	0	0.00 %
Activities of households as employers; undifferentiated goodsand services-producing activities of households for own use	0	0.00 %
Activities of extraterritorial organizations and bodies	0	0.00 %
Total	*148*	*100.00 %*

Table 5.5: Questionnaire – Respondents by size. [author]

Organization Size	Respondents	
	Number	Percent
Small	10	6.76 %
Medium	117	79.05 %
Large	21	14.19 %
Total	*148*	*100.00 %*

Table 5.6: Questionnaire – Respondents by position. [author]

Position	Respondents	
	Number	Percent
Chief Information Officer	45	30.41 %
Chief Executive Officer	6	4.05 %
IT Manager	85	57.43 %
Process Manager	0	0.00 %
General Manager	1	0.68 %
Project Manager	8	5.41 %
Chief Strategist	0	0.00 %
Other	3	2.03 %
Total	*148*	*100.00 %*

Table 5.7: Questionnaire – Domain influence on service quality. [author]

Domain	Mean percentage influence on service quality
Architectural fit	10 %
Quality of service operation	38 %
Pre-contractual preparedness	7 %
Contract strength	16 %
Post-contractual service quality	24 %
Stability	3 %
Understanding	2 %
Total	*100 %*

Recommended sufficient rating of individual quality metrics gives us some insight on potential future benchmark of these individual quality metrics and related domains. As described in Table 5.8, it was counted as arithmetic mean of recommended ratings by individual respondents. Please refer to the individual tables with scales presented in Chapter 4.3, which were presented to respondents within related questions.

Table 5.8: Questionnaire – Recommended ratings of individual quality metrics. [author]

Metric	Recommended value (on scale)[146]
Integrability	6
Accessibility	7
Performance	6
Reliability	7
Scalability	5
Customisation	7
Pre-sales testability	5
Credibility of the provider	6
Extent of SLA use	6
Service quality safeguarding	6
Data security	6
Emergency preparedness	6
Maintenance	7
Training	6
Innovation	6
Geographical proximity	7
Quality of the infrastructure	7
Political and economic stability	7
Cultural proximity	5
Language skills	6

Most used financial metrics in relation to IT outsourcing are then summarized in Table 5.9. Lot of organizations use ROI for their IT related investments, whereas NPV and TCO roughly share the second place. Some financial metrics are not yet utilized (NPV+R0) or utilized very scarcely (PP). Use of Real Options is as expected an experimental thing potentially useful in future. There are some metrics that have their own niche. For instance we saw EVA mostly in the industry of Financial and insurance activities. IRR did not have any patern involved, but is used sometimes. Interestingly, these niche metrics have been exclusively used together with other metrics mentioned above. To conclude, this gives us clear message that the most used financial metrics in our sample and probably in the IT management community dealing with IT outsourcing are the ROI, TCO, and NPV.

Regarding the various viewpoints when dealing with IT outsourcing (see Table 5.10), the mostly used viewpoints were definitely service functions and service costs. However,

Table 5.9: Questionnaire – Most used financial metrics in relation to IT outsourcing. [author]

Financial metric	Used in our ourganization	
	Number	Percent
Return on Investment (ROI)	101	68.24 %
Total Cost of Ownership (TCO)	58	39.19 %
Net Present Value (NPV)	54	36.49 %
Internal Rate of Return (IRR)	18	12.16 %
Payback Period (PP)	2	0.01 %
Economic Value Added (EVA)	25	16.89 %
Net Present Value + Real Options (NPV+RO)	0	0 %

Table 5.10: Questionnaire – Viewpoints taken into account when dealing with IT outsourcing. [author]

Number	Taken into account by respondents (number)
Viewpoint	Number
Service functions	148
Service costs	148
Implementation time	75
Service quality	113

the service quality has also some use[147], as well as implementation time that was the least to select (even though it was selected by more than a half of respondents). Majority of organizations currently consider only price vs. function ratio, and the reason behind service quality viewpoint may be either lack of understanding of the viewpoint, or lack of methods for systematic IT outsourcing management.

This brings us to the next question analyzed, where we asked about potential appreciation of a specialized advanced tool for IT outsourcing (see Table 5.11). Which in fact proved that a tool such as SOURCER framework could potentially fill the gap on the market. More than 62 % of the respondents expressed that they would appreciate such tool in their IT outsourcing agenda, whereas another 20.27 % answered maybe.

[147] Although it is presumable that without any structure like we present in this thesis.

Table 5.11: Questionnaire – Potential appreciation of a specilized advanced tool for IT outsourcing. [author]

Answer	Respondents	
	Number	Percent
Yes	92	62.16 %
No	25	16.89 %
Maybe	30	20.27 %
Do not know	1	0.68 %

5.2.2 Interview results

In the interview, we focused mainly on qualitative information concerning personal experience with IT outsourcing in relation to the presented framework, and on analyzing the overall model settings.

While describing the framework and its use, we asked about domains and their relation to service quality, which once more verifies the analysis from questionnaire. These results can be found on Table 5.12. We also asked about individual metrics connected to these domains and their relation captured essentially in other working hypotheses. Those results can be seen on Table 5.13.

Regarding the verification of hypotheses presented earlier, the interviewees all answered that they agree with the hypotheses H_{CQ01}–H_{CQ07}, which confirms the results of questionnaire mentioned in the previous section. In case of the hypotheses regarding metrics, their response has been also very positive, and they agreed with all the hypotheses H_{CQ001}–H_{CQ020}. Finally, we captured the verification of effect of quality, costs, function, and implementation time on IT outsourcing success, as presented on Table 5.14. As we can see, again, these hypotheses were all accepted by our interviewees.

Having four interviewees from different backgrounds proved to be very valuable for the output, since the variety of topics we discussed lead to various suggestions, which are discussed below. Namely:

Petr Křelina emphasized the need to take into account various regulations in the corporate context. Mainly in banking, some regulation might influence the realization and effective duration of individual steps in the SOURCER framework. He also mentioned the potential utilization for ICT services architecture management in Enterprise Architecture methods. There is a potential to incorporate the framework to some existing services provided by IT, such as financial controlling of IT and benchmarking methods. For instance, such benchmarks could be run on the various services used by diferent branches within the corporate group.

Roman Albrecht mentioned the need for careful presentation to various types of people in the organization. Also, that in a larger organization, there are multiple persons with different roles in relation to service management and acquisition (one defines a strategy, another selects the service, another makes the decision to allocate money, etc.). Also mentioned was a need to make the method as easy as possible, preferably with electronic support (i.e.

Table 5.12: Interviews – Verification of hypotheses related to domains. [author]

Opinion	Respondents verification of working hypotheses			
	Petr Křelina	Roman Albrecht	Miroslav Hübner	Miloslav Marčan
Agree	H_{CQ01}–H_{CQ07}	H_{CQ01}–H_{CQ07}	H_{CQ01}–H_{CQ07}	H_{CQ01}–H_{CQ07}
Disagree	None	None	None	None

Table 5.13: Interviews – Verification of working hypotheses regarding metrics. [author]

Opinion	Respondents verification of working hypotheses			
	Petr Křelina	Roman Albrecht	Miroslav Hübner	Miloslav Marčan
Agree	H_{CQ001}–H_{CQ020}	H_{CQ001}–H_{CQ020}	H_{CQ001}–H_{CQ020}	H_{CQ001}–H_{CQ020}
Disagree	None	None	None	None

Table 5.14: Interviews – Verification of hypotheses related to IT outsourcing success. [author]

Opinion	Respondents verification of working hypotheses			
	Petr Křelina	Roman Albrecht	Miroslav Hübner	Miloslav Marčan
Agree	H_{CQ1},H_{CC1}, H_{CF1},H_{CT1}	H_{CQ1},H_{CC1}, H_{CF1},H_{CT1}	H_{CQ1},H_{CC1}, H_{CF1},H_{CT1}	H_{CQ1},H_{CC1}, H_{CF1},H_{CT1}
Disagree	None	None	None	None

online service). Different personality archetypes within the roles also implicate different styles of using the framework and demand various forms of its popularisation.[148] From his experience, dealing with service costs, the prefered financial metrics used in corporate environment are ROI, NPV, and TCO.[149] These metrics together with other parts of the framework are a good source for benchmarking, which has been traditionally a popular thing within midsize-large organizations. It is important to emphasize the strategic aspect of the framework, since service sourcing is also a strategic thing - in case of insourcing there may be lack of human resources. Whereas outsourcing can transfer people to different departments, positions, or companies, which in turn affects employee morale.

Miroslav Hübner suggested an option to extend the Teardrop model with another voluntary additional viewpoint - risk. Although risk itself is an implicit value coded into the service quality viewpoint, there may be some occassions where stating it explicitly could help. For instance, in PRE, everything relies on risk calculations. Therefore for some companies, it would be useful to extend the model with risk viewpoint generated using their existing risk-management systems. With rising spendings on ICT services rises the need for formalization - it is useful to capture things such as service descriptions, service managers and their responsibilities, or maintaining service catalogue. This is an area where the framework might help. Generaly speaking, it has been concluded that it is good solution to keep the framework open for various strategies, since these can vary for different service

[148] Some people prefer a broader structure with much flexibility, whereas others prefer fixed framework desing including detailed specification of components. Some people would appreciate an IT based consulation tool on a self-service basis, whereas others would prefer individual consultations.

[149] Every financial metric has to have some aim, which the framework does luckily emphasize. Use of other metrics is possible, but no-one in the company from the business side really cares in the end. Also, problem with TCO is that it is quite complicated for most companies, and therefore, it is good to have some guideline available. Most importantly, the problem with small companies is that a lot of managers never heard of these financial metrics.

types. Therefore the decision for preference between cost, function, time and quality must remain open. Also, there has to be compatibility with other strategic approaches, tools and methods, such as the Gartner's Bimodal IT.[150] Moreover, with the SOURCER framework, there is definitely a future potential for using it for identification and setting of the criteria for procurement and public tenders.

Miloslav Marčan suggested potential use in formulation and evaluation of public tenders in the public administration segment. Main strengths are the variety of viewpoints and integration of multiple criteria. Currently, many tenders are evaluated with limited number of criteria - mainly price, or overall economic profitability.[151] Identified risk is a possible loss of know-how in case of outsourcing, therefore it is important to keep the strategic aspect in outsourcing decision-making. Given the regularly repeating audits, it may be good for the organization to have such a tool that can track requirements and SLAs of the ICT services, and also expertly set guidelines for outsourcing decision-making. Unfortunately, by the time of this interview they did not find such method. Since the SOURCER framework fulfills these expectations, it could be very useful in a number of areas. Regarding its settings, in public sector, there is a large preference of price. In case of service functions it may be good to have at least 80% coverage of the required non-critical functions, and 100% of critical functions. Mainly used financial metrics are definitely NPV and ROI.

5.3 Chapter summary

This chapter sums up results from our survey, namely the questionnaire and set of interviews.

The survey fulfilled the expectations we had. In the questionnaire we identified and set the individual domain significance coefficients for the overall service quality evaluation, which we subsequently utilize in the proof of concept chapter (see Chapter 6). In the interview, we focused on qualitative information related to SOURCER framework use and possible guidelines of use, putting it within the real organization context. We also accepted all 31 working hypotheses of the overall model dealing with model settings.

With these results it implies that we can reject the null hypotheses H_{A0}, H_{B0}, H_{C0}, and accept the related alternative hypotheses H_{A1}, H_{B0}, H_{C0}. In other words, we can conclude that IT outsourcing success is not a completely random phenomenon, and that it is influenced by various factors. We can also say that financial factor is definitely not the only predictor of the IT outsourcing success, and that IT outsourcing success can be predicted

[150] As mentioned by Heudecker [84]. Following on the long-time academic and practitioner discussion of legacy versus versus emergent systems and how to manage them.

[151] Which is relatively flexible indicator, so it would be great to have a standardized model to set the criteria and use it to evaluate public tender results.

by other than financial factors. Lastly, importance of the individual factors involved in IT outsourcing success prediction is not equal, and it varies.

Survey gives us few important outputs such as the previously mentioned *Domain mean influence on service quality*, which we will use in our calculations. Frequently used financial metrics, and recommended sufficient ratings can assist an organization with decision-making when comparing services using the framework – advantage is that they give the user an idea of what may be recommended by its colleagues more experienced in IT outsourcing.

When we have a look at the interview results, some interesting points come up. Most importantly, the interviewees did not have any complaints about the service quality weights. In fact, all of them agreed on all 31 working hypotheses. Therefore, we may consider this part of the framework validation successful. Given the fact that the interviewees have experience with leading midsize to small IT departments in terms of headcount[152] and at the same time managing a larger number of ICT services, makes them a representative sample for our research. Also, the fact that we captured views from corporate, public sector, and consultancy background makes the results quite interesting in terms of information coverage.

We can find a lot of useful information in the interview comments above in this chapter. Quite interesting is that most of our interviewees identified several similar points that could be addressed. A frequently mentioned was the emphasis of risk-based management methods, which may be reflected by potential individual extension of the Teardrop model – i.e. track the risk as a separate extra viewpoint, keeping and maintaining the information in service catalogue. Benchmarking was also mentioned quite frequently as something that is highly desired by current organizations, and certainly something that the SOURCER framework can provide through its results. Especially in the service quality area and its components. Very important thing is also the strategic aspect of outsourcing. It is good to have the tool to give advice but not force its recommendations to be executed. Interviewees appreciated that various strategies can be combined with the framework, and that it is open to strategic decisions that can occasionally override the straightforward calculations.

[152]Generally speaking about up to 100 IT employees in the department.

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Chapter 6

Proof of concept

This chapter is devoted to presenting a proof of concept of the whole framework with a sample application. While respecting suggestions related to case study research as advised by Myers [134, 133] and more concretely by Yin [208]), it focuses on proving that the concept is applicable in practice, particularly utilizing the descriptive type of case study. In order to illustrate actual use of the framework, we present its application in a real organizational settings. Firstly, we present the background of the organization and its broader description, which covers the first phase of the framework. Secondly, we describe the use of the SOURCER framework on this particular example. This second part consists of the detailed service architecture, analysis of services on the market and presentation of results provided by the framework that generally covers the rest of the framework phases.

This case study follows a structure that emphasizes areas necessary for successful use of the framework in practice. It utilizes a lightweight architectural representation based on the SPSPR approach discussed earlier in the thesis, in order to emphasize ICT services connection to other architectural layers in the organization. This case study, which serves as a proof of concept, illustrates usability of the approach in real-life environment. It can be regarded as a much needed starting point for potential wider framework adoption in future organizational practice.

Both presented parts in combination cover the whole framework, its individual phases, and its major steps as described earlier in the thesis.

6.1 Company background

Company ABC[153] is a wholesaler of military equipment, which operates in the Central European region since 1991.[154] The company is an exclusive distributor in Czech Republic and Slovakia for five premium military equipment brands. These five major suppliers are

[153]The organization expressed its will to remain anonymous, therefore we refer to it as to a Company ABC.

[154]Using the ISIC industry classification, it can be put under class 4690 (non-specialized wholesale trade), which is positioned within section G (Wholesale and retail trade), more concretely division 46, and group 469.

based in United States, Japan, and Israel. Moreover, it covers rest of the military portfolio by reselling products of various other producers non-exclusively. Although it is no longer its main business, the company also maintains ongoing business relations with world producers of weapons and ammunition. The main aim of this is to provide a complete offering of personal equipment for ground combat units. In case of a quote from the military, special forces, or police, the company is able to provide a range of equipment according to the demand from the client.

Number of employees including seasonal workers is seven, whereas the turnover is under two million EUR. This indicates that the organization fits into the definition of a micro enterprise, as described by Eurostat [58] or European Commission [34].

From the viewpoint of organizational IT, majority of activities in this company are currently performed without using a dedicated information system or ICT service. Much of the sales and purchases are managed through telephone and e-mail. Marketing focuses on print advertisements in professional magazines, and on trade exhibitions, demonstrations, and organization of special events. Analysis of web-page traffic and internet advertisement is practically non-existent. However, the information system present is an open-source ERP system (OpenERP) that also includes an accounting module, where the company maintains evidence of inventory, and other relevant data. This ERP is deployed on a server managed by the organization, and includes its own database system based on PostgreSQL. Other ICT resources present are mainly the LAN networks including routers and various network components, and a storage server, where the emploeeys store, archive, and share files necessary for business operations. In order to manage these resources, an essential open-source IT management system is implemented (Zenoss).

We may build strategy of the organization on its business model.

The company focuses on two *customer segments*: military units, and retailers. These two segments differ in multiple aspects as we describe further in this chapter. Main difference is that these two groups are approached by different distribution channels. Military units as customers are driven by the need of equipment or re-equipment in case of combat deployment, or planned annual armaments. Important part of this segment are sudden orders at the end of the year, which may be hard to predict.

Retailers operate their own local shops focused on end-users of the products. Their customers are mainly soldiers adding the gear individually to better match their own preference, which sometimes do not match with the winning bid in public tenders. Other customers include military enthusiasts, sport shooters, recreational shooters, hunters, and players of sports simulating combat-situations such as air-soft or paint-ball.

Value proposition is straightforward: Offering a complete solution for ground military units in one place.

Channels are different for each customer segment. In case of *military units*, the orders are processed with own sales force, which is in majority of cases direct with no intermediaries involved. In order to reach individual customers as described earlier, the organization uses indirect channel type, which is represented by the *retailers*.

In terms of *customer relationships*, both segments are supported by annual shooting competition and other events. Such events help to sustain *community* of educated buyers around the main brands and in the end promote sales. The organization then focuses mainly on personal assistance with the orders and selection of the best portfolio suiting the customer needs.

Revenue streams derive mainly from sales of actual goods. In the segment of military units, the number of orders per unit tends to be small, but with higher overall order value. Retailers tend to order in smaller quantities, but more often, in order to continuously replenish their stock. This situation is reflected in margins, which tend to be slightly larger in case of retail segment. It is mainly due to the need to process orders more often, and overall service provided to retailers.

Key resources are the exclusive distribution rights for the main brands. These rights entirely cover markets in the Czech Republic and Slovakia. Another key resource is rather intangible. It is the personal contact with brand owners, which ensures smoother solution of possible problems that might emerge during business operations.[155] *Key activities* include mainly timely ordering of goods, and actual sales of the goods to customers. These activities are then influenced by promoting the brands on the market. *Key partnerships* are then mainly with the suppliers, which in the end influence time to delivery, order sizes, and possible order frequency. Another important part is the relationship with selected retailers. These get involved mainly in case of a need for niche products to accompany the order[156] as eventual suppliers for the organization.

The primary strategy of the Company ABC takes into account mainly the identified key activities, key partnerships, and key resources of the organization, where it promotes these areas. Goal for the next three years is to increase overall turnover leading to better prices from suppliers and therefore increasing margins and profits. In order to do that, the organization has to optimize sales and make orders from retailers more predictable.

In terms of IT strategy, this means establishing clear measures of the processes and services in the organization. The measurements can not be done without systematic gathering of the data and informed decisions within the organization.

What is especially needed is a dedicated process for marketing and thus promotion of sales, preferably with support of information systems.

[155] These could be problems such as counterfeit products on the market, or retailers ordering products from different wholesaler from abroad and cutting off margins.

[156] In the military units segment.

Given the fact that the organization operates in a specific industry and on a highly competitive market, it is necessary to keep certain information and IT in the organization in order to ensure that nobody has access to these data. Also, given the recent implementation of a new ERP system and IT management system, the organization wants to keep these two systems in place.[157]

6.1.1 Process model

According to the described strategy, we construct the actual global business process model. This model is depicted on Figure 6.1. Due to the fact that we deal mainly with top-level view of the organization and its information systems, we utilize the Ericsson-Penker approach to business modelling as described by Eriksson and Penker [55].

Key processes identified in the Company ABC are the Purchasing and Wholesale. These processes are marked with red colour in order to be better distinguished in the model.

Supporting processes are then Marketing, Logistics, Warehousing, Finance, and Data analysis. Marketing supports the Wholesale process, where it focuses on actual customers of the organization. In order to do this more efficiently, it is further supported by Data analysis, which also connects to Finance. Finance is then interconnected with other processes in the organization. Logistics then connects to finance and both key processes.

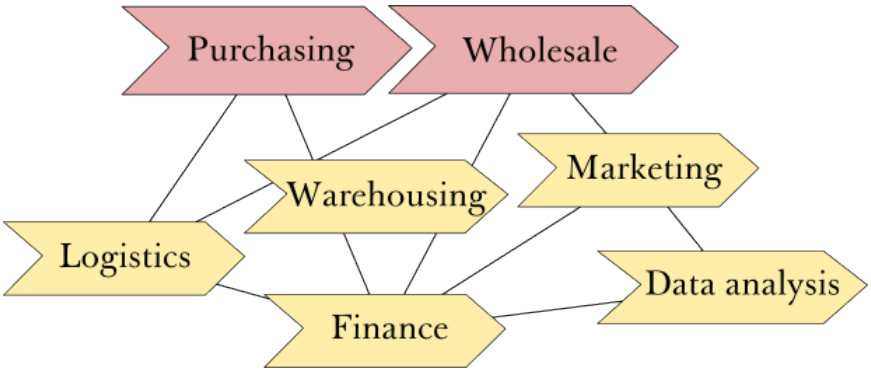

Figure 6.1: Global process model. [author]

Purchasing focuses on purchase of goods and communication with suppliers, which also includes their active search and overall management of purchases. This includes planning of orders in terms of size, distribution in time, potential negotiation of individual offers and mapping alternative solutions. This supply side of the business is limited to fewer entities, and involves a lot more individual considerations.

[157] The organization itself does not have any particular sourcing strategy. However, it highly prefers selecting the best-of-breed solutions rather than limiting itself to one provider or other options, thus the multisourcing strategy would describe its aim the best.

Wholesale involves selling products to actual customers. This can be either retailers or military units as specified earlier in this chapter. The process also includes processing orders, and active search for opportunities. Thanks to the fact that the demand side of the business focuses on much higher number of entities and significantly more orders, it requires different approach than the other key process. In this case, there is much higher need of quantitative analyses.

Warehousing then supports both processes while providing means of storage of goods.

Marketing is then supporting the Wholesale process with methods and techniques to reach the specified goals regarding the sales. It focuses mainly on supporting existing distribution channels, but also on finding new customers. Important part of the process is communication with customers.

Data analysis provides accurate data to the Marketing process as presented earlier. It focuses on gathering data created in both outside and inside the organization, and on finding information that would be relevant for business and its further development. This involves using specific analytic techniques depending on the actual data. Main data sources in this case are the actual orders from customers, their structure, segmentation, aspect of time, and order size. Other sources are actual market data, and various external indicators. This is for instance the number of combat missions, their actual impact on sales, and planned missions and their potential future impact.

Finance process then consists of various financial operations related to the business and its financial accounting. It also includes financial activities within the relations of the business and other entities, such as customers, suppliers, or the government. This process provides financial information to other processes as an output, but also gathers financial information from these processes as its input.

Logistics then focuses on actual transport of goods. This means ensuring successful delivery from suppliers to the organization warehouse in case of Purchasing process, and successful delivery to the customers of the organization in case of Wholesale process. However, as presented earlier, the organization focuses on its main business, and therefore because of strategic reasons the whole Logistics process is outsourced to an external partner.[158] Providing coverage of this process by ICT services within the organization is not necessary, as this is managed also by the external partner. However, the organization has to ensure that the inputs and outputs of the outsourced process are ensured in the connected processes.

In case the organization wants to further map its processes in greater detail, we may suggest using the BPMN 2.0 notation with use of the book written by Silver [173]. Since our interest is mainly to illustrate actual use of the framework, we proceed directly to the next step.

[158] In a form of Business Process Outsourcing.

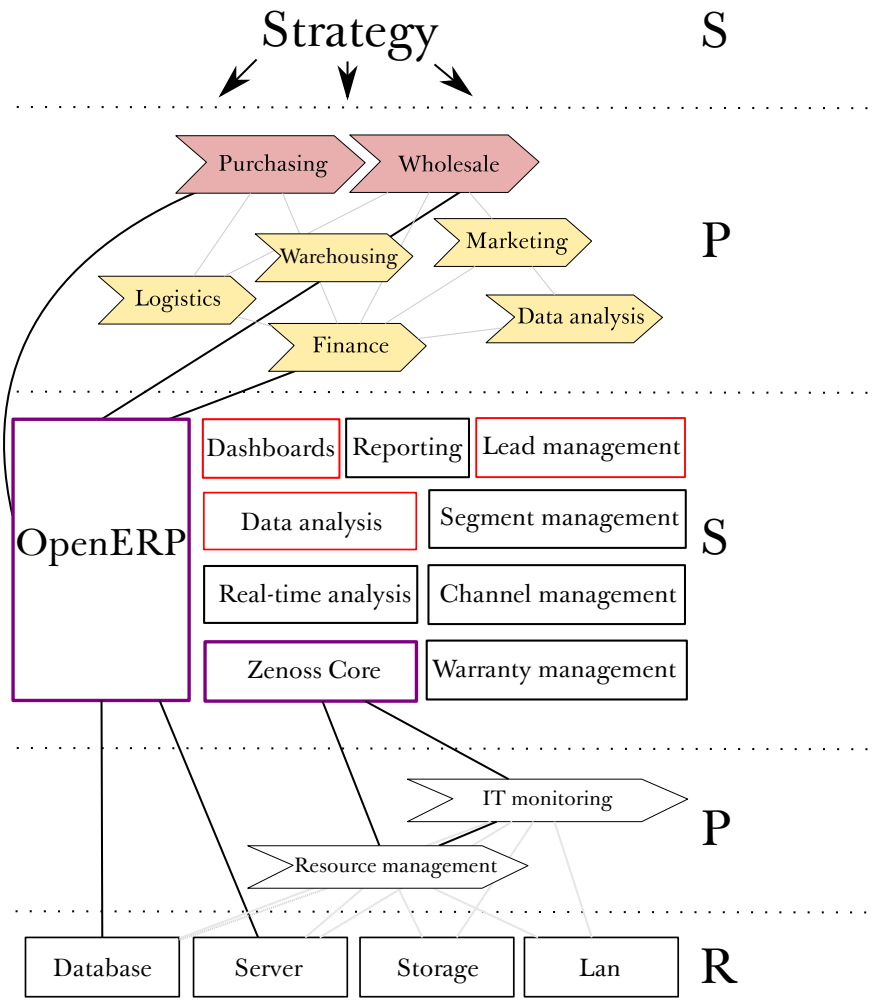

Figure 6.2: Service requirements using the SPSPR model. [author]

From the viewpoint of ICT services we may form the following general requirements. The wholesale, purchasing, warehousing, and finance processes are currently supported by an existing ERP solution OpenERP. In order to monitor ICT resources, a purely ICT process oriented ICT service is the existing service Zenoss Opensource. Both of these processes are provided internally and the organization decided to keep these services in the following years.

Regarding future ICT service selection, most critical is the lead management. Nice to have would be a service that can handle segments, channels and warranties, however, these functionalities are not necessary. As for the connected services, the most critical is the data analysis, which would provide accurate data to the lead management described earlier. Another critical function are the dashboards. Nice to have would be an advanced reporting functionality. These areas might be further shaped with using the functionality analysis as presented in Chapter 4.1.

Current situation in the organization with the existing systems and required ICT services is depicted on Figure 6.2 while utilizing the SPSPR model. This model helps the organization identify actual relation of the existing ICT services to various business processes and also to existing ICT resources. It also helps with finding missing interconnections in the whole model and also assists with summing-up the ICT service requirements.

With identification of the ICT services needed to support business processes of the organization, we may finish the phase I of the SOURCER framework. By finishing this phase, the organization fulfills the necessary organizational conditions.

6.2 Fulfilling necessary framework conditions

In this section we proceed to the next phase of the framework, phase II. Due to the fact that this is an essential example, we limit ourselves to two aggregated application services that are further discussed: the Customer Relationship Management (CRM) service and Business Intelligence (BI) service. We refer to them as to the application services. These application services consist of the individual ICT services identified earlier.

Namely the CRM service consists of lead management, segment management, channel management, and warranty management. The BI service then covers data analysis, dashboards, reporting, and real-time analysis.

We sum up the service catalogue extension in Table 6.1. It is important to mention that the table presented here is only an extension of the full catalogue, which may be quite large, given our aim of illustrating the framework use. The services come already aggregated since they were identified as part of the larger application services. Therefore individual steps within the phase II of the framework are limited to service ranking. This ranking is then created according to the process model mentioned in the previous phase. As the ERP directly supports the key processes, it is considered the most critical service. The CRM service supports a business process that is directly connected to a key process and also is more interconnected in the organization. Therefore it is positioned higher than the BI service. Lowest rank in terms of criticality has the ITM service that is connected to ICT processes and to neither of the business processes directly.

6.3 Selecting relevant sourcing practices for each service

In phase III of the framework we focus on selecting the relevant sourcing practices for each application service. Firstly, in the service catalogue and its extension, we fill in solutions that we want to keep in place. In our case, this is the ERP service OpenERP and the ITM service Zenoss. We also include the actual Service Level Targets (SLTs) for these services and relevant Service Level Requirements (SLRs) that would be sufficient for the service

to fulfil its role in the demanded quality. Secondly, for rest of the services, we use the positioning matrix as depicted on Figure 6.3.

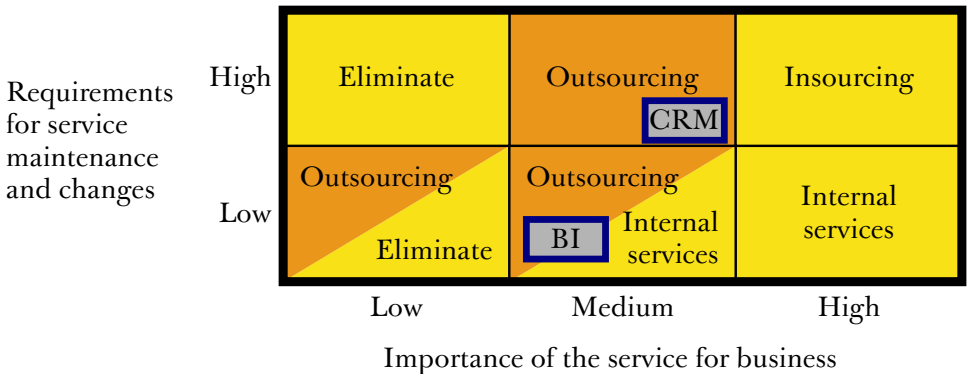

Figure 6.3: Identification of the most suited application service sourcing practices. [author]

As we can see from the strategy and the presented SPSPR model, neither of the two services CRM and BI can be considered highly important for the business. This is due to the fact that they do not support any of the key processes directly. However, both of the services are of a supportive nature with a considerable importance for the enterprise. Therefore the rating on this scale would be medium.

With the CRM service the requirements for service maintenance and changes are high, because of the dynamic nature of the market. Also, the CRM is one of the most often outsourced application services. In case we would keep the CRM in-house, keeping pace with recent advances in the field would be insufficient.

On the contrary, with the BI service these requirements are expected to be low, because the required methods for analysis itself would not change much in the future. More precisely, they might change over time but the Company ABC does not expect radical change of requirements and expectations from their side regarding this service.

Therefore, suggested sourcing practice for the CRM service is outsourcing, while for the BI service it is outsourcing or internal services.

Table 6.1: Extension of the service catalogue. [author]

Name	…	Rank	Sourcing strategy	Solution	SLA
CRM	…	2	outsourcing	tbd–SOURCER	…
BI	…	3	outsourcing, internal services	tbd–SOURCER	…
ITM	…	4	internal services	Zenoss	N/A
ERP	…	1	internal services	OpenERP	N/A

With entering recommended sourcing practices, we have finished phase III. This recommendation indicates, which markets have to be included in the next phase of the framework.

6.4 Available relevant services on the market

This section deals with phase IV of the framework, which focuses on finding available services on the market. In order to identify relevant services offered on the market, an initial search within the relevant application service markets is performed using the web-based catalogue GetApp.com. More insightful analyses of the services in much of the alternatives have to be done through signing up for the trial version and trying the service ourselves.

The CRM service has been selected for possible external provisioning, whereas the BI has been selected for possible external or internal provisioning. We identified several services that might suit our needs.[159] The organization could normally evaluate all these services. In order to better illustrate the overall evaluation, we have identified two options for each application service while excluding the others.[160]

In case of CRM service, the services selected for comparison are the Close.io and Netsuite CRM+. This part of the analysis focuses on comparison of two externally provided solutions. In case of BI service, the services selected for comparison are the Pentaho Community and Tableau Online. This part aims on comparing in-house open-source solution with a solution provided externally.

After selecting service variants suitable for comparison, we may proceed to the next phase of the framework.

6.5 Analysing selected services and recommending best options

Within this section, we evaluate available solutions according to the four viewpoints: function, quality, time, and cost. While evaluating the service quality, we utilize the metrics as suggested in the framework. Important aspect that has been considered are the domain significance coefficients and weights of the individual metrics and of the factors. These act as weights affecting the overall service quality index. In close co-operation with the employees of the Company ABC, we have estimated these weights so that they reflect the priorities of the organization, as well as the previous experience of IT managers as captured in the survey.

The used significance coefficients reflect the priorities of the organization, based on experience of the author, and interview and questionnaire results.

The following subsections deal with the ICT service evaluations individually, while the last subsection summarizes the aggregated results.

[159] For CRM services we identified Insightly, Salesforce, Close.io, Zoho CRM, Netsuite CRM+, Pipedrive, and Enquiry. For BI services, we identified BIME, Jaspersoft, Pentaho, Pentaho Community, Yurbi, Tableau Online, Tableau Server, and Gooddata.

[160] This exclusion could also happen because of the service not meeting minimal level in one or more quality attributes as set by the organization.

6.5.1 CRM service

From the viewpoint of function coverage, which is an starting point in our evaluation, we have identified critical and regular requirements earlier in this chapter. In order to assess this viewpoint, it was necessary to use the trial version of the service and map the functions actually provided. Within the ratings, the value 1 means that the function is fully covered, while rating 0 means that the service is not covered within the solution. In some cases it was relatively easy, because some functions form the core of these services. We also found out that some providers do not explicitly state the function in the description, but they actually provide the functionality. In such cases, these functions are covered partially and therefore have an evaluation lover than 1.

Table 6.2: CRM functional coverage evaluation. [author]

ID	Function	Close.io	Netsuite CRM+	Required	Critical
CRM01	Call center management	0	0	0	0
CRM02	Lead management	1	1	1	1
CRM03	Segment management	0.7	1	1	0
CRM04	Field applications	0	0	0	0
CRM05	Interaction center	0	0	0	0
CRM06	Channel management	0.4	1	1	0
CRM07	Warranty management	0.5	0.7	1	0
CRM08	Service contract management	0	0	0	0

The detailed CRM costs evaluation is as follows. Costs calculation is made for *three years*. This time period is also used in TCO and NPV calculations.

Following sections deal with the separate CRM solutions Close.io, and Netsuite CRM+ and the other viewpoints.

Table 6.3: CRM costs evaluation. [author]

Cost	Close.io	Netsuite CRM+
Search		
Cost of up-front evaluation study	2000 CZK	2000 CZK
Cost of up-front proof of concept implementation	3000 CZK	3000 CZK
Acquisition of service		
Cost of service	30200 CZK	117600 CZK
Cost of customisation to meet the business needs	3000 CZK	15000 CZK
Cost of integration (to current platform)	5000 CZK	25000 CZK
Cost of service contract		
Cost of actual contract creation	0 CZK	0 CZK
Cost of contract evaluation	2000 CZK	2000 CZK
Cost of legal advisory	3000 CZK	3000 CZK
Implementation and change		
Cost of migration (data and users)	1000 CZK	1000 CZK
Cost of training	2000 CZK	20000 CZK
Cost of business processes changes	0 CZK	0 CZK
Opportunity cost	0 CZK	0 CZK
Use		
Cost of support services – in house	0 CZK	0 CZK
Cost of support services – contracted	0 CZK	38700 CZK
Cost of maintenance and upgrades	0 CZK	0 CZK
Service scaling cost (for change in user or transaction volumes)	0 CZK	0 CZK
Contract maintenance cost	3600 CZK	3600 CZK

6.5.1.1 Close.io

The Close.io quality evaluation is specified in Table 6.4. We utilized the scales proposed in the framework within Chapter 4.3.

Within the *Architectural fit* domain, the results were quite promising. The integrability of the solution is very high, as there exist dedicated connectors to most of the major third party applications. Medium level of accessibility is specified due to the fact that although the service provides web browser access, there is neither any native mobile application or tailored mobile web-interface.

In the *Quality of service operation* domain the results oscillate around values between medium and high rating. Performance is high with minimal responsiveness issues, reliability is around 96 %, whereas there is also a potential for limited scalability.

The domain of *Pre-contractual preparedness* is mediocre, which is mainly due to the fact that it is a standardized service. There exists a limited level of customization. Mainly it comprises customization of appearance, but also the configuration of functionality is available to some extent.

The *Contract strength* domain oscillates around the medium rating. The provider has some reference installations with mostly good references from its customers, but it is not an established player on the market. The problem is in the extent of SLA use, which is low as the SLA generally does not exist in this case. However, some of the aspects are described in the terms and conditions of the service. Also, in case of not meeting the targets specified in these terms and conditions, the fines only cover cost of the service itself and not any other damage caused by the service.[161]

Domain of *Post-contractual service quality* is then positioned between low and medium rating, whereas the quality metrics with the lowest rating were the emergency preparedness and training. In case of the emergency preparedness, there is only a very little information about any plans in case of unexpected events. The level of training is then influenced by the fact that there exist only few tutorials and a brief user guide. On-line training courses are unfortunately not available. Medium rating is then within the data security and maintenance. The essential rules for data management, ownership and security are covered. Maintenance and support are present and provide generally good performance. Best rating within this domain then has the innovation thanks to the fact that the service constantly adds new features and optimizes its interface.

Servers of the Close.io are located in the United States, therefore the distance from service provider to Company ABC is quite high. Apart from that the *Stability* domain is medium to high rating. Political and economic stability is very high, whereas the quality of the infrastructure is medium especially because the Czech Republic as a country of operation has lower rating than the United States and other transit countries and therefore lowers the evaluation.

The *Understanding* domain is then rated in the medium to high spectrum. Cultural proximity is medium, because although the cultures are different this does not affect communication with the provider. Language skills are very high, while the provider resides in the United States and the staff speaks generally perfect English.

Overall evaluation of the Close.io is described in Table 6.5. Generally speaking, the service covers all critical functions and its costs, implementation time, quality index have very good results.

[161] Such as longer service outages, or provider-induced corruption of the data stored in the related databases.

Table 6.4: Close.io service quality evaluation. [author]

Metric	Weight	D.sign.	Rating	Quality
Integrability	0.83	10 %	9	0.747
Accessibility	0.17		5	0.085
Performance	0.51	38 %	7	1.3566
Reliability	0.36		6	0.8208
Scalability	0.13		6	0.2964
Customisation	0.89	7 %	5	0.3115
Pre-sales testability	0.11		8	0.0616
Credibility of the provider	0.49	16 %	6	0.4704
Extent of SLA use	0.28		3	0.1344
Service quality safeguarding	0.23		5	0.184
Data security	0.31	24 %	4	0.2976
Emergency preparedness	0.14		2	0.0672
Maintenance	0.42		6	0.6048
Training	0.04		2	0.0192
Innovation	0.09		7	0.1512
Geographical proximity	0.48	3 %	3	0.0432
Quality of the infrastructure	0.32		5	0.048
Political and economic stability	0.2		9	0.054
Cultural proximity	0.4	2 %	5	0.04
Language skills	0.6		9	0.108
Total				*5.9009*

Table 6.5: Close.io evaluation. [author]

Functional coverage (normal | critical)	65 %	100 %
Quality	5.9009	
Implementation time	90 hours	
Costs (TCO | NPV)	54800 CZK	340000 CZK

6.5.1.2 Netsuite CRM+

Similarly as in the previous case, we evaluate the Netsuite CRM+ service quality as described in Table 6.6. Surprisingly, Netsuite is much worse in integrability as in there exist only limited APIs that are harder to utilize than dedicated connectors. Also the pre-sales testability of the solution is limited since only limited demo version is available on request. An aspect that adds to this situation is that there is much higher possibility of customisation and therefore the actual solutions may differ.

Other various metrics such as accessibility, reliability, scalability, customisation, provider credibility, data security, emergency preparedness, or maintenance are rated higher than in the case of the Close.io.

Overall evaluation of the Netsuite CRM+ is then described in Table 6.7. Regarding the

Table 6.6: Netsuite CRM+ service quality evaluation. [author]

Metric	Weight	D.sign.	Rating	Quality
Integrability	0.83	10 %	4	0.332
Accessibility	0.17		8	0.136
Performance	0.51	38 %	7	1.3566
Reliability	0.36		9	1.2312
Scalability	0.13		10	0.494
Customisation	0.89	7 %	8	0.4984
Pre-sales testability	0.11		4	0.0308
Credibility of the provider	0.49	16 %	9	0.7056
Extent of SLA use	0.28		5	0.224
Service quality safeguarding	0.23		5	0.184
Data security	0.31	24 %	9	0.6696
Emergency preparedness	0.14		7	0.2352
Maintenance	0.42		8	0.8064
Training	0.04		4	0.0384
Innovation	0.09		6	0.1296
Geographical proximity	0.48	3 %	3	0.0432
Quality of the infrastructure	0.32		5	0.048
Political and economic stability	0.2		9	0.054
Cultural proximity	0.4	2 %	5	0.04
Language skills	0.6		9	0.108
Total				*7.365*

functionality viewpoint, the service is more robust than the alternative. On the other hand, the service is more lengthy in terms of implementation time, and it is also more demanding in terms of costs.

Table 6.7: Netsuite CRM+ evaluation. [author]

Functional coverage (normal | critical)	92.5 %	100 %
Quality	7.365	
Implementation time	238 hours	
Costs (TCO | NPV)	230900 CZK	280000 CZK

6.5.2 BI service

For the BI service, we apply the same logic as with the CRM service. We start with the functional evaluation and proceed to the evaluation of costs, time, and service quality. In case of functions in this comparison, we can see that the covered functionality is very similar, the more interesting comparison is expected to be in the other viewpoints.

Costs calculation is made for *three years*.[162] Given the fact that the requirement for BI ser-

[162]Three years are used in TCO and NPV calculation.

Table 6.8: BI functional coverage evaluation. [author]

ID	Function	Pentaho Community	Tableau Online	Required	Critical
BI01	Data analysis	1	1	1	1
BI02	Reporting	1	1	1	0
BI03	Dashboards	1	1	1	1
BI04	Scorecarding	0	0	0	0
BI05	Performance management	0	0	0	0
BI06	Advanced forecasting	0	0	0	0
BI07	Real-time analysis	0.2	0.5	1	0
BI08	Unstructured data analysis	0	0	0	0
BI09	Audio analysis	0	0	0	0
BI10	Video analysis	0	0	0	0
BI11	Sentiment analysis	0	0	0	0

vice is two users, this makes the cost for service in case of Tableau Online 3000 USD.[163] According to the usual hardware requirements for the Pentaho Community, costs for the following server configuration are calculated: Server Supermicro 1U, Dual Intel® 5500 series Xeon® Quad, 8GB DDR3 ECC RAM.

[163]The calculation is the following: $500(USD) * 2(users) * 3(years) = 3000USD = 59200CZK$.

Table 6.9: BI costs evaluation. [author]

Cost	Pentaho Community	Tableau Online
Search		
Cost of up-front evaluation study	2000 CZK	2000 CZK
Cost of up-front proof of concept implementation	3000 CZK	3000 CZK
Acquisition of service		
Cost of service	43500 CZK	59200 CZK
Cost of customisation to meet the business needs	10000 CZK	5000 CZK
Cost of integration (to current platform)	6000 CZK	3000 CZK
Cost of service contract		
Cost of actual contract creation	2000 CZK	0 CZK
Cost of contract evaluation	0 CZK	2000 CZK
Cost of legal advisory	0 CZK	3000 CZK
Implementation and change		
Cost of migration (data and users)	1000 CZK	1000 CZK
Cost of training	15000 CZK	10000 CZK
Cost of business processes changes	0 CZK	0 CZK
Opportunity cost	0 CZK	0 CZK
Use		
Cost of support services – in house	27000 CZK	0 CZK
Cost of support services – contracted	0 CZK	0 CZK
Cost of maintenance and upgrades	30000 CZK	0 CZK
Service scaling cost (for change in user or transaction volumes)	0 CZK	0 CZK
Contract maintenance cost	3600 CZK	3600 CZK

6.5.2.1 Pentaho Community

Overall evaluation of the Pentaho Community is described in Table 6.11.

Table 6.10: Pentaho Community service quality evaluation. [author]

Metric	Weight	D.sign.	Rating	Quality
Integrability	0.83	10 %	7	0.581
Accessibility	0.17		7	0.119
Performance	0.51	38 %	10	1.938
Reliability	0.36		8	1.0944
Scalability	0.13		6	0.2964
Customisation	0.89	7 %	6	0.3738
Pre-sales testability	0.11		10	0.077
Credibility of the provider	0.49	16 %	8	0.6272
Extent of SLA use	0.28		10	0.448
Service quality safeguarding	0.23		0	0
Data security	0.31	24 %	3	0.2232
Emergency preparedness	0.14		3	0.1008
Maintenance	0.42		5	0.504
Training	0.04		9	0.0864
Innovation	0.09		5	0.108
Geographical proximity	0.48	3 %	10	0.144
Quality of the infrastructure	0.32		5	0.048
Political and economic stability	0.2		9	0.054
Cultural proximity	0.4	2 %	10	0.08
Language skills	0.6		9	0.108
Total				*7.0112*

Table 6.11: Pentaho Community evaluation. [author]

Functional coverage (normal | critical)	80 %	100 %
Quality	7.0112	
Implementation time	208 hours	
Costs (TCO | NPV)	143100 CZK	544427 CZK

6.5.2.2 Tableau Online

Overall evaluation of the Tableau Online is described in Table 6.13.

Table 6.12: Tableau Online service quality evaluation. [author]

Metric	Weight	D.sign.	Rating	Quality
Integrability	0.83	10 %	9	0.747
Accessibility	0.17		9	0.153
Performance	0.51	38 %	8	1.5504
Reliability	0.36		8	1.0944
Scalability	0.13		9	0.4446
Customisation	0.89	7 %	5	0.3115
Pre-sales testability	0.11		8	0.0616
Credibility of the provider	0.49	16 %	6	0.4704
Extent of SLA use	0.28		5	0.224
Service quality safeguarding	0.23		4	0.1472
Data security	0.31	24 %	4	0.2976
Emergency preparedness	0.14		3	0.1008
Maintenance	0.42		3	0.3024
Training	0.04		9	0.0864
Innovation	0.09		8	0.1728
Geographical proximity	0.48	3 %	3	0.0432
Quality of the infrastructure	0.32		5	0.048
Political and economic stability	0.2		9	0.054
Cultural proximity	0.4	2 %	5	0.04
Language skills	0.6		9	0.108
Total				*6.4573*

Table 6.13: Tableau Online evaluation. [author]

Functional coverage (normal | critical)	87.5 %	100 %
Quality	6.4573	
Implementation time	134 hours	
Costs (TCO | NPV)	91800 CZK	594033 CZK

6.5.3 Aggregated service evaluation results

In case where the possible options potentially exceed the optional individual limit set using the *extent of outsourcing* criterion, we have to consider this in the final decision-making. In case of the Company ABC, this limit is set at 80%, which we do not reach even when choosing all possible outsourcing options. When this limit would be set on 30%[164], we would have to exclude the outsourcing option from the BI service decision.

Overal SOURCER framework application in our case is summarized in Table 6.14. Within either ICT service type[165], the organization utilized the Tear-drop model views.

For CRM service, no solution can be positioned as *intersetion A* solution, therefore we

[164] Which is not advisable.
[165] CRM and BI.

Table 6.14: Application services used in the case study – overall evaluation. [author]

Service name	Function	Critical function	Quality	Time	TCO	NPV	Type	Implemented
Netsuite CRM+	92.50 %	100 %	7.365	283 hours	230900 CZK	280000 CZK	CRM	No
Close.io	65 %	100 %	5.9009	90 hours	54800 CZK	340000 CZK	CRM	Yes
Tableau Online	87.50 %	100 %	6.4573	134 hours	91800 CZK	594033 CZK	BI	No
Pentaho Community	80 %	100 %	7.0112	208 hours	143100 CZK	544427 CZK	BI	Yes

have to reduce on one of the viewpoints. Because of strategy of Company ABC, and the fact that it is a small enterprise, price is a major viewpoint taken into account. Therefore they chose to focus on solution from *intersections C, B, and E*. Given the fact that both solutions offer 100% critical functionality, and that in both TCO and NPV views is the Close.io better, these benefits significantly outweight some of the missing non-critical functionality. The manager estimated that the sacrifice of few functions gives him enough critical functional coverage, and that potential functions in case of Netsuite CRM+ does not justify the cost increase. Close.io was then selected as a sourcing solution.

For BI service, similarly with the previous service type, neither solution can be positioned as *intersetion A* solution. According to strategy of Company ABC the sourcing of BI service should prefer quality and critical functionality over financial and time perspective. There is a preference for BI solutions with more control on operation and keeping the know-how inside the organization, and also, there is a strong sympathy towards open-source solutions. Therefore the Company ABC opted for Pentaho Community, despite being slightly more demanding on the costs side.

According to analysis above, taking into consideration strategic perspective (reflected in taking into account the preference between costs, quality, time, and functions viewpoint for individual services), the Close.io and Pentaho Community were identified as the most suitable solutions.

6.6 Sourcing, integration and execution

According to the application services formation, we may further extend our service structure and interconnections to business processes as depicted on Figure 6.4. Finally, Company ABC summarized the service variants and their ratings, and subsequently decided to select Close.io as a solution for CRM service, and Pentaho Community as a solution of BI service. The company also prepared a plan for implementation and service launch. Given the fact that both services do not interfere with any existing services, there were no restrictions or limitations regarding the implementation time. Based on its strategy and

other factors, the company decided to proceed with other steps of the framework phase for Close.io in August 2014, and for Pentaho Community planned to proceed in late September 2014.

The contract for Close.io was already specified with no flexibility in potential changes of terms and conditions, therefore the actual signature to the contract happens immediately after the implementation project starts. In case of Pentaho Community, there is no need for detailed legal contract since the service will be provided as an internal service on company infrastructure. However, there is a need to specify a Service Level Agreement the same way as it would be with external provider.

Necessary addition to the overall ICT service model is the Integration service, where this service provides technical integration of the OpenERP and the selected solutions. This service is again provided internally, while utilizing quite well documented APIs of both solutions.

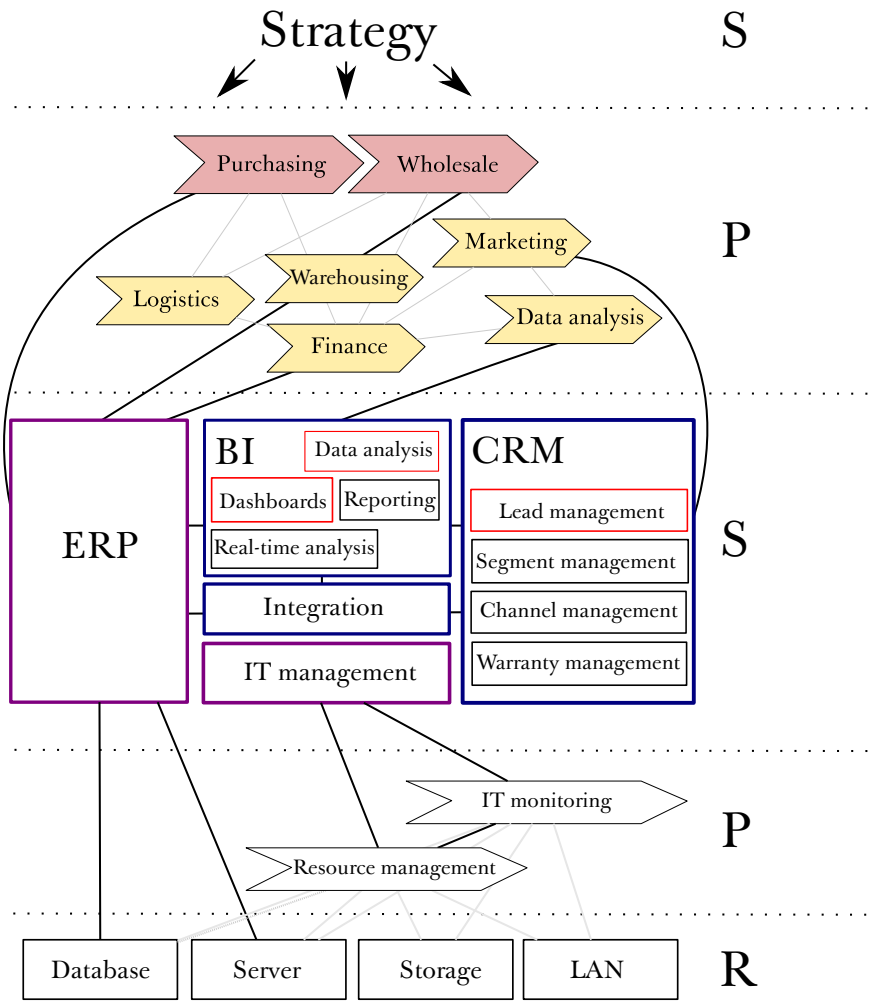

Figure 6.4: Service architecture using the SPSPR model. [author]

Given the expected implementation time, as expressed earlier, the project encompassed implementation of the CRM solution in the first place, and afterwards followed with BI solution. Integration service implementation started continuously with set-up of the Close.io. Regarding the initial expectations, when counting the man-days of the employees assigned to the implementation tasks, both services were approximately estimated correctly. The Close.io was launched in November 2014, whereas the Pentaho Community in January 2015. The organization continuously proceeded to next phase as outlined in the following section.

6.7 Future monitoring

Finally, regarding the phase VII of the framework, the Company ABC focused on monitoring existing alternatives. Given the limited budget and focus on long term solutions, this generally means yearly screening of the considered alternatives such as Tableau Online and Netsuite CRM+, and potentially reacting to significant changes of the services. In practice this involves price changes, and service quality measures when this information is available. The organization has to contrast these with the actual price and service levels gained from the current ICT service portfolio.[166] Due to its limited budget, the organization limits the monitoring on the actual service variants of its CRM (Close.io) and BI (Pentaho Community). However, the same could be potentially applied to any other services used in the organization, such as the ERP (OpenERP) or ITM (Zenoss).

To be able to compare its BI service, provided internally, the organization decided to measure the actual internal service levels. This monitoring as a whole is performed by the current IT administrator with use of the existing ITM service (Zenoss) for measuring the services currently adopted in the organization.

Publicly available information is used in case of the considered externally provided alternatives. In case of any new ICT services appear on the market, these services will be included in the decision-making as suggested.

6.8 Chapter summary

In this chapter, we illustrate actual use of the framework in practice. The chapter itself provides a description of a real organization, including its business model and strategy, which may be considered an essential point when deciding about ICT services outsourcing.

Lessons learnt may be summed up pointing out the main critical points related to use of the framework in practice.

[166] It has to be noted that these actual service levels might be different than the service level targets specified in the contract. Also, the overall quality of the service might be assessed by the end-users providing their own experience about the service. In case of the Company ABC, a meeting focused on ICT service quality evaluation was planned to be scheduled every three months.

This relates mainly to individual ICT service *functions* evaluation, which is by far the most time consuming process in the whole framework. Method used in our example required actual registration in case of externally provided services, and testing installation of the service in order to get certain information. Much of the functionality is not properly structured by the providers as they do not use the same terminology to describe their service functions. Therefore the organization needs to actually explore the service itself while focusing on actual functionality. This is not a problem when the number of required ICT services and available options is low as in this case. However, with more complex situations, this may require significant amount of time to accomplish. This critical point can be reduced with outsourcing part of the workload onto an external provider, or to a specialized internal unit within the organization.

Another critical point is identified within evaluation of the ICT service *quality*. In some cases the actual Service Level Agreement has a different form which might be complicated to find or properly assess. In case of most of the ICT services provided as SaaS, the SLA has a form of general terms and conditions, and is covered only partially. Problem is, again, in a fact that this information is in much of the cases not disclosed on the web page or in promotional materials[167]. If they are specified, they are instead presented only in the final contract, or after the registration in the actual dashboard of the service. Existence of these general SLAs and safeguarding might have an impact on contract strength, and therefore searching for SLA in various information sources might help greatly with this part of the evaluation.

The actual use of the framework has been evaluated by the employees of the Company ABC very positively, since it helped them gain foothold with their ICT service sourcing decision.

To be more precise, the actual application of service approach to IT management assisted them with shaping their requirements and with perception of the resources and their relation to the processes defined within the organization. Instead of focusing on management based purely on rigid organizational structure, or on the more general process approach, the ICT services layer, through SPSPR model showed the interconnections of the system. This is expected to be important especially with expected business growth and in potential future additions to the information system as the requirements posed on IS/ICT might change over time.

Another advantage identified by the Company ABC is a set of service quality criteria, which helped them with the evaluation of individual ICT service solutions.

[167] In some cases, the promotional materials even present misleading information offering only incomplete information about the service levels. An example might be promising 99 % availability of the service while counting it as an average value across all servers, which might bring servers in some locations down to the guaranteed availability as low as 85 %.

The fact that the organization received a set of four evaluations – function, quality, time, and costs – related to various alternatives has been regarded positively by the financial manager and general manager. Instead of focusing on one single value as a score of the service, the framework also provides space for a strategic decision. Overall, the openness to various strategies favours use of the framework in future.

Significant benefit perceived by the employees is the relative simplicity and ease of use when compared to robust IT governance best practices such as ITIL or COBIT, or when compared to major Enterprise Architecture frameworks such as TOGAF.

Following the actual framework use and implementation of the services, we revisited actual situation in Company ABC a year and half after implementation. According to company management, SOURCER framework helped greatly with management and use of ICT services, which added significantly to company effectiveness. They are currently looking to extend the monitoring phase onto other external services. Given limited human resources, they expressed that it would be good to have some tools to make work with the framework more automatized. The framework also enables them to keep track of implemented ICT services, associated Service Level Agreements, and monitor service changes.

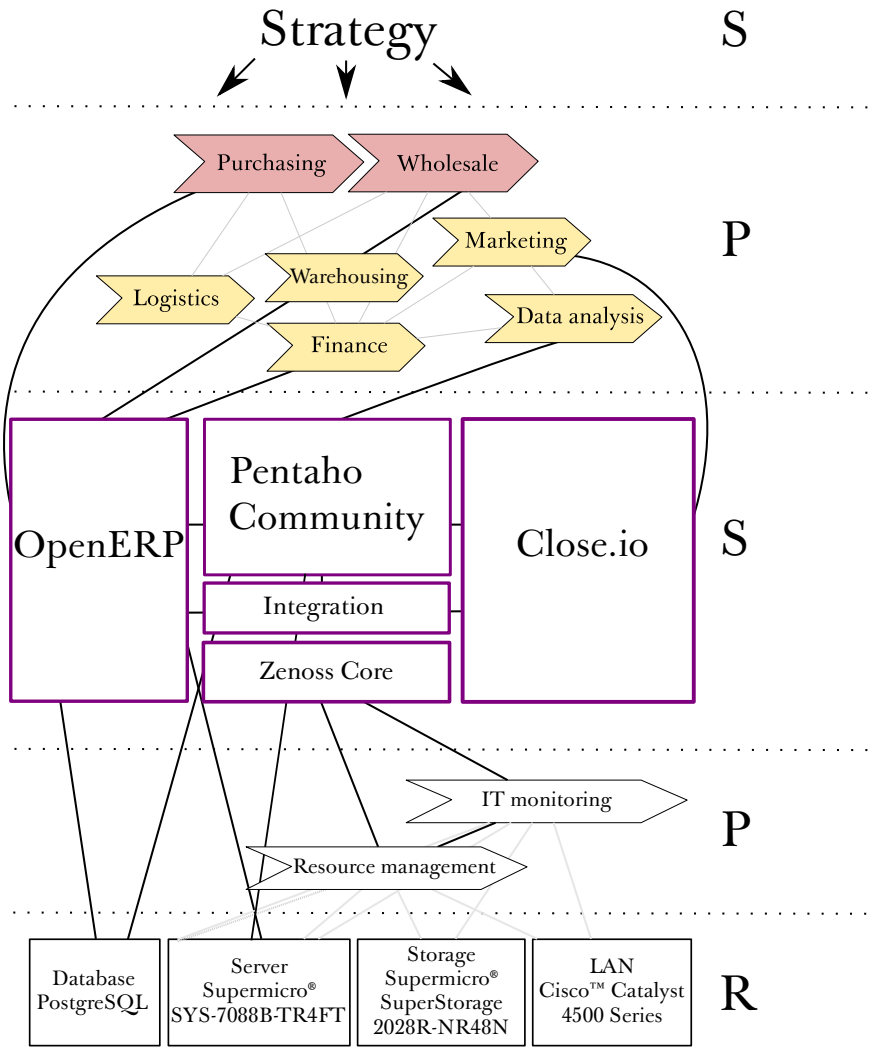

Figure 6.5: Final service architecture using the SPSPR model. [author]

Chapter 7

Conclusions

Information Systems field is built on interdisciplinary base and therefore the thesis uses analysis of multiple research directions. The presented argument is structured as a storyline between various findings from recent research with various backgrounds. The thesis itself dealt with the question of IS/ICT management with focus on ICT service outsourcing.

Building on the current trends influencing IS/ICT management, we may identify the following context of outsourcing: There are ongoing changes on the ICT service market that an ordinary organization is not able to keep tracking. The dynamics associated with such changes can be dangerous for business continuity.

Apart from the changes on the ICT service market, we may observe increase of information system complexity as a phenomena quite often experienced in practice. Together with increase of solution variants (in case of IT outsourcing), it makes IS/ICT management even more complicated. Moreover, relatively new forms of outsourcing emerged – cloud services and software-as-a-Service – that require different management concepts. These services allow rapid deployment and thanks to their architecture effectively position their pricing models to compete with the traditional systems (transfering CAPEX to OPEX).

With the ongoing commoditization of ICT service markets, together with the points expressed above, there is definitely an opportunity for organizations.[168] Especially the Small and Medium Enterprises may potentially compete with larger organization in terms of establishing sound competitive advantage through effective technology adoption and use. Current trends influencing contemporary ICT service market offer many opportunities to a variety of organizations. The emerged Software-as-a-Service concept utilizes on-demand application service provision. Such service could be in most cases deployed at a fraction of time in comparison with the traditional business software applications. This is mainly thanks to the concepts on which they are built on, their innovated business models, and thanks to the ongoing evolution of ICT infrastructures and resources

[168] Those organizations acting as customers on the ICT service market.

Problem of the current situation identified in this thesis and also confirmed by recent research in this area, is that there are insufficient tools do support IT outsourcing decision-making that would enable organizations to choose the most favourable solutions to suit their individual needs. Current approaches such as ITIL, COBIT, TOGAF, ISO 37500 [90], or the ones suggested by Jurison [96], De Looff [44], Han et al. [79], or by Cullen, Seddon, and Willcocks [37] unfortunately do not cover those needs. What is missing are the methodologies, guidelines, and specific tools that would ensure appropriate outsourcing, deployment, integration, and management of such solutions. Although some of the existing methodologies could support a portion of the tasks, they are mostly too much all-embracing, cumbersome, and therefore not very suitable for a majority of potential customers. Therefore there was a place for designing new approach, which initiated this thesis and the research.

In order get the full picture of current context of this area, major areas related to IT outsourcing were studied. Namely, main focus was put onto Enterprise Architecture, Business–IT Alignment, IT Governance and its applications in practice, and Cloud Computing. From the viewpoint of theoretical grounding, the basis of existing outsourcing literature was studied within its various streams that we may identify: Economics, Sociology, Systems theory, Strategy, and respectively other streams including the one of practitioner research. These resources were then utilized in designing and developing our approach – *The SOURCER framework*.

Process–wise according to DSRM the thesis proceeded as follows:

- *Identify Problem & Motivate* – The identification of the problem and motivation was discussed in Chapter 1, where an overall situation was presented and a need for a new approach to fill the research gap was identified.
- *Define Objectives of Solution* – While defining broad objectives of the needed solution in Chapter 1, further shaping of these objectives and boundaries within the Information Systems field was discussed in Chapter 2.
- *Design & Development* – Following the previous steps, an original approach, the SOURCER framework was designed in Chapter 3 to reflect the needs expressed in previous chapters, and it was further developed in Chapter 4 (Sections 4.1, 4.2, and 4.3).
- *Demonstration* – The designed framework was then demonstrated using a descriptive case study approach in Chapter 6.
- *Evaluation* – Various parts of the framework were then evaluated using survey that was described in Chapter 5 (Section 5.2), and throughout Chapter 6.

- *Communication* – Parts of the research concerning the artifact were published on an ongoing basis in a number of academic outlets – international conference proceedings and journals – that are listed in Section 1.6.

The specified objectives have been addressed throughout the thesis, and we may conclude, they have all been fulfilled.

- The primary objective was fulfilled in Chapter 3. The Chapter focuses on Designing a framework for decision-making about ICT service sourcing, including methodology, and criteria for selection of most suited practices as well as particular solutions. This framework was further extended in Chapter 4. Chapter 5 then covers successful validation of the whole framework using a survey, whereas Chapter 6 deals with further validation of the framework through a pilot deployment in selected real business environment.

Moreover, chapters and the fulfilled secondary objectives are as follows:

- Chapter 3 also includes Definition of prerequisites of framework adoption, Identification of factors influencing IT outsourcing success from the viewpoint of end user organizations, and Identification of the decision-making factors and their significance for the selection of solutions (more concretely in Sections 3.5, 3.8).

- Chapter 4 then continues with the Decision-making factor for IT outsourcing success identification, where it further extends them – namely in Section 4.1 (Functions of ICT Services), Section 4.2 (Costs of ICT Services), and in Section 4.3 (Quality of ICT Services).

- Chapter 2 includes Analysis of contemporary sourcing models and presentation of a unified classification of possible IT outsourcing strategies (more concretely in Section 2.6).

- Section 4.1 then includes detailed proposal of possible functional taxonomy of ICT services based on actual situation of the ICT services market.

The framework has been verified utilizing a survey of IT managers with experience with IT outsourcing. In more detail, a questionnaire with unique 148 respondents provided insight into some aspects of IT outsourcing, whereas four selected significant figures from Czech IT Management community discussed the framework use in more detail. The selection of respondents enabled us to get feedback from corporate, public sector, and consultancy background, which makes the results quite interesting in terms of information coverage.

The survey also provided few important outputs: individual domain influence on overall service quality[169], usual financial metrics used in organization, and recommended sufficient rating of individual quality metrics. This information can assist with decision-making when comparing services using the framework – advantage is that they give the user an idea of what may be recommended by its colleagues more experienced in IT outsourcing.

As apparent from the previous chapters, we have successfully managed to design, develop, demonstrate and verify the SOURCER framework. This artifact is unique in a sense that it is based on the service paradigm in IT management, it provides full guidelines for outsourcing including service selection factors, reflects ongoing commoditization of IT, and also given its design it is suitable for Small and Medium Enterprises.

Apart from the verification of our artifact, we managed to identify areas that may be useful in combination with the framework, such as benchmarking[170] which is certainly an area where the SOURCER framework can provide sound base for its utilization. Especially in the service quality area and individual service quality components. Moreover, it is important to emphasize strategic aspect of outsourcing, which influences the framework use.

The framework itself is a complex artifact, and as such could be used flexibly. It depends on the manager, whether he adjusts relative weights of individual service quality metrics within the service quality domains to fit his needs. Also it is possible to use limited viewpoints within the framework use.[171]

Case study presents decision-making about IT outsourcing in real organization Company ABC while utilizing SOURCER framework for this purpose. This proof-of-concept enables us to evaluate framework use in all its phases, while dealing with real-life context. The case study underlines the fact that in these situations a real organization has already set its strategic priorties and preferences, and these can be further reflected in the framework settings and use. Thanks to actual use of the framework, we were able to compare available ICT service variants. Based on the calculation and comparison of various viewpoints, the Company ABC was suggested two services that were subsequently implemented.

7.1 Hypotheses

Given the fact we used hypotheses to code findings of our survey, this section is devoted to summarize these hypotheses. To conclude, underlying working hypotheses were all accepted within the survey.

[169] Which was used in the proof-of-concept calculations.

[170] Benchmarking was also mentioned quite frequently as something that is highly desired by current organizations.

[171] Using just service funtions, and service costs, and only part of the service quality viewpoint – for instance when there is not enough information about compared ICT service variants.

More concretely, the H_{CQ1}, H_{CC1}, H_{CT1} and H_{CF1} were accepted, as well as H_{CQ01}–H_{CQ07}, and also the H_{CQ001}–H_{CQ020}.

With these results it implies that we can reject the null hypotheses H_{A0}, H_{B0}, H_{C0}, and accept the related alternative hypotheses H_{A1}, H_{B0}, H_{C0}. In other words, we can conclude that IT outsourcing success is not a completely random phenomenon, and that it is influenced by various factors. We can also say that financial factor is definitely not the only predictor of the IT outsourcing success, and that IT outsourcing success can be predicted by other than financial factors. Lastly, importance of the individual factors involved in IT outsourcing success prediction is not equal, and it varies.

With all the hypotheses confirmed, we also effectively validated the overall model depicted in Figure 5.1.

7.2 Added value

The thesis has the following original contributions, which form added value for academic community:

- The SOURCER framework and its components.
- Survey with IT managers concerning the area of IT outsourcing experience and framework settings.
- Classification of IT outsourcing strategies based on the relationship aspect summarizing existing approaches.

For practitioners, the framework brings the much needed tool for decision-making about IT outsourcing in the new ICT service, SaaS-centric era.

Apart from the successfull proof-of-concept in Company ABC, the framework has been applied in a number of other organizations, namely:

- *Ministry of Interior of the Czech Republic* – Whole framework was applied as a base material for decision-making about sourcing Enterprise Architecture repository solution for the National Architecture Plan of the Government of the Czech Republic (Realization 1Q – 2Q 2016)
- *Czech Technical University in Prague* – At the time of thesis submission, the application of the framework is in progress in the area of ICT service portfolio evaluation dealing with parts of the ERP system, currently focused on the function and quality viewpoints. Project is currently in its first phase (launched 3Q 2016).
- and *Servodata, a.s.* – Whole framework was applied on the ICT service portfolio of the organization (4Q 2015 – 2Q 2016).

7.3 Future research

Added value of the SOURCER framework potentially grows with the ICT services available to support the framework use. Such service could then lead the user of the framework within, the whole process, separate steps, and offer hints and suggestions throughout these process steps. This could be easily incorporated into existing organizational IS/ICT. This can also serve as a database of Service Level Agreements offering service monitoring and initiate further optimalization suggestions. Generally speaking about the last phase of the framework.

As apparent from the above-mentioned, although the framework can be used for isolated number of services, its added value grows with increasing number of services in the comparison. Another example would be therefore existence of systematical online service catalogue summarizing information on all existing services on the market. This would allow faster evaluation of the service variant. Such database could be contracted externally as a service. Regarding future research in this area, it would be great to shape the benchmark while including as many services as possible, either by automatized data collection, by application of gamification principles on the data collection, or preferably applying both methods in combination.

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Glossary

Application service ICT service that perform functions of software application while utilizing various ICT resources. The application service then supports one or more activities within a business process, or a business process as a whole. [94]

Business-IT alignment Business-IT alignment is the degree of fit and integration among business strategy, IT strategy, business infrastructure, and IT infrastructure. [83]

Business Process Set of logically related tasks performed to achieve a defined business outcome. [42]

Business Process Outsourcing A delegation of one or more business processes to an external provider that, in turn, owns, administers and manages the selected processes. [70]

Framework A real or conceptual guide to serve as support or guide. [192]

ICT Service ICT service is represented by coherent activities and information delivered by ICT service provider to service consumer. ICT service is implemented by ICT processes, which consume ICT resources (hardware, software, data, expertise, etc.) during their execution. Service is realized on the basis of agreed business and technological conditions. [198]

Information Technology Outsourcing IT outsourcing is a significant contribution by external vendors of the physical and/or human resources associated with the entire or specific components of the IT infrastructure in the user organization. [114]

Insourcing using an Internal Service Provider to manage ICT services. [92]

IT Governance Specification of decision rights and accountability framework to encourage desirable behaviour in the use of IT. [201]

Outsourcing Using an External Service Provider to manage ICT services. [92] A process that ensures transfer of responsibilities for a particular service/process/resource onto external provider. [200]

Service-based IT management A management of all processes that cooperate to ensure the quality of live ICT services, according to the levels of service agreed with the customer. [194]

Small and medium enterprises Organisations that have less than 250 persons employed, and that also have an annual turnover of up to 50 million EUR or their annual balance sheet total does not exceed 43 million EUR. [34]

List of abbreviations

ASP Application Service Provision

BI Business Intelligence

BPO Business Process Outsourcing

CAPEX Capital Expenditures

CASE Computer Aided Software Engineering

CEO Chief Executive Officer

CFO Chief Financial Officer

CIO Chief Information Officer

COBIT Control Objectives for Information and related Technology

COTS Commercial Off-The-Shelf

CRM Customer Relationship Management

DSR Design Science Research

DSRM Design Science Research Methodology

EA Enterprise Architecture

ECM Enterprise Content Management

ERP Enterprise Resource Planning

EVA Economic Value Added

IASW individual application software

ICT Information and Communication Technologies

IRR Internal Rate of Return

IS/ICT Information Systems / Information and Communication Technologies

IT Information Technologies

ITIL Information Technology Infrastructure Library

ITM IT Management

ITO Information Technology Outsourcing

JV Joint Venture

KPO Knowledge Process Outsourcing

MBI Management Business Informatics

MDM The Master Data Management

NPV Net Present Value

NPV+RO Net Present Value + Real Options

OPEX Operational Expenditures

PLM Product Life-cycle Management

PP Payback Period

ROI Return on Investment

SaaS Software-as-a-Service

SCM Supply Chain Management

SDO Software Development Outsourcing

SLA Service Level Agreement

SME Small and Medium Enterprise

SOA Service Oriented Architecture

TASW typified application software

TCO Total Cost of Ownership

TOGAF The Open Group Architecture Framework

TOGAF ADM TOGAF Architecture Development Method

Appendix A

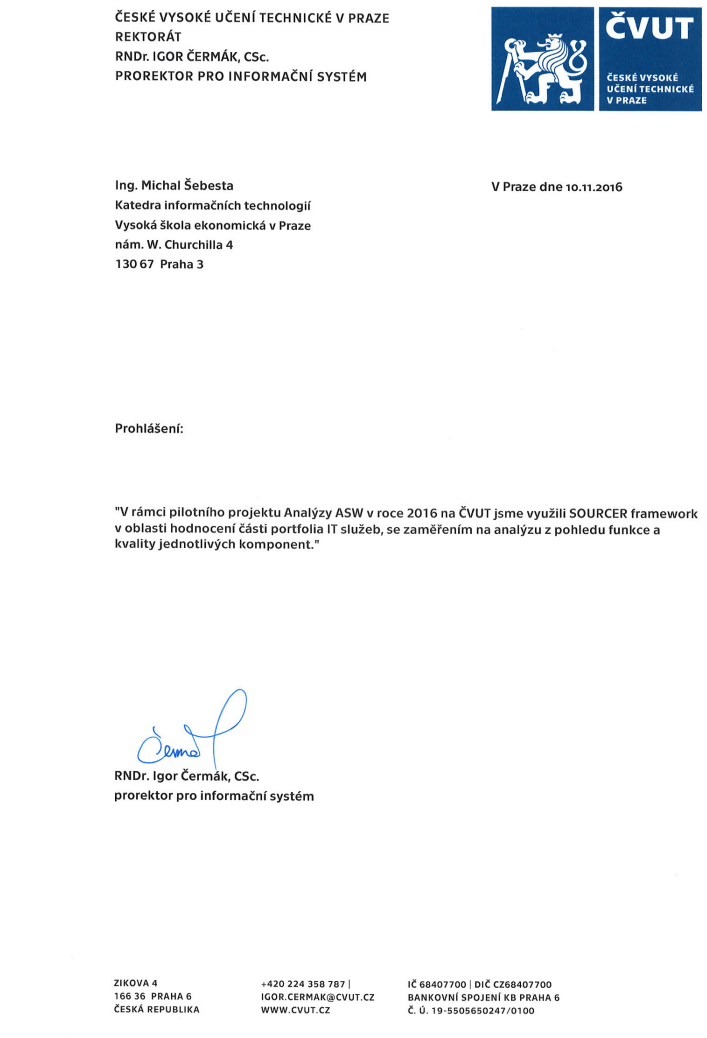
Application services quality evaluation

Table A.1: Application services quality evaluation (global view). [author]

Criteria	Weight	D.sign.	Close.ie		Netsuite CRM+		Tableau Onl.		Pentaho Com.	
			Rating	Quality	Rating	Quality	Rating	Quality	Rating	Quality
Integrability	0.83	10 %	9	0.747	4	0.332	9	0.747	7	0.581
Accessibility	0.17		5	0.085	8	0.136	9	0.153	7	0.119
Performance	0.51	38 %	7	1.3566	7	1.3566	8	1.5504	10	1.938
Reliability	0.36		6	0.8208	9	1.2312	8	1.0944	8	1.0944
Scalability	0.13		6	0.2964	10	0.494	9	0.4446	6	0.2964
Customisation	0.89	7 %	5	0.3115	8	0.4984	5	0.3115	6	0.3738
Presales testab.	0.11		8	0.0616	4	0.0308	8	0.0616	10	0.077
Credibility of pro.	0.49	16 %	6	0.4704	9	0.7056	6	0.4704	8	0.6272
Extent of SLA use	0.28		3	0.1344	5	0.224	5	0.224	10	0.448
Service quality safeguarding	0.23		5	0.184	5	0.184	4	0.1472	0	0
Data security	0.31	24 %	4	0.2976	9	0.6696	4	0.2976	3	0.2232
Emergency prep.	0.14		2	0.0672	7	0.2352	3	0.1008	3	0.1008
Maintenance	0.42		6	0.6048	8	0.8064	3	0.3024	5	0.504
Training	0.04		2	0.0192	4	0.0384	9	0.0864	9	0.0864
Innovation	0.09		7	0.1512	6	0.1296	8	0.1728	5	0.108
Geographical proximity	0.48	3 %	3	0.0432	3	0.0432	3	0.0432	10	0.144
Quality of the infrastructure	0.32		5	0.048	5	0.048	5	0.048	5	0.048
Political and economic stability	0.2		9	0.054	9	0.054	9	0.054	9	0.054
Cultural prox.	0.4	2 %	5	0.04	5	0.04	5	0.04	10	0.08
Language skills	0.6		9	0.108	9	0.108	9	0.108	9	0.108
Total				*5.9009*		*7.365*		*6.4573*		*7.0112*

Appendix B

SOURCER framework in practice



ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE
REKTORÁT
RNDr. IGOR ČERMÁK, CSc.
PROREKTOR PRO INFORMAČNÍ SYSTÉM

ČVUT
ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

Ing. Michal Šebesta
Katedra informačních technologií
Vysoká škola ekonomická v Praze
nám. W. Churchilla 4
130 67 Praha 3

V Praze dne 10.11.2016

Prohlášení:

"V rámci pilotního projektu Analýzy ASW v roce 2016 na ČVUT jsme využili SOURCER framework v oblasti hodnocení části portfolia IT služeb, se zaměřením na analýzu z pohledu funkce a kvality jednotlivých komponent."

RNDr. Igor Čermák, CSc.
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Č. Ú. 19-5505650247/0100

Figure B.1: Confirmation of framework use (Czech Technical University).

servodata group

Váš partner pro náročná ICT řešení

Ing. Michal Šebesta

Katedra informačních technologií

Vysoká škola ekonomická v Praze

nám. W. Churchilla 4

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Potvrzujeme, že společnost Servodata a.s. v rámci řízení IT úspěšně použila v období 4Q 2015 až 1Q 2016 metodiku SOURCER pro zlepšení řízení sourcingu IT služeb. V následujících letech plánujeme navázat v jejím používání pro další potenciální optimalizaci v této oblasti.

Dne 3.10.2016

Ing. Jiří Vyhlačil

předseda představenstva

Servodata a.s., Jankovcova 1037/49 (Classic 7, budova C), 170 00 Praha 7
IČ 25112775, DIČ CZ25112775, www.servodata.net
Zapsáno u MS v Praze, pod spis. zn. B 4593

Figure B.2: Confirmation of framework use (Servodata a.s.).

Appendix C

IT Governance patterns

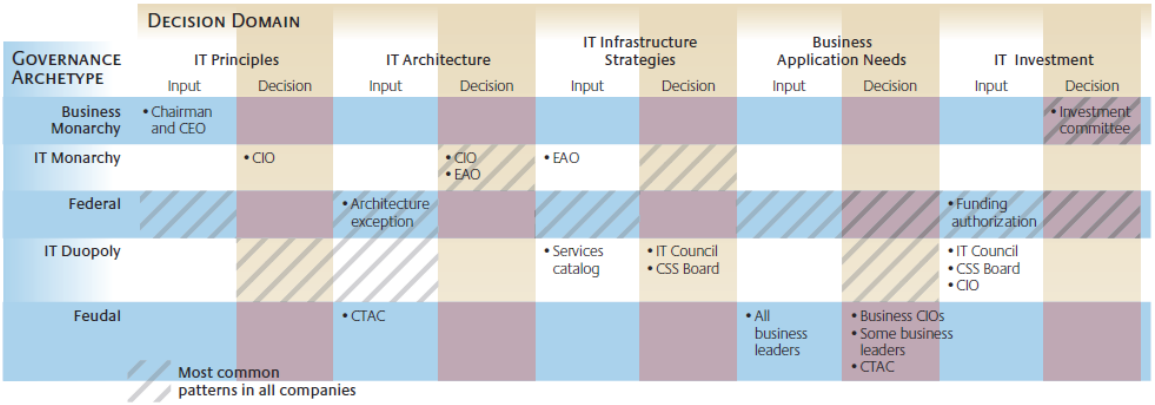

Figure C.1: IT Governance patterns. [201]

The IT Governance patterns may be another useful tool following the comments captured in the interviews about various responsibilities in larger organizations. Figure C.1 depicts responsibilities for decisions in various decision domains, as well as inputs of these decision domains. Depending on the organization governance archetypes in the domains, there may be different roles assigned to decisions effectively influencing *where the IT related decisions are really made* .

The Figure captures the most common patterns with market table cells. The included example then comes from a case study of IT Governance at Carlson Companies that was originally published by Weill and Ross [201].

As mentioned by Tingting Lin and Riitta Hekkala [186] in their recent research, there is also some influence of personal networks in Governance related to IT outsourcing. This may add further dimension to IT Governance Patterns model.

Appendix D

Survey hypotheses

H_{CQ1}: High service quality is likely to have positive impact on perceived IT outsourcing success.

H_{CC1}: Favourable financial metrics are likely to have positive impact on perceived IT outsourcing success.

H_{CF1}: High service functionality coverage is likely to have positive impact on perceived IT outsourcing success.

H_{CT1}: Short service implementation time is likely to have positive impact on perceived IT outsourcing success.

H_{CQ01}: High service integrability is likely to have positive impact on architectural fit of the service.

H_{CQ02}: High quality of service operation is likely to have positive impact on overall service quality.

H_{CQ03}: High pre-contractual preparedness is likely to have positive impact on overall service quality.

H_{CQ04}: High contract strength is likely to have positive impact on service quality.

H_{CQ05}: High post-contractual service quality is likely to have positive impact on overall service quality.

H_{CQ06}: High level of service stability outlook is likely to have positive impact on service quality.

H_{CQ07}: High level of understanding with the provider is likely to have positive impact on service quality.

H_{CQ001}: High service integrability is likely to have positive impact on architectural fit of the service.

H_{CQ002}: High service accessibility is likely to have positive impact on architectural fit of the service.

H_{CQ003}: High performance is likely to have positive impact on quality of service operation.

H_{CQ004}: High reliability is likely to have positive impact on quality of service operation.

H_{CQ005}: High scalability is likely to have positive impact on quality of service operation.

H_{CQ006}: High degree of customisation is likely to have positive impact on pre-contractual preparedness.

H_{CQ007}: High extent of pre-sales testability is likely to have positive impact on pre-contractual preparedness.

H_{CQ008}: High credibility of the provider is likely to have positive impact on contract strength.

H_{CQ009}: High extent of SLA use is likely to have positive impact on contract strength.

H_{CQ010}: High service quality safeguarding is likely to have positive impact on contract strength.

H_{CQ011}: High level of data security is likely to have positive impact on post-contractual service quality.

H_{CQ012}: High emergency preparedness is likely to have positive impact on post-contractual service quality.

H_{CQ013}: High level of maintenance is likely to have positive impact on post-contractual service quality.

H_{CQ014}: High level of training is likely to have positive impact on post-contractual service quality.

H_{CQ015}: High level of service innovation is likely to have positive impact on post-contractual service quality.

H_{CQ016}: High geographical proximity is likely to have positive impact on service stability outlook.

H_{CQ017}: High quality of infrastructure is likely to have positive impact on service stability outlook.

H_{CQ018}: High political and economic stability is likely to have positive impact on service stability outlook.

H_{CQ019}: High cultural proximity is likely to have positive impact on level of understanding with the provider.

H_{CQ020}: High language skills are likely to have positive impact on level of understanding with the provider.

Appendix E

Questionnaire webpage

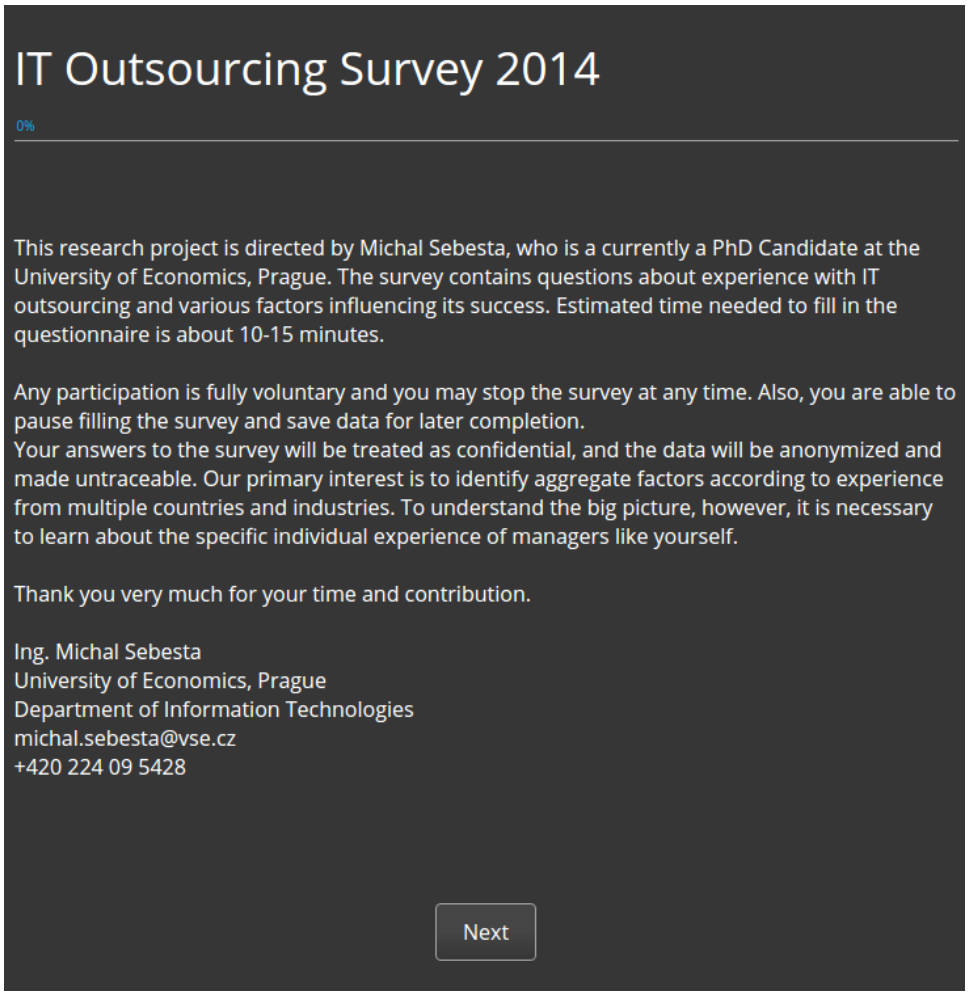

Figure E.1: Questionnaire webpage – introduction of the survey. [author]

Appendix F

IT Management services (alternative)

Table F.1: IT Management services (alternative based on ITIL). [178]

IT Management (ITIL)	
Code	Service
ITIL01	Strategy Generation
ITIL02	Service Portfolio Management
ITIL03	Business Relationship Management
ITIL04	Demand Management
ITIL05	Financial Management
ITIL06	Design Coordination
ITIL07	Service Catalogue Management
ITIL08	Service Level Management
ITIL09	Capacity Management
ITIL10	Availability Management
ITIL11	Service Continuity Management
ITIL12	Information Security Management
ITIL13	Supplier Management
ITIL14	Transition Planning and Support
ITIL15	Change Management
ITIL16	Service Asset and Configuration Management
ITIL17	Release and Deployment Management
ITIL18	Service Validation Testing
ITIL19	Change Evaluation
ITIL20	Knowledge Management
ITIL21	Event Management
ITIL22	Request Fulfillment
ITIL23	Incident Management
ITIL24	Problem Management
ITIL25	Access Management
ITIL26	Service Desk
ITIL27	Operations Management
ITIL28	Application Management
ITIL29	Technical Management
ITIL30	Service Reporting
ITIL31	Service Measurement
ITIL32	Service Improvement

Appendix G

Six Types of Real Options

Option	Definition	How Value is Created	Pitfalls
Stage	A project can be divided into distinct stages where pursuit of each stage is contingent on a reassessment of costs and benefits at the time the preceding stage is completed.	As each stage is completed the ambiguities about the net payoffs from subsequent stages are resolved; only stages with positive payoffs are pursued.	Managers may prefer all-at-once funding to obtain maximum control over a project's fate or to generate full *a priori* commitment to the project.
Abandon	A project can be terminated midstream and remaining project resources relatively easily redeployed.	As a project unfolds actual costs and benefits become more clear, and losses can be curtailed by terminating the project.	Projects tend to take on a life of their own and are difficult to terminate. Abandoning projects can carry intangible costs related to credibility and morale. Resources can't always be productively redeployed.
Defer	A decision on whether to invest can be deferred for some period without imperiling the potential benefits.	The firm avoids investing in what is destined to be a losing proposition. Chances are increased of making the right choice on a crucial project decision.	Strategic benefits often erode with time. Direct experience with a technology is often required to resolve uncertainty.
Strategic Growth	An initial baseline investment opens the door to pursue a variety of potential follow-on opportunities.	Over time, the relative value of follow-on investments becomes more apparent and only investments with positive pay offs are pursued.	Growth options can be difficult to value due to higher ambiguity and the longer time frames often involved.
Change Scale	Resources allocated to a project can be contracted or expanded, or the operational system enabled by a project can be scaled up or down more easily.	The organization can increase the scale of a project/system (and thus the range of potential benefits) if circumstances are favorable; or can reduce the scale (and thus potential losses) if circumstances are unfavorable.	Building in the option to scale up or down can add to project costs. As with the abandon option, scaling down a project can carry intangible costs related to credibility and morale.
Switch	An IT asset developed for one purpose can be redeployed to serve another purpose (switch use). A key foundation technology supporting a project can be swapped out for another (switch inputs).	Over time, the relative value of alternative uses becomes more apparent and only uses with positive payoffs are pursued. If a chosen foundation technology proves less robust than a rival technology, the organization can switch to the rival technology.	If licensed technologies are involved there may be legal restrictions on the ability to switch use. Creating this option usually involves making the system more generic, typically at added expense.

Figure G.1: Six Types of Real Options. [64]