



## **The Utilisation of Information and Communication Technology across the Outsourcing Process**

### **The Vendor's Perspective**

**Perunovic, Zoran; Pedersen, Jørgen Lindgaard; Christoffersen, Mads**

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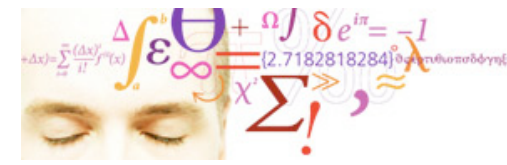
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# Utilisation of Information and Communication Technology across the Outsourcing Process

- The Vendor's Perspective -

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**TECHNICAL UNIVERSITY OF DENMARK  
CENTRE FOR TECHNOLOGY, ECONOMICS, AND MANAGEMENT  
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## PROLOGUE

*"To outsource, or not to outsource? That is the wrong question."  
Silliam Whakespeare*

The dilemma remains. Meanwhile, the lights of the contemporary Globe theatre mottle the stage, crowded with overexcited actors. They compete for the main role, to make the dreams about glory, perfectionism, and money, come true. Not all the actors have the noble artisan virtuosity. Some are good at transformation but bad at diction; others are gifted with divine diction, but perform miserably, and so on, and so forth. Notwithstanding, all of them suffer from a common malady, apart from being in love with not-soft-drinks, the acting amnesia. They can't remember the text. Therefore, the theatrical performance of the Globe theatre divas is dependent on the prompters. The process of remembering has been outsourced, thus enabling the actors to concentrate on their core competences. And, yes, the glory goes to those visible. The audience knows the actors and directors, but the prompters are cast into the darkness beyond the Globe theatre's blazing lights.

*"The lights shall beam those, whose importance is as great as our ignorance about them."  
Author unknown, beginning of the 21<sup>st</sup> century*

# PREFACE

This thesis is submitted as a partial fulfilment of the requirements for the Danish Ph.D. degree. The work was carried out at the Centre for Technology, Economics, and Management within The Technical University of Denmark, during the period September 2005 to November 2008. Associate Professor Mads Christoffersen supervised and Associate Professor Jørgen Lindgaard Pedersen co-supervised the study.

The study was financially supported by the Ph.D. scholarship of the Technical University of Denmark., and the support is gratefully acknowledged.

It has been a privilege to work with Associate Professor Mads Christoffersen, to whom I am grateful for his friendship, guidance, support, and dedication in supervising the study. Every PhD student should have a supervisor like Mads is. I also thank my co-supervisor Associate Professor Jørgen Lindgaard Pedersen for his generous support and wise advice. I am grateful to Associate Professor Howard Williams for his generous support.

I would like to thank my colleagues at the Centre for Technology, Economics, and Management (TEM). They have been inspiring me, providing me with numerous opportunities and challenges, and making me feel at home. TEM is a unique place to be.

I would like to gratefully acknowledge the active role of the management and employees in the case companies. It is a rare opportunity and honour for a researcher to be welcomed, accepted, and supported by the entire top management team. Without their engagement this study would not have been possible. Thank you PROMETHEUS, ASTERION, and CALIFIA.

Many thanks to Tom Togsverd, Jan Zneider, and John Sarborg Pedersen from the Confederation of Danish Industries for their help in mapping the Danish EMS industry. I am grateful to the Tuborg Fund for providing the means for accomplishing the research in California. I am honoured to be one of the laureates of the Tuborg Industrial Economics Prize. I spent unforgettable five months doing research in California, based at the University of San Francisco. I would like to thank Professor Robert Mefford for his kind hospitality and advice and Professor Steven Alter for his guidance in ICT issues.

I am grateful to the international academic community that studies outsourcing. It is a privilege knowing them and discussing the challenges with them.

And finally, I am eternally grateful to my loving family. Thank you Jelena, for your unselfish support and intellectual challenges. Thank you Tara, for following me on this quest. I am proud to be your father. And thank you little Ena, for coming into our lives and bringing the joy in usually hectic last months before submitting the PhD thesis.

Copenhagen  
November 2008

# EXECUTIVE SUMMARY

Vendors' utilisation of ICT across the outsourcing process was explored through the prism of the resource-based view. Since the vendor's competences and capabilities are proven to be important in winning, running and renewing outsourcing contracts we looked into how ICT impacts competences and capabilities, and whether such impact has had further direct or indirect impact on the vendor's performance (measured by win, run, and renew criteria). We explored the impact in the context of the application-creation dimension of technology (Steele, 1989).

We studied three contract electronic manufacturing companies: one that has been creating some of its own ICT applications, and two that are only applying existing ICT applications, where one of those companies has business supportive ICT resources, while the other company's ICT resources are not business process supportive.

The contributions of the thesis to the existing knowledge can be divided into three groups:

- We developed the “topography of outsourcing”, a model for a deep understanding of the outsourcing phenomenon where special attention is given to the development of the outsourcing process frameworks, both from the outsourcer's and the vendor's perspectives
- We proposed that each of the stages in the vendor's process of outsourcing (win, run, and renew) requires a different portfolio of capabilities
- We developed a model of how ICT impacts the performance through the mediating effect of competences and capabilities

Outsourcing shouldn't be considered a simple business practice. Instead, it can be a very complex phenomenon which requires careful consideration throughout its lifecycle. Through the exploration of the outsourcing phenomenon we developed the “topography” of outsourcing, which argues that the outsourcing phenomenon consists of six elements (enablers, types, outcomes, process, theories, and the vendor's perspective). Understanding each of the elements and their possible combinations is the only way to understand the outsourcing phenomenon. The emphasis was put on two elements, the outsourcing process and the vendor's perspective in outsourcing.

The second stream of findings is related to the competences and capabilities which were explored through the competences-capabilities-performance triad. We found that each stage of the outsourcing service provision process (win, run, and renew) requires a different portfolio of capabilities. The findings also suggest that the concept of core function is obsolete, and that competences with the greatest impact on capabilities are actually embedded within several functions, or even on the corporate level, or, finally, in the EMS process itself.

The third group of findings relates to the research framework and ICT impact on the competences-capabilities-performance triad. We found that ICT can have six roles (capability developer, capability enabler, ICT as a capability, competence developer, competence enabler, ICT as a competence) when impacting the triad. The direct impact of ICT on the vendor's performance in the EMS industry is when ICT is a capability developer, under the condition that there are strong ICT competences on the corporate level and in the unit that has created the particular capability. Indirect impact of ICT on the performance can be executed

when ICT is a capability enabler. ICT can enable a capability directly, or as a competence developer of the competence that has strong influences on the particular capability. The EMS provider can have ICT competences in certain units or phases, but that is not a prerequisite for the fulfilment of the indirect type of ICT impact on the performance. However, the more ICT competences are present in more units, the wider and more versatile the impact of ICT on the performance that can be expected. The findings suggest that in the case of indirect impact the ICT infrastructure, applications, and human capital do not need to be business process supportive. However, direct impact can take place only when the three ICT elements (infrastructure, applications, and human capital) fully support the business process. The creation-application dimension of technology does not have any influence on the roles of ICT. For the most effective impact of ICT on the vendor's performance, the ICT department must fully understand the business process, and ICT competences should be present on the corporate level and in all organisational units.



# SYNOPSIS

Tidligere undersøgelser af outsourcing-leverandørernes anvendelse af Information og Kommunikation Teknologi (IKT) på tværs af processens forskellige faser er i høj grad foretaget med udgangspunkt i teorien om Resourced-based view. Eftersom leverandørernes kompetencer og kapabiliteter har stor betydning for at vinde, drifte og forny outsourcing-kontrakterne, har jeg studeret, hvorledes IKT påvirker disse kompetencer og kapabiliteter, og i hvor høj grad en sådan påvirkning har direkte eller indirekte effekt på leverandørernes forretningsmæssige succes (målt ved kriterier for at vinde, drifte og forny kontrakterne). Jeg har undersøgt denne effekt inden for teknologiens anvendelsesskabelsesdimension (Steele, 1989).

I afhandlingen indgår studiet af tre virksomheder, der arbejder inden for elektronisk kontrakt-fremstilling. Den ene har skabt nogle af deres IKT anvendelser, mens de to øvrige blot anvender eksisterende IKT applikationer. Det gælder for disse sidstnævnte to virksomheder, at den ene disponerer over forretningsunderstøttende IKT ressourcer, hvorimod den anden virksomheds IKT ressourcer ikke understøtter forretningsprocesserne.

Afhandlingens bidrag til den eksisterende viden falder inden for tre områder:

- Der er udviklet en model for ”outsourcings topografi”, som muliggør en dybere forståelse af outsourcing-fænomenet med særlig henblik på at udvikle en ramme for outsourcingprocessen. Både ud fra outsourcerens såvel som leverandørens perspektiv.
- Der er fremsat en underbygget antagelse om, at hver af de forskellige faser i leverandørernes proces (vinde, drifte og forny) forudsætter forskellige porteføljer af kapabiliteter.
- Der er udviklet en model for, hvorledes IKT påvirker virksomhedernes forretningsmæssige succes formidlet af effekterne af forskellige kompetencer og kapabiliteter.

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**CHAPTER I**

**INTRODUCTION**

## CHAPTER 1

### INTRODUCTION

Efforts to investigate whether Information and Communication Technology (ICT) is a business opportunity creator or just a contemporary necessity enabling faster and cheaper operations and collaboration still leave us without any clear or unique answers. The debate around the actual utilisation of ICT in business has not, so far, yielded any clearly defined majority opinions. For example, if we take the role of ICT in achieving competitive advantage and embracing new market opportunities, we come across contradictory opinions. Oz (2004) exemplifies how a company can achieve competitive advantage by utilising ICT to reduce costs, raise barriers to market entrants, establish high switching costs, create new products and services, differentiate and enhance products or services, establish alliances, and lock in suppliers and buyers. Davis and colleagues (2003) recognize that it is hard to distinguish whether competitive advantage achieved by a superb IT strategy is a temporary or permanent competitive advantage. This same research revealed that competitive advantage, due to an IT-enabled strategy, is discernable by market participants, and is apparent as a competitive advantage obtained through other means. Both supporting and opposing the previous opinions, Porter (2001) develops a model of ICT utilisation across a company's value chain. However, he argues that the Internet has to be seen as a complement to strategy, and not a strategy in itself.

Put in an outsourcing context, the debate about ICT utilisation becomes even more complex. It is a common perception that outsourcing developed on the back of ICT (Castells, 2000; Hendry, 1995; McIvor, 2005; Click and Duening, 2005). Click and Duening (2005) argue that there are six driving factors in business process outsourcing. They are: broadband Internet availability, inexpensive data storage, online analytic processing, Internet security, educational attainment and business specialization. Four of the drivers are associated with ICT development. Furthermore, there have been many optimistic assertions that ICT should help to overcome barriers of time and space, reduce costs and create business opportunities. The prime role of ICT is to serve as a facilitator in diminishing geographical, cultural, economical and technological distances through enhanced flow of information, transaction and distribution, and quality of decision making (Hultman and Axelsson, 2005). These statements and findings from academic research and general perceptions are very optimistic in crediting ICT as a catalyst for doing business in new ways by outsourcing. Truth of these assertions aside, one question still remains unanswered: how can companies involved in outsourcing (outsourcers and vendors) *actually* utilise ICT in order to satisfy their objectives?

There are many possible ways researchers could step in to address the issue raised above. The application of ICT in contemporary businesses is rich and versatile. However, it seems that the business application of ICT is more sufficiently understood phenomenon than outsourcing is. Therefore it looked quite reasonable to start the framework development process with uncovering the outsourcing phenomenon. This is what we deal with in Chapter 2, where we explore outsourcing and define the “topography of outsourcing”, a framework for a better understanding of the outsourcing phenomenon. The exploration of the topography made us clearly determined to take the vendor's perspective in outsourcing and to study ICT utilisation throughout the vendor's process, superficially consisting of the three phases or business objectives: to win, successfully run, and renew the outsourcing contracts.

In Chapter 3 we develop the research framework by adding, to the existing vendor's perspective, arguments that we should study the vendor's competences and capabilities. We also define that we perceive ICT as consisting of three elements (infrastructure, applications, and human capital). We also define the context of ICT utilisation, stating that we will study companies that create ICT solutions and companies that apply existing ICT solutions. Finally, we raise the general research question in which we state our interest to study how vendors utilise information and communication technologies across the outsourcing processes.

In Chapter 4 we describe how we conducted the study. We explain why we chose to use the qualitative study and why the multiple case study was chosen as a strategy. We justify the choice of three case companies PROMETHEUS, ASTERION, and CALIFIA. Further we present the research design with the protocol and instruments. At the end, we explain how the data were collected and which tactics we used for the data analysis.

Chapter 5 is the most comprehensive part of the dissertation because we conduct the presentation of the cases and the single and multiple case analyses. We start with explaining the dynamics of the chosen electronic manufacturing service (EMS) industry. We continue with the brief description of companies and their EMS processes. Then we embark on capturing the cases' competences, capabilities, and the elements of the ICT system. Thereafter we analyse the impact of competences on capabilities, and their overall impact on the performance. We call that relationship the competences-capabilities-performance triad. Finally we analyse the impact of ICT on the competences-capabilities-performance-triad.

In Chapter 6 we discuss the findings and compare them with the existing complementary and contradictory concepts. In the last chapter we explicitly state the contribution of the research to the existing body of knowledge. We also discuss the limitations and the expected further work regarding the further unveiling of ICT utilisation in outsourcing.



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**CHAPTER II**

**TOPOGRAPHY OF OUTSOURCING**



## CHAPTER 2

# TOPOGRAPHY OF OUTSOURCING

Each phenomenon is just a phenomenon until it has been experienced and well understood. The Ancient Greeks were good in describing the phenomena they experienced or heard and learned about. In order to understand the outsourcing phenomenon, I have tried to γραπην<sup>1</sup> this challenging τοπος<sup>2</sup> of Outsourcing. Topography is the art or practice of graphic delineation in detail, usually on maps or charts, of natural and man-made features of a place or region, especially in a way to show their relative positions and elevations (Merriam-Webster Online Dictionary). I propose that there are six main features or constructing elements of outsourcing that we need to comprehend in order to understand the outsourcing phenomenon properly. Organisations involved in outsourcing should also consider each of the elements prior to deciding to outsource or prior to rolling out the outsourcing projects. These elements are:

1. Enablers
2. Types
3. Process
4. Theories
5. Outcomes
6. Vendor's Perspective

I shall describe those elements, but before that we need to establish some common understanding on the definition and the genesis of outsourcing.

Merriam-Webster dictionary defines outsourcing as “the practice of subcontracting manufacturing work to outside and especially foreign or non-union companies”. Indeed this has been a predominant opinion, but business school academics have tended to deepen this definition in the sense that a task, prior to being outsourced, has been performed internally. Some of the examples of the definitions are given by Kakabadses (2000) in a review article about outsourcing where they say that

*“Outsourcing has been viewed as a form of predetermined external provision with another enterprise for the delivery of goods and/or services that would previously have been offered in-house.”*

...and by Momme (2001) who studied the outsourcing process in manufacturing

*“Outsourcing is the process of establishing and managing a contractual relationship with an external supplier concerning provision of capacity that has previously been provided in-house.”*

The visual interpretation of the outsourcing is given in Figure 2.1.

---

<sup>1</sup> γραπην – to write

<sup>2</sup> τοπος – place

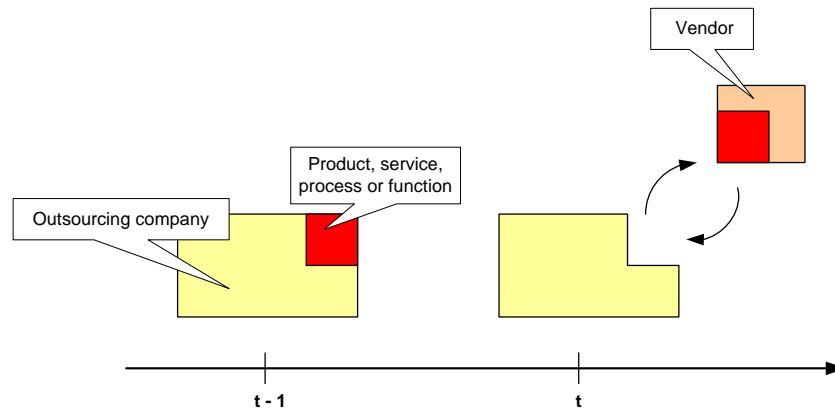


Figure 2.1 – Outsourcing defined

When did outsourcing start? It is perhaps harder to trace the history of outsourcing than the history of the Mayan civilization. If one looks back into the secrets gone-by times and finds an Organisation, not necessarily a business Organisation, that had performed an activity, and then decided to let someone or something else do it, that would be the origin of outsourcing. Would that have been a Stone Age matriarchal woman that outsourced hunting to the subservient male of the species; or Roman emperors outsourcing the watchtowers of the Northern Italian frontier to Noricans; or theatre prompters of Victorian England (see Prologue); or ...? Having another Organisation do something that yours cannot or chooses not to do for itself goes back as far as one cares to look (Corbett, 2005).

There is still no common agreement on the origin of outsourcing. Kakabadse and Kakabadse (2000) found that outsourcing practices date back to XVIII century England and that outsourcing has been in use in numerous industries since it received impetus in the latter half of the 1980s and 1990s in the emerging service sector. Greaver (1999) chooses to go back to the World War II, when systems facilities management was provided to the U.S. government. The term outsourcing was first adopted in 1960s and 1970s, predominantly around manufacturing activities (Corbett, 2005), when Original Equipment Manufacturers (OEM) rethought their manufacturing strategies, and as components became commodities, they started to outsource their production to contract manufacturers (Greaver, 1999; Hadaya et al., 2000). Heywood (2001) argues that such development is a consequence of a new paradigm in competitiveness that started to emerge at that time. Manufacturing is now 70% to 80% outsourced (Corbett, 2005).

Over a short period of time, information technology (IT) outsourcing replaced manufacturing on the “What to outsource” hit-list. IT outsourcing started in the 1970s with the client/server phase due to the expensive processing power (Pati & Desai, 2005; Heywood, 2001), continued with the milestone when Kodak Eastman outsourced its IT activities to IBM, Businessland and DEC in the beginning of the 1990s, followed by the internet-phase of the late 1990s (Lacity and Willcocks, 1995; Pati & Desai, 2005).

## 2.1. The First Element: Enablers

We don't know when outsourcing actually started, but everyone seems to agree that outsourcing became a respectable strategic alternative during the 1980s. There are several enablers (Figure 2.2) that influenced Organisations to reach for outsourcing, but first of all, it

is necessary to understand that outsourcing is a phenomenon deeply embedded within the new economy, interacting with its various elements.

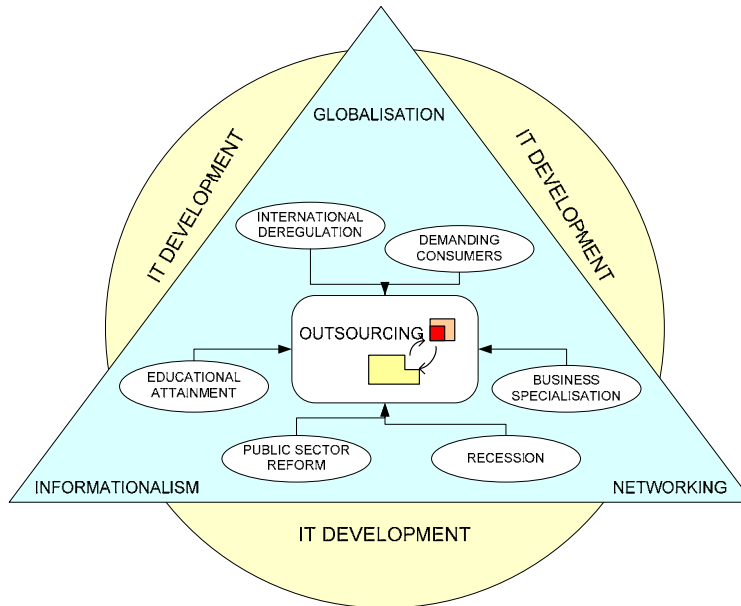


Figure 2.2 – Enablers of outsourcing in the new economy

Influential sociologist from University of California at Berkley Manuel Castells argues that since the 1980s and 1990s contemporary social and economical order has been driven by informationalism, globalization, and networking. These three pillars create a common playground for various settings of business life. The new economy is informational because the productivity and competitiveness depend upon the capacity to generate, process, and apply efficiently knowledge-based information. It is global because business activities are organized on the global scale, and it is networked because activities are performed in a global network of interaction between business networks. Castells adds the information technology revolution as the essential ingredient, “It is the historical linkage between the knowledge-information base of the economy, its global reach, its network-based Organisational form, and the information technology revolution that has given birth to a new, distinctive economic system” (Castells, 2000).

Cambridge professor John Hendry identifies the changes in technology (development of information technology) and international deregulation that made smaller companies more competitive on the global scale as key drivers of outsourcing. He also adds that in the late 1980s and early 1990s the forces of competition were exacerbated by the effects of recession and cost-cutting in all its forms became the order of the day (Hendry, 1995).

Ronan McIvor (2005) distinguishes four changes in the business environment as driving forces of outsourcing. They are globalization, the development of information and communication technologies, public sector reforms, and more demanding consumers. He shares Hendry’s view that globalization has been boosted by international deregulation, while national outsourcing has been co-driven by public sector reforms in many countries. Lonsdale and Cox (2000) explain that it happened when neo-liberal political parties in the UK, such as the Conservative Party, reformed the public sector through a combination of privatization and contracting-out.

Rick Click and Thomas Duening strongly and clearly argue for six driving factors of business process outsourcing. These are broadband Internet, inexpensive data storage, online analytic processing, Internet security, educational attainment, and business specialization. Educational attainment is impressive in some regions which unfairly haven't been previously recognized for the top education they provide. China and India are outgrowing (both relatively and absolutely) the USA and the EU in the number of technical sciences students. Business specialization as a driving factor goes very well with Heywood's (2001) line of thinking that specialization creates IT intensive processes that are suitable for outsourcing. Still four of the drivers are associated with the IT development drawer. Broadband refers to the growing capacity of the Internet, allowing large chunks of information to flow with fewer congestion issues. They also say that the advent of analytic software capable of re-creating and possibly improving human decision making has revolutionised the power of the desktop computer. Where the ideal of the Industrial Age was to eliminate the need for human thinking through mechanical design, the ideal of the Information Age seems to be to improve human thinking through software design. One may think that the ideal of the Information Age seems to be to incorporate mechanical design with human thinking. Security systems today include proxy servers, passwords, authentication, firewalls, encryption layering, certificates, virtual private networks, open systems interconnection, and extranets (Click and Duening, 2005).

### Learning points

There were two groups of trends that gave a strong push to practicing outsourcing. The first trend is the development in IT, and the emergence of the globalization and networking processes. That more fundamental level served as an environment in which some smaller-scale trends have been developing. These are educational attainment, international deregulations, demanding consumers, specialization, recession, and public sector reforms. Eventually, these trends created a fertile environment for Organisations to start pursuing outsourcing as one of their strategies.

## 2.2. The Second Element: Types

Outsourcing terminology has developed significantly over the past decade, though sometimes creating some confusion. I have grouped and systematised the efforts of numerous scholars to define types and/or modes of outsourcing. The types of outsourcing are grouped around several criteria (Table 2.3).

### *Strategic impact*

Outsourcing has a substantial impact on the long and short-term performance of an organisation. However, the level of that impact can vary and it has been described in several types. The differentiation between *strategic* and *non-strategic* outsourcing depends on whether the company has a strategic policy concerning outsourcing, and whether it is prepared to consider the outsourcing of core activities (Alexander and Young, 1996). The outsourcing of a varying mix of non-core processes is described by the term *business process outsourcing*. Typically this mix will include finance and accounting, human resources, procurement, payroll, internal audit, taxation work, customer support centres and a range of industry specific processes (Heywood, 2001). The market for business process outsourcing is still developing with some good niche players and start-ups, but no supplier yet looks able to service all a customer's business process needs (Cullen and Willcocks, 2003). Outsourcing can enable strategic re-focusing or business process re-engineering if the transformational and

transitional types of outsourcing are applied. *Transformational* outsourcing is defined as a long term relationship through which an outsourcing vendor assists the buyer in stimulating continuous business change while also achieving operational effectiveness (Click and Duening, 2005; Linder, 2004). An outsourcer brings in a vendor to completely re-engineer business processes of the function. At the end of the project the outsourcer regains full control and responsibility (Heywood, 2001). *Transitional outsourcing* is the act of handling over legacy systems to enable in-house focus on building the new IT systems (Heywood, 2001; Cullen and Willcocks, 2003). For strategic access to markets companies are applying *value-added outsourcing* i.e., combining client and vendor strengths in order to market products or services commercially (Cullen and Willcocks, 2003).

#### *The amount of work outsourced*

In terms of the amount of work outsourced, we can distinguish two types: *total* and *selective* outsourcing. Total outsourcing is taken to be where 80 per cent or more of an organisation's function or process budget is spent on third party management of assets, people, and activities to achieve required or agreed results (Willcocks & Choi, 1995). Companies that use the total outsourcing strategy are more likely to be focusing on the core competences (Pinnington and Woolcock, 1995), while companies using the selective outsourcing tend to outsource commodity type activities (Willcocks et al., 1995a).

#### *Approaches to outsourcing*

*Incremental* outsourcing involves starting with small portions with discrete contracts, evolving over time into larger contracts. One or more suppliers are selected for pilot-projects. Escalation of outsourcing happens if previous outsourcing is successful (Willcocks et al., 1995a; Cullen and Willcocks, 2003). *Hard-way* outsourcing happens when an organisation is pressed to go into a large-scale outsourcing arrangement without having the experience and clear picture of how to manage the process. During the period of four to eight years, the organisation learns how to manage the process, so next contracts are more successful (Willcocks et al., 1995a). *Big-bang* approach is when significant portions of all activities are outsourced at one time. Cullen and Willcocks (2003) ironically notice that the big-bang is more frequently reported in media than it actually happens. *Piecemeal* outsourcing occurs when each activity is outsourced independently over time combining a variety of vendors (Cullen and Willcocks, 2003).

#### *Number of vendors*

Regarding the number of vendors we distinguish two types:

- *Single vendor* outsourcing
- *Multiple vendors* outsourcing

#### *Level of commitment between outsourcer and vendor*

The kind of outsourcing agreement a company enters into will depend on the kind of relationship it has with the vendor. There are two approaches, which are almost polar opposites (Oates, 1998):

- Transactional
- Relational (partnership)

Outsourcing can start as a transactional, discrete, one-time engagement of vendors (it is common in pharmaceutical industry where a major company contracts a biotech specialist for screening compounds as a part of the drug discovery process), and outgrow over time into a relational mode (Maloni & Benton, 1997).

Criteria	Taxonomy	Manifestation
Strategic impact	Strategic	Strategic policy concerning outsourcing and considering to outsource core activities (Alexander and Young, 1996)
	Business process outsourcing	Outsourced mix of non-core activities (Heywood, 2001; Cullen and Willcocks, 2003)
	Transformational	Long term relationship. Vendor assists in stimulating continuous business change while also achieving operational effectiveness (Click and Duening, 2005; Linder, 2004; Heywood, 2001)
	Transitional	Handling over legacy systems to enable in-house focus on building the new systems (Heywood, 2001; Cullen and Willcocks, 2003)
	Value-added	Client and vendor combine strengths in order to market products or services commercially (Cullen and Willcocks, 2003)
Amount of work	Total	More than 80% of function or process outsourced (Willcocks and Choi, 1995)
	Selective	Less than 80% of function or process outsourced (Willcocks and Choi, 1995)
Approach	Incremental	Starting with small portions with discrete contracts, evolving over time with larger contracts (Willcocks et al., 1995; Cullen and Willcocks, 2003)
	Hard-way	The organisation is pressed to go into a large-scale outsourcing arrangement without having experience and clear picture how to manage the process. Next contracts are more successful because of the learning effect (Willcocks et al., 1995)
	Big bang	Significant portions of all activities are outsourced at one time (Cullen and Willcocks, 2003)
	Piecemeal	Each activity is outsourced independently over time combining the variety of vendors (Cullen and Willcocks, 2003)
Number of vendors	Single vendor	One vendor
	Multiple vendors	Several vendors
Level of commitment	Transactional	One-time or short-term projects (Oates, 1998)
	Relational	Long-time partnerships (Oates, 1998)
Geography	Domestic (On-shore)	Domestic vendor (Smith et al., 1996; Click and Duening, 2005)
	Near-shore	Geographically and culturally close country (Smith et al., 1996; Click and Duening, 2005)
	Off-shore	Geographically and culturally distant country (Smith et al., 1996; Click and Duening, 2005)
Configurational arrangements	Equity holding	Either the outsourcer or the vendor takes an equity stake in the other (Kakabadse and Kakabadse, 2000; Heywood, 2001; Cullen and Willcocks, 2003)
	Co-sourcing	Supplier takes over an activity, or works with a client on it, and gets paid for improvements in the client's business result (Kakabadse and Kakabadse, 2000; Heywood, 2001; Cullen and Willcocks, 2003)
	Spin-offs	Creating a separate company out of an effective IT function, and allowing it to sell its services on the open market, as well as back to the original host company (Kakabadse and Kakabadse, 2000; Heywood, 2001; Cullen and Willcocks, 2003)
	Joint venture	Setting up a new company to exploit a perceived business opportunity (Kakabadse and Kakabadse, 2000; Heywood, 2001; Cullen and Willcocks, 2003)

Table 2.3 – Types of outsourcing

#### *Geographical location of vendor*

From the geographical point of view, a company can outsource to its own country (*domestic* outsourcing) or to another country, which is called *off-shore* outsourcing (Smith et al., 1996). Another similar distinction relates to *on-shore* outsourcing, indicating the domestic location of the vendor, *near-shore* outsourcing indicating the geographical and cultural proximity of the vendor, and finally *offshore* outsourcing indicating a vendor located in a far-a-way country, with, most probably, distinctive cultural differences (Click and Duening, 2005).

### *Configurational arrangements*

Configurational arrangements of outsourcing have much to do with the sourcing decision and choosing the governance mode. Many configurational arrangements are actually associated with different alliance arrangements, rather than a typical outsourcing arrangement. The types of outsourcing according to configurational arrangements are (Kakabadse and Kakabadse, 2000; Heywood, 2001; Cullen and Willcocks, 2003):

- *Equity holding* – either the outsourcer or the vendor takes an equity stake in the other
- *Co-sourcing* – the supplier takes over an activity, or works with a client on it, and gets paid for improvements in the client's business result
- *Spin-offs* – creating a separate company out of an effective IT function, and allowing it to sell its services on the open market, as well as back to the original host company
- *Joint venture* – setting up a new company to exploit a perceived business opportunity

## **2.3. The Third Element: Process**

After more than twenty years of utilisation in industry, many practitioners have realised that successful outsourcing is based on a deeper understanding of the different processes characterising the phenomenon. In addition a more structured approach following distinct phases seems to improve results. This has however only to a limited extent been mirrored in the outsourcing literature. Despite an impressive research intensity of the outsourcing process, there are only few frameworks depicting the actual stages and the layout of the overall process of outsourcing. In Figure 1 (see below) we have presented an overview of some of the frameworks. One of the first efforts to capture the outsourcing process was presented by consultant Maurice Greaver in 1999. He suggested that an outsourcing process should be conducted through seven stages. One of the key characteristics of his model is that it assumes that project teams should be established to justify management's decision to outsource or to challenge that decision with strong arguments. Three years later Jesper Momme (2002) presented six generic phases of the outsourcing process, with built-in key activities performance measures and expected output. Momme augmented the model by adding the contract termination phase, thus emphasizing that the process is time limited. Shortly after, Sara Cullen and Leslie Willcocks (2003) developed a cyclic outsourcing process framework, thus further emphasizing that outsourcing process is not finished after the contract's expiration. The eight stage process is comprises of three general phases: architect, engage, and govern. Cullen and Willcocks developed a series of tools that may be used within the stages of the process. Franceschini and colleagues (2003) proposed the outsourcing process in accordance with the principles of total quality management. The approach is supported by different decision and analysis tools, like benchmarking techniques, multiple criteria decision aiding methods, etc. Michael Corbett (2004) suggests a five-stage outsourcing framework. In addition to the stages, Corbett provides us with the questions to be answered, the decision makers and the time lines associated to each of the stages. He emphasises that the outsourcing process demands a closed loop linking stages and teams. Click and Duening (2005) use a five stages model, but ignore termination issues of the outsourcing project. McIvor (2005) provides a comprehensive framework for outsourcing. The process consists of six stages, where the emphasis is on carefully planning the process. Again, the process is seen as a straight-forward, neglecting its recurrent characteristic.

It is obvious that different frameworks do not provide a unified view of the outsourcing process. Is there a generic model that could embrace all proposals? Probably not, but we can

learn something from analysing the evolution of the outsourcing process framework (See Figure 2.4. below):

- The majority of the stages are concentrated in the first general phase, where the strategic decision regarding whether to outsource or not should be made.
- There are more general phases that emphasise *how to outsource* instead of *whether and what to outsource*.
- Only two frameworks see outsourcing as a closed loop cycle, where the outsourcer shall deal with the post contract-termination situation.

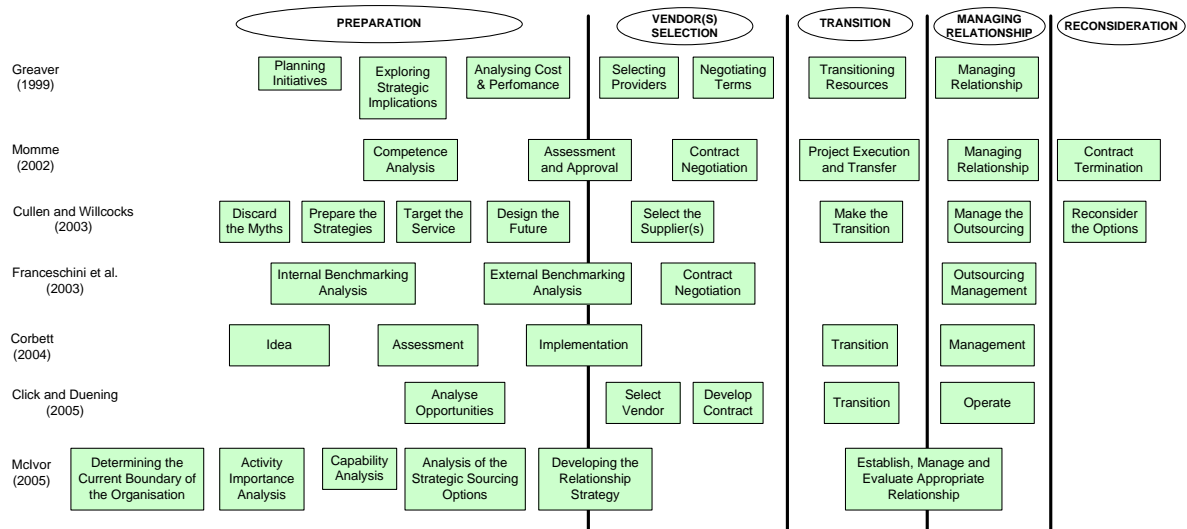


Figure 2.4 - Overview of the outsourcing process frameworks

After carefully examining the content of the stages of each of the proposed outsourcing process frameworks we have aligned the frameworks and grouped the stages into the following sequence: preparation, vendor(s) selection, transition, managing relationship and reconsideration (Figure 2.4.). Each of the stages has to provide an answer to various questions, thus emphasising the complexity of the outsourcing process and arguing for a need that it has to be managed carefully throughout its life cycle (See Figure 2.5.). The cyclic and holistic characteristics of the outsourcing process management are derived from the evolutionary economics (Nelson and Winter, 1982). The evolutionary economic theory lies at the core of process theories. It has received significant application in exploring firm's learning characteristics for improving performance (Simonin, 1997), creating value (Anand and Khanna, 2000), and capabilities (Kale et al., 2002). Still, the evolutionary economics theory is seldom applied to the study of the outsourcing process. Some of the examples include the work of Mahnke (2001), Cullen and Willcocks (2003) and Willcocks and Feeny (2006), and in some fragments Momme (2002) and Corbett (2004).

In the following text we describe more comprehensively the content of the phases of the proposed five-stage cyclic outsourcing process model.



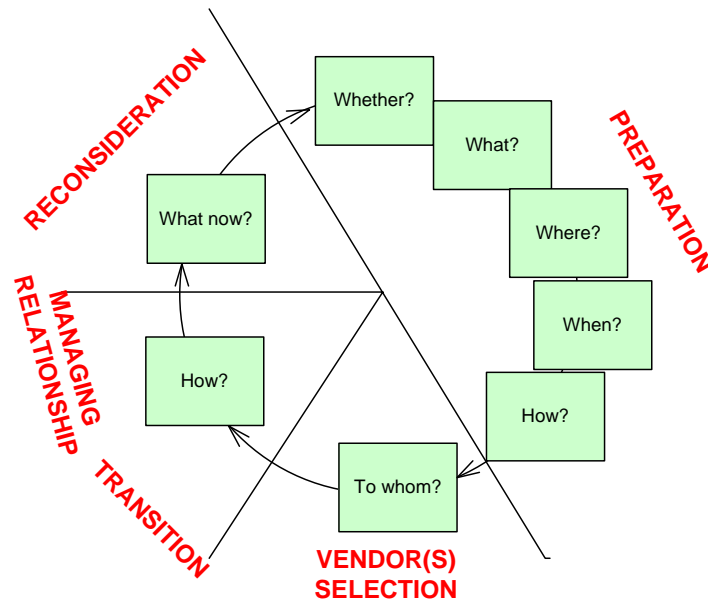


Figure 2.5 – Framework for the process of outsourcing (The Outsourcing Circle)

### 2.3.1. Preparation

The first phase of the outsourcing process should reflect, as Shepherd (1999) calls it, the **underlying philosophy** of an outsourcing agreement. The philosophy of an outsourcing arrangement consists of the objectives of the principal architects of the agreement, along with the set of beliefs that led them to conclude that outsourcing would be an effective and appropriate way to proceed (Shepherd, 1999). Quinn and Hilmer (1994) coined the term “strategic outsourcing” to emphasise distinction between what is the strategic core of the firm and those other activities which are necessary to attain the firm's strategic goals. As Willcocks et al. (1995a) argue, taking a strategic approach to outsourcing means recasting the question “to outsource or not?” into a more useful question: “how do we use, if at all, the opportunity which is available on the market to leverage business advantage?” The issue then becomes not outsourcing, but *rightsourcing*.” In contrast to that, Greaver (1999) proposed as the first stage the formation of cross-functional teams to study and implement outsourcing initiatives. The project team should have really strong arguments to reject top management’s prior decision to outsource.

The major task in this phase is to explore strategic sourcing options, and a significant number of tools has been developed over the time to assist the management in making the right decision. The main debate is that company should keep its core activities in-house, while those not important may be outsourced.

Alexander and Young (1996) suggest four meanings of core activities, as perceived by companies:

1. Traditionally performed activities
2. Activities critical to performance
3. Activities creating competitive advantage
4. Activities driving growth and renewal

Those activities enable competitive advantage, and should therefore be retained in-house. Willcocks et al., (1995) developed a framework for IT sourcing decision, based on six contextual factors from the market: business positioning impact, link to business strategy, future business uncertainty, technology maturity, level of IT integration, and in-house vs. market expertise. Almost ten years later Willcocks, this time with Plant (2003), proposed five different sourcing paths an organisation may take: the in-house development path, the cheap sourcing path, the outsourcing path, the insourcing/partnering path, mixed development paths. Jenings (1996) and Hadaya et al. (2000) used the value chain approach for the sourcing decision. Baden-Fuller et al. (2000) put forward arguments that outsourcing of core skills can be very beneficial for firms, providing the right approach is taken. Situations when outsourcing the core skills is suitable are: catch-up, changing value chains, technology shift, and emerging markets. Momme (2001) proposed four sourcing strategies: make or buy - produce in-house or purchase from suppliers; outsourcing; insourcing; and strategic sourcing – the process of determining whether to provide products or services in-house or through an extended supplier network. Leavy (2004) proposed four outsourcing strategies: focus, scale without mass, disruptive innovation, and strategic repositioning. McIvor (2005) developed a matrix for sourcing decisions, based on activity importance and relative capability position.

The debate in outsourcing gradually moved from whether and what to outsource towards how to outsource, thus fructifying the outsourcing process development by adding the relational dimension i.e., defining the outsourcing approach. Once the **outsourcing philosophy** is set, the **outsourcing approach** should be determined. The outsourcing approach reflects this philosophy, and determines the basic shape of the outsourcing agreements that are concluded (Shepherd, 1999). Cullen and Willcocks (2003) draw up the strengths and weaknesses of three outsourcing approaches:

- Big bang – significant portions of all activities are outsourced at one time
- Piecemeal – each activity is outsourced independently over time and a variety of suppliers are used
- Incremental – one or more suppliers are selected for pilot project(s) with a planned escalation of outsourcing. The escalation occurs if preceding outsourcing is successful

The next step in the preparation phase should be determining the **configurational arrangement** an outsourcing Organisation would like to take. The configurational arrangement relates to a high-level description of the set of choices the Organisation makes in crafting its outsourcing portfolio (Cullen et al., 2005). Depending on various attributes like the scope of work, number and types of suppliers, scale of financial commitments, duration, pricing, resource ownership, and etc, there could be many configurations of outsourcing arrangements such as (Kakabadse and Kakabadse, 2000; Cullen and Willcocks, 2003):

- Multiple vendors
- Joint ventures, cross equities, and franchises
- Spin-offs: individual and joint ventures
- Alliances, consortia and the shared services concept
- Many suppliers
- Preferred suppliers
- Prime contractor with subcontractors
- Sole supplier (one stop shop)

When considering outsourcing as an option, organisation should decide early in the process what type of relationship with vendors would be the most suitable for it. The type of the

relationship is usually determined by the importance of the activity that is to be outsourced, by existing risks on the vendor market, and by the amount of work outsourced.

Ronan McIvor (2005) argues that when activities are critical to competitive advantage and the supply market risk is low, the organisation should deploy a competitive collaborative relationship strategy. If the supply market risk is high the strategy should be close collaborative. In the case when activities are not critical to the competitive advantage, organisations should deploy either adversarial or secure supply strategies, in cases of low and high supply market risk respectively. Franceschini and colleagues (2003) combine specificity and complexity, from the transaction cost economics, to determine four types of relationship: temporary relationship (high specificity-low complexity), traditional vendor (low specificity and complexity), strategic union (low specificity and high complexity), and network organisations (high specificity and complexity). Specificity refers to the level of reutilisation of the considered product/process for many different uses. Complexity refers to the difficulty of monitoring and defining contract terms and conditions of the outsourcing process. Willcocks and Choi (1995) argue that selective outsourcing (less than 80% of an activity is outsourced) cases are rarely referred to in "strategic partnership" terms, and yet often total outsourcing cases (80% and more of an activity outsourced) have very much the same characteristics. There are also higher risks in a total outsourcing situation in the sense that very high costs will be attached to reversing the decision.

In essence, an outsourcing company will seek one of the two polarities of a relationship. It will strive either for a short-term transactional (contractual) or a long-term relational (collaborative) relationship. As a result of outsourcing more critical activities, organisations have been attempting to develop collaborative relationships with suppliers as they seek to reduce the risks associated with outsourcing (McIvor, 2005). Longer contracts tend to be used when (Greaver, 1999):

- The relationship is more strategic
- Outsourced functions and processes are closer to the core competences
- Significant assets are transferred to the vendor
- The vendor has to make significant investments

While shorter contracts are preferred when:

- Significant uncertainties are involved
- The relationship is not strategic
- Outsourced functions and processes are clearly non-core
- Assets being transferred are not significant
- The vendor will invest little in start-up costs

The contract length will affect the types of providers that are asked to respond to the Request for Proposals (Greaver, 1999). Among other things, the length of the contract is determined by the degree of specific organisational knowledge required by the vendor, hence the investment required by the organisation to instil such knowledge (Cullen and Willcocks, 2003). Before writing the request for proposal (RFP), outsourcer has to explore the existence and characteristics of potential vendors, both within domestic and international markets. International outsourcing is a consequence of a firm's ability to search and evaluate foreign suppliers, which is co-determined by its size, multinationality, and frequency of cross-border communications (Mol et al., 2005).

Modelling a future outsourcing relationship reflects the roles to be played by each of the parties once the agreement is in place. Essentially, it is the implementation of the philosophy within the outsourcing approach (Shepherd, 1999). Preparations that an organisation makes before developing the relationship influence forthcoming management and success of the outsourcing relationship (Willcocks and Choi, 1995).

All different strategic options, sub-options, and activities should be benchmarked amongst each other in order to make the final decision that should consist of answers to the questions: **Whether, What, When, Where** and **How** to outsource; or as Willcocks et al. (1995a) suggested, organisations need to pursue in-house improvements first, identify full costs and establish performance benchmarks, pursue further in-house improvements, and only then make in-house vs. outsourcing comparison.

### **2.3.2. Vendor(s) Selection**

Vendor selection has become an increasingly important phase of the outsourcing process. This importance stems from a tendency of outsourcing organisations to engage in more collaborative and relational oriented outsourcing arrangements (McIvor, 2005). If vendor scanning activities from the preparation phase haven't revealed the final candidate for entering the negotiation process, then vendor selection shall be carefully designed. It shall follow a more or less pre-determined path, consisting of writing the request for proposals (RFP), determining evaluation criteria, evaluating and selecting the vendor, negotiating and finalising the contract. The outsourcing company shall choose partner(s) that it will be tied to for a period of time, sharing good and bad, or as Vice President of a multinational company said "When your partner experiences difficulties, you experience difficulties. It's like a marriage with a well-defined point of divorce"

RFP is not the only way to seek vendors. Actually, with the growth of more collaborative outsourcing arrangements, a more collaborative approach in seeking and selecting the vendor is emerging (Corbett, 2004). However, in transactional outsourcing arrangements RFP is still the prevailing way to find an appropriate partner. Michael Corbett (2004) mentions a few critical principles that cannot be neglected by the Organisation in the process of writing the RFP:

- Needing to focus on objectives and results, not resources and methodologies.
- The RFP answering two questions: What results does the organisation seek? How will the organisation determine whether or not those results are being achieved?
- Describing all of the factors that will go into evaluating the vendors' proposals, and even the relative weight that will be applied to each.
- Specifying the information and format required so that the proposals can be readily compared to each other.
- Defining the current problems and costs associated with the existing process.
- Positioning the organisation as good prospective customer.

Before RFP is sent out, the evaluation criteria should be established. Even in the case of collaborative outsourcing, there should be evaluation criteria that will help judging the vendor in the forthcoming phases of the process. Three types of the evaluation criteria should be developed (mandatory, qualitative and cost based), while throughout the whole vendor selection process, the probity issue shall be ultimately emphasised (Cullen and Willcocks, 2003).

In addition an outsourcing company shall make sure that it matches supplier capabilities with its own strategic intent. Fenny, Lacity and Willcocks (2005) provide a list of 12 supplier capabilities that need to be considered while setting the evaluation criteria and actually choosing the partner. These are:

1. Domain expertise – capacity to apply and retain sufficient professional knowledge of the target process to meet the user requirements
2. Business management – ability to consistently meet both client SLA and its own business plan
3. Behaviour management
4. Sourcing – ability to tap the resources needed to meet service targets
5. Technology Exploitation – ability to deploy technology to support critical service improvements
6. Process re-engineering – ability to design and implement changes to the service process to meet improvement targets
7. Customer development
8. Planning and contracting – ability to develop and execute business plans that can deliver win-win results for both customers and suppliers over time
9. Organisation design
10. Governance
11. Programme management
12. Leadership

These capabilities are embedded into three groups of competences that suppliers are expected to have: delivery, relationship, and transformation.

In spite of the preparedness of outsourcers and their carefully thought deterministic approach in the vendor selection there are numerous factors that may influence the assessment of vendors bids (Willcocks et al., 1995):

- Pre-existing evaluation practice
- Sources of hidden costs (in particular the failure to fully define present and future requirements, and unforeseen in-house contract management costs)
- Economic myths in outsourcing (e.g. IT outsourcing vendors are inherently more efficient; savings of 10-50 per cent can only be achieved through outsourcing)

Negotiation of outsourcing agreements requires a different mindset than that required in traditional commercial contract negotiation. Rick Click and Thomas Duening (2003) argue that the negotiation in outsourcing should start as a positive sum negotiation where both parties are interested in creating more resources than currently exist and dividing gains from them. In addition, an outsourcing negotiation should also be collaborative, long-term oriented with flexible terms that create a win-win situation.

Finally, the vendor selection phase shall provide the major output, the contract. Outsourcing contracts may be developed as a single term (fixed one-term), rollover (extendable) or evergreen contracts (Cullen and Willcocks, 2003). The outsourcing contract is the only certain way to ensure that expectations are realised. It may comprise standard elements, although each outsourcing arrangement shall take into account specificities of parties involved and characteristics of the work that is about to be outsourced. An outsourcing contract will include some of the following (McIvor, 2005):

- Service Level Agreement

- Transfer of staff and assets
- Price and payment terms
- Liability
- Contract termination
- Flexibility

Flexibility of contracts is an emerging characteristic of contracts which is being explained by the theory of incomplete contracting. The robustness of the contract is very important and it should serve as an effective mechanism in the case of activities for which complete information exists and future uncertainty is manageable. Ronan McIvor (2005) illustrates numerous methods of incorporating flexibility into a contract through incomplete contracting, thus ensuring that the outsourcer is not locked into a relationship with an uncompetitive partner. These mechanisms include Price flexibility, Renegotiating, Contract length, Early termination.

The vendor(s) selection phase should provide an answer on the question: *To whom* to outsource.

### **2.3.3. Transition**

Having decided to outsource, specified the outsourcing arrangement, chosen the vendor and signed the contract, the outsourcer has to finally ensure that it really has let go of its function, process, product, and/or service. As Greaver (1999) points out “It is like sending your child off to college or military service, you say goodbye with a tear in your eye”. Without doing that, the vendor cannot start to provide the service.

The transition phase makes all planned activities start happening. Its goal is to secure efficient mobilisation (Cullen and Willcocks, 2003). The transition phase is typically focused around transferring assets, people, contracts, hardware and software, information and projects that the vendor will have responsibility for in the future (Greaver, 1999; Cullen and Willcocks, 2003). This process embraces change management. The performance of the transition phase may be measured by the ability to implement the change process (Momme, 2001). An effective change management process requires the following (Click and Duening, 2005):

- Compelling vision of the outcome of the change process
- Visible leadership from top management of organisation
- Extensive communication and opportunities for employee feedback
- Ability to deal with job loss and changeover
- Ability to maintain business continuity and benchmark performance

Regardless of whether the process remains on-site or is moved off-site, there will be a need to transfer process-related information, knowledge, and controls. In addition, during the transition phase it will be necessary to establish information exchange and data interface protocols that mesh the existing standards and information management architectures of each firm (Click and Duening, 2005).

A very sensitive topic is how to handle employees who need to move to the vendor, or those whose employment is going to be terminated. The workflow has to undergo substantial reengineering and establishment of new interfaces (Momme, 2001; Cullen and Willcocks,

2003), since some activities are performed in the new setting. Therefore, internal protocols and procedures need to be specified.

The transition phase imposes another *How* question to be added to our list of outsourcing process questions.

### **2.3.4. Managing Relationship**

The outsourcer and vendor may be engaged in four generic types of relationships (Pinnington and Woolcock, 1997): reciprocal, client dominant, vendor dominant, or preferred vendor. Some relationships may evolve over time, from short-term contractual obligations, to even strategic alliances (Willcocks and Choi, 1995), although only in case of total outsourcing arrangements (See Taxonomy of Outsourcing).

An outsourcing relationship may be maintained in three ways: through contracts, by trust or by hostages (Willcocks and Choi, 1995; Barthélemy, 2003). Contracts are widely used in Anglo-Saxon societies, where there is strong legal enforcement by courts. Trust is common in East Asian societies, where personal relationships based on trust and enforcement by society are important. Hostages are widely used in Eastern Europe and developing regions, where there is neither strong legal enforcement nor high levels of trust in society. More long-term relationships are discouraged by randomness and unpredictable discretion. Barthélemy (2003) distinguishes four types of managing relationship based on soft and hard outsourcing management styles. The soft side of IT outsourcing management refers to the development of relationships based on trust. Trust can be defined as the expectation that the vendor will not take advantage of the client or *vice versa*, even when the opportunity is available. The hard side of outsourcing management refers to development and enhancement of a good contract. Companies achieve most satisfactory outcomes of outsourcing if they complementarily manage by implementing both hard and soft techniques. This phase shall facilitate the success of the outsourcing project, provide added value, establish deeper trust and relationship with partner(s), trace future steps, and secure the company against contractual breaches. Managing relationship phase should provide for the efficient development and application of activities such as:

- Handling meetings and communicating
- Performance monitoring and evaluation
- Applying incentives and penalties
- Solving problems
- Re-negotiating and managing variations

The outsourcer has to establish communication, information and knowledge sharing, and monitoring systems in order to secure a successful outsourcing relationship with its partner, and a successful outsourcing arrangement in general. The degree of knowledge sharing will have a positive effect on the outsourcing process (Lee, 2001). The influence of knowledge sharing on the outsourcing success is moderated by the level of organisational capability and the quality of the partnership. The outsourcing process will be slower and more costly, the less participants are capable and willing to articulate and share their knowledge with the external vendor (Mahnke, 2001).

Critical to success of outsourcing is effective communication among all parties, based on a collaborative relationship. Relationship management is an integral part of each governance

model and can be performed on the strategic, functional and operational levels (Gewald and Helbik, 2006).

An example of building an impressive outsourcing relationship across the global community is the UPS-Motorola experience (Zviran et al., 2001).

The success of the buyer-supplier relationship will be very much determined by how it is managed at the operational level. The strength of the relationship will be dependent on four groups of factors (McIvor, 2005):

- Economic factors – the volume of financial value and supplier's turnover; strategic importance of the buyer to the supplier; exit costs
- Character of the exchange relationship – types of information exchanged; willingness to share information; frequency of communication, level and number of personal contacts, duration of the relationship
- Co-operation between buyer and supplier – willingness to integrate systems; integration of management
- Distance between buyer and supplier – social distance; cultural distance; technological distance; time distance; geographical distance.

Again, another *How*.

### **2.3.5. Reconsideration**

In this phase companies are challenged to provide the answer to the question of *what now?* Reconsideration is an almost completely neglected phase of the outsourcing process, except in few examples. The outsourcing contract can be terminated before expiring as the result of changes in control of the supplier, for convenience, due to insolvency, offence, breach, or default (Cullen and Willcocks, 2003). Sometimes it is not necessary to have a particular reason for terminating the contract. It is called voluntary termination. The third option is the pure expiration of contract.

Outsourcers should use this time to put together two and two and see whether they have achieved success or they have failed, and to decide what they shall do now. As far as common logic allows us to say, there are three possible options (Cullen and Willcocks, 2003):

- Continue with outsourcing with the same partner
- Continue with outsourcing with re-tendering the supplier(s)
- Backsource (it is appropriate to use the term Insource, as well)

The first two options may be conducted by retaining, decreasing or increasing the level and scope of the outsourcing arrangement.

The second option in the reconsideration (changing the supplier) is threatened with high potential switching costs. In buyer-supplier relationships, switching costs are defined as the overall cost or difficulty of switching i.e., additional costs and efforts in changing suppliers (Whitten and Wakefield, 2006). Switching costs are further divided into the following costs: uncertainty costs, post-switching behavioural and cognitive costs, set-up costs, hiring and retraining costs, management system upgrade costs, lost benefit costs, search and evaluation costs, and finally, sunk costs (Whitten and Wakefield, 2006).



### Learning points

The aim of this section has been to provide the reader with a simpler and more operational model for successful outsourcing. We have developed it on the basis of a very thorough analysis of earlier contributions – in particular the frameworks more or less explicitly incorporating different phases of outsourcing. One of the advantages of working with phases is, in our view, the ability to divide a very complex phenomenon (where overview is easily lost) into “time-zones” with distinct tasks.

However contrary to many of the earlier contributions, we do see outsourcing as a cyclical rather than a linear thing. Particularly if one is to conduct continuous successful outsourcing. The cyclical nature of the different phases provides a good opportunity for managers to reflect on past experiences and use these experiences in new initiatives, leading (hopefully) to more successful outsourcing outcomes in the longer run. This could also work as a tool for companies, who might have made several errors earlier, to improve past performance rather than just leave the field with baggage of failure.

## 2.4. The Fourth Element: Theories

Various authors have identified a significant number of theories that underlie the development of the outsourcing phenomenon (cf. Gottschalk and Solli-Sæther, 2005; McIvor, 2005). In order to depict the utilised theories we have conducted a literature study of the research papers in outsourcing from the 1990s up to 2006. Table 2.6 shows the exemplary papers that have utilised various theories to address the outsourcing phenomenon.

Year	Authors	Theory	Method	Key points
1995	Lacity and Willcocks	Transaction Costs Economics (TCE)	Case study	Experiences with the TCE framework of efficient governance structures resulted in anomalies
1995	Pinnington and Woolcock	Core competences	Case study	Growth of IT vendor industry is creating a new firm relationship for the IT function
1995	Willcocks and Choi	Relational view	Case study	Defining characteristics of total IT outsourcing strategic alliances and identifying problems of managing them
1995	Willcocks et al.	Core competences	Conceptual framework	Factors around which IT outsourcing decisions can be based
1996	Aubert et al.	TCE, Incomplete contract theory	Case study	TCE and Incomplete contract theory support the choice of activity to be outsourced and contract management between the outsourcer and its vendor
1996	Ulset	TCE, Property rights theory	Survey	When substantial externalities are involved, e.g. in the supply of R&D, TCE should be combined with property rights theory to explain the use of governance mechanisms
1997	Brandes et al.	TCE, Core competences	Case study	Outcomes are more successful if the outsourcing decision is based on core competence and cost efficiency and if the outsourced unit is able to develop strong resource base
1999	Vining and Globberman	TCE	Conceptual framework	Framework for making the outsourcing decision
2000	Arnold	TCE, Core competences	Conceptual framework	Framework for making the outsourcing decision
2000	Baden-Fuller et al.	Core competences	Conceptual framework	Framework for making the outsourcing decision
2001	Lee	Knowledge-based view,	Survey	Knowledge sharing is positively related to

		Core competences		outsourcing success
2001	Mahnke	Evolutionary economics	Conceptual paper	Propositions regarding scope, speed and switching costs developed
2001	Roy and Aubert	RBV	Case study	The best predictor of success and failure is the governance mode and project position in the value matrix
2001	Zviran et al.	Relational view	Case study	Factors determining success from outsourcer's and vendor's perspectives – good project definition and specifications, good project management, trustworthiness, technical competence
2003	Barthélemy	Agency theory, Relational view	Case study	Managing outsourcing by contracts and trust
2004	Aubert et al.	TCE, Incomplete contract theory	Survey	Uncertainty is a major deterrent to outsourcing, while the level of technical skills is the most important reason to outsource
2005	Barthélemy and Geyer	TCE	Survey	Determinants of outsourcing and quasi-outsourcing decisions
2005	Gottschalk and Solli-Sæther	11 theories	Case study	Core competences and stakeholder theory best explain critical success factors
2005	Pati and Desai	Core competences	Conceptual framework	Framework for making the outsourcing decision
2006	Barthélemy and Quelin	TCE, Resource-based view	Survey	To restrict vendor opportunism, contracts must contain incentives and penalties, as well as pricing and monitoring clauses
2006	Gottschalk and Solli-Sæther	Cumulative theory, TCE, Agency, Contracts, RBV, Core competences, Relational view, Social exchange	Conceptual model	Maturity model of IT outsourcing relationships
2006	Halldórsson and Skjøtt-Larsen	TCE, Agency theory, Contract theory, Relational view	Case study	Challenges TCE, agency, and contract theories and argues for a relational view
2006	Miranda and Kim	TCE, Institutional theory	Survey	The logic of TCE decision maker is contingent on institutional context
2006	Mirani	Evolutionary economics	Conceptual framework	Stages of relationships are contracts, networks and hierarchies
2006	Whitten and Wakefield	TCE, Social-exchange theory	Survey	A second-order switching costs model for specifying switching behaviour

Table 2.6 – Theories utilised in the research of the outsourcing phenomenon

### Transaction Cost Economics

Transaction cost economics (TCE) has been the most utilised theory of outsourcing. The unit of analysis is the transaction between two or more Organisational systems. These transactions are associated with costs that are typically associated with the cost of organizing information, coordinating behaviour, safeguarding the interests of the transacting parties, monitoring the transactions, inducing appropriate behaviour adjustments, re-contracting, etc. Before, after and during the interaction process some transactional difficulties may occur, influenced by bounded rationality, opportunism, small number bargaining, and information impacting (McIvor, 2005).

Outsourcing is a typical example of a make-or-buy decision. TCE has strong influence on outsourcing because it explains (under its own premises):

- When an organisation shall choose outsourcing rather than some other governance mode,
- What contractual safeguards it should include into the outsourcing contract.

The core proposition of TCE is that the attributes of the transaction influence the choice of governance mode. The main attributes of a transaction are asset specificity, uncertainty and measurement problems, and frequency. The governance mode is associated with three generic forms of economic organisation: market, hybrid and hierarchy. Markets and hierarchies are polar modes, while hybrid modes refer to various forms of long-term contracting (Williamson, 1991). The transaction cost view of an inter-firm alliance (and outsourcing) is that of a hybrid governance form (Oxley, 1997). Williamson (1991) defines the hybrid mode by saying that “it is characterised by semi strong incentives, an intermediate degree of administrative apparatus, displays semi-strong adaptations of both kinds (autonomy and cooperation) and works out of a semi-legalistic contract law regime.” Figure 2.7 depicts the transaction cost economics framework i.e. guidance to the governance mode selection.

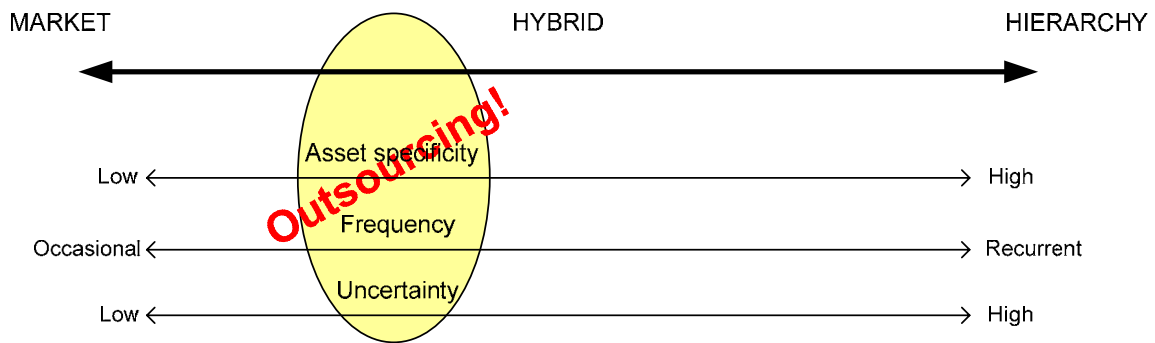


Figure 2.7 – Outsourcing decisions explained by Transaction cost economics

Lacity and Willcocks (1995) define the frequency of occurrence as the number of times the buyer seeks to initiate the transaction and it may either be occasional or recurrent. Asset specificity refers to the degree of customization of the transaction type. It may be highly asset specific if it cannot be readily used by other organisation. Asset specificity may be non-specific (highly standardised), idiosyncratic (highly customised to a specific organisation), or mixed (some aspects of transaction are standard while others are customised). Lacity and Willcocks (1995) summarise Williamson’s efficient sourcing strategies and propose that outsourcing is more efficient than insourcing for all transactions except recurrent-idiosyncratic transactions, asset-specific transactions with a high degree of uncertainty, and transactions with a small number of suppliers. Similar was documented by Aubert et al. (1996) and Mahnke (2001) who say that outsourcing shall be the chosen governance mode if activities:

- do not require investments in specific assets that invite hold-up
- are not subject to a high degree of environmental uncertainty
- are those on which the firm infrequently relies.

This would imply that companies outsource commodity services that involve a low degree of asset specificity.

Another useful issue for outsourcing provided by TCE is the explanation of contractual complexity. When contracts are incomplete because of gaps in specification, the possibility of moral hazard arises on either side of transaction (Oxley, 1997). Reuer and Arino (2005) showed that the contractual complexity is greater for:

- Greater asset specificity

- Time-bound alliances than for open-ended collaborative relationships
- Greater strategic importance of the activity

Even though it has been employed extensively in both alliance and outsourcing applications, the TCE method has several weaknesses. Lacity and Willcocks (1995) found that the original mapping to the TCE framework only explained few IT sourcing decisions and generated much more anomalies in their sample. Another critique could be that TCE relies on a single transaction as a unit of analysis, neglecting the contemporary industrial collaborative arrangements. Finally, TCE is static, which doesn't correspond to the dynamism of current business environment.

### Relational View

Relational view explains how firms gain and sustain competitive advantage within inter-organisational relationships (McIvor, 2005). Its key premise – the concept of relational rents (Dyer and Sing, 1998) has been explored to explain how firms choose their future outsourcing partners and preferred type of the relationship. The relational view argues that more successful partnerships are based on *commitment*, *coordination*, *interdependence* and *trust*, supported by the application of conflict resolution techniques and communication behaviour (Mohr and Spekman, 1994; Click and Duening, 2005). Lee and Kim (1999) found that partnership quality is positively influenced by factors such as *participation*, *communication*, *information sharing*, and *top management support*, and negatively affected by the age of relationship and mutual dependency. A high quality relationship allowing the *flow of knowledge* shall enable the partners to create a successful outsourcing outcome (Lee, 2001). These nine elements act as “relational electrolytes”, a form of conductive medium for the outsourcing relationship.

### Resource-based View

The core premise of the resource-based view is that resources and capabilities can vary significantly across firms, and that these differences can be stable (Barney and Hesterly, 1996). If resources and capabilities of a firm are mixed and deployed in a proper way they can create competitive advantage for the firm. The resource-based view in outsourcing builds from a proposition that an organisation that lacks valuable, rare, inimitable and organised resources and capabilities, shall seek for an external provider in order to overcome that weakness. Therefore the most prominent use of the theory is in the Preparation phase of the outsourcing process for defining the decision making framework and in the vendor selection phase for selecting an appropriate vendor. The theory has been also used to explain some of the key issues of the Managing relationship and Reconsideration phases.

### Concept of Core Competences

The concept of core competences was developed on the basis of the resource-based view. Prahalad and Hamel (1990) defined the core competencies as the collective learning in the organisation, especially how to coordinate diverse production skills and integrate multiple streams technologies. The application of the concept of core competences in outsourcing became very popular among researchers. The concept has been predominantly used to develop and test various outsourcing decision frameworks arguing that the core activities should remain in house. The learning and communication premises of the concept have also made it applicable in the Managing relationship and Reconsideration phases. Vendor competences are assumed to be one of the most important factors that influence the success of an outsourcing arrangement (Levina and Ross, 2003; Feeney et al., 2005).

### Evolutionary Economics

Although mentioned for the first time in <sup>XIX</sup> century, evolutionary economics experienced a revival after Nelson and Winter's work in 1982. The theory was developed from Darwinism and includes some assumptions transposed to the economic "species". This makes the theory highly applicable in outsourcing. However, actual research has been very modest, studying issues predominantly within the Managing relationship phase. The other phases of the outsourcing process (except the transition) have also been explored through evolutionary economics but very scarcely.

### Agency Theory

The focus of the agency theory originally was on the relationship between managers and stakeholders (Jensen and Meckling, 1976), but it has spread over time to include explaining the relationship between two inter-firm subjects. In that context we associate the agency theory with understanding the relationship between the outsourcer and vendor. Sources of the agency problem, moral hazards and adverse selection (Arrow, 1985) should be resolved by monitoring and bonding (Barney and Hesterly, 1996). Consequently, the application of the theory in outsourcing process research was in the Preparation Phase i.e., when screening for vendors and defining the outsourcer's own attitude towards the type of the relationship. Naturally, the Managing relationship phase has been also explored, and to a very small extent the Reconsideration phase.

### Knowledge-based View

The knowledge-based view provides insight into understanding how individuals co-operate to produce goods and services. The knowledge-based view distinguishes two ways of how knowledge is shared among partners. These are knowledge generation and knowledge application. The knowledge-based view has been utilised in outsourcing research to prove that knowledge sharing in the Managing relationship phase is positively related to the success of an outsourcing arrangement.

### Neoclassical Economic Theory

The key characteristics of the neoclassical economic theory are (Hodgson, 1994):

- Assumption of rational, maximizing behaviour by agents with given preference function
- Focus on attained, or movement towards, equilibrium states
- Absence of chronic information problems

The neoclassical theory explains the initial motives for outsourcing demonstrated by some pioneering companies like Kodak. However, the theory has received a significant critique for not being able to explain contemporary business processes. The concepts of rationality and absence of chronic information problem have been especially criticised. However, Gottschalk and Solli-Sæther (2005) showed that the neoclassical economic theory explains critical success factors of outsourcing that are evaluated in the Reconsideration phase.

### Social Exchange Theory

The social exchange theory explains interpersonal relationships by positing economical cost-benefit analysis as a precondition for social engagement and exchange. The theory presupposes that the exchange of resources (material or social) is a basic form of human interaction. Social exchange is an ongoing reciprocal process in which actions are contingent on rewarding reactions from others (Gottschalk and Solli-Sæther, 2005). The theory has been used in combination with TCE for specifying switching behaviour in the Reconsideration phase.

### Learning points

In most theories about outsourcing processes the perspective has been focused on exploring certain issues emerging within the phases of the process. The problem occurring in such an approach is to choose between many different possible outcomes. In principle it is possible to find an optimal solution of this rather stationary problem.

However, a more fruitful and practically useful approach could be taken if we ask questions about the dynamics in the outsourcing processes. What is important in such cases can be captured under the term learning. The idea is that outsourcing decision makers will take into account results of former decisions in similar cases. This creates a need to study the outsourcing process as an evolutionary process. Evolutionary thinking in economics and more generally in social sciences such as Organisational theory and sociology has used these insights to draw one important conclusion, namely that structure is not sufficient to make an optimal solution in outsourcing considerations. It is also necessary to take into consideration the actors with their interpretation of history. In social sciences the problem is well known as the structure – actor problem.

Applied to the outsourcing problematic, the point is that the relevant discussion is not only to look at the mentioned theoretical models or explanations of the outsourcing phenomenon. It is also about doing things in another way next time because you have made some mistakes and failed in some things the first time. Therefore we cannot draw a conclusion about the absolute optimal solution beforehand. We can and shall learn from history but still at one point we shall stop and make a decision.

## 2.5. The Fifth Element: Outcomes

Literature presenting the outcomes of outsourcing can be divided in two groups:

- Descriptive - the authors present findings from surveys and case studies pinpointing the success and failures of various outsourcing arrangements
- Prescriptive - the authors advise which actions should be taken in order to secure successful outsourcing arrangement

Outsourcing doesn't succeed or fail. Rather, it is the actions by both parties that will cause the arrangement to triumph or fail, and outsourcing is rarely seen as a total success or total failure. The success of outsourcing can be measured by strategic, economical, technological and social benefits obtained through outsourcing (Dahlberg and Nyrhinen, 2006). In most cases organisations were getting benefits, but invariably less than they had expected (Cullen and Willcocks, 2003).

In spite of the increasing value of the outsourcing industry, nearly 70 per cent of companies who have undergone outsourcing state that they are unhappy with one of more aspects of their suppliers (Kakabadse and Kakabadse, 2000). The primary motive for outsourcing, to decrease costs seems also not to be satisfied. Only about half of IT outsourcing contracts deliver the promised 20 to 30 per cent cost savings, and even back in the early 1990s, a considerable number of companies expressed dissatisfaction with outsourcing (Cullen and Willcocks, 2003).

In an extensive study of the new paradigms in outsourcing Nada and Andrew Kakabadse (2000) list following failures of outsourcing that are based on their literature study:

- Becoming dependent on outside suppliers for services
- Failing to realise the purported hidden cost savings to outsourcing
- Losing control over critical functions
- Having to face the prospect of managing relationships that go wrong and lowering the morale of permanent employees
- Loss of critical skills or developing the wrong skills
- Failure to gain innovation from vendors - short-term contracts, based on the principle of the lowest winning bid, are claimed to stifle incentives to innovate because rewards for innovation cannot be captured by the contractor

The positive outcomes of outsourcing according to the same study are:

- Enabling existing staff to concentrate on core activities or organisational specialisations, focusing on achieving key strategic objectives
- Lowering or stabilising overhead costs, and thereby gaining cost advantage over the competition
- Providing flexibility in response to changing market conditions
- Reducing investment in high technology
- Decrease of the product/process design cycle time

One approach has identified so called unintentional outcomes of outsourcing, categorizing them into groups of positive and negative ones (Perunović and Christoffersen, 2005). The positive unintentional outcomes are the high quality of service, access to certain amount of both tacit and explicit knowledge about the technologies and markets, and outsourcing made some companies get their processes standardised. The negative unintentional outcomes are predominantly legal burdens, and security breaches.

Another group of literature on the outsourcing's success has showed which decisions have to be made and actions taken in order to secure the positive outcome of an outsourcing arrangement.

Brandes et al. (1997) suggest that the outcome of outsourcing has potential for success if:

- Outsourcing is based on strategic decisions including core competence and cost efficiency considerations, rather than being an emergency action prompted by financial problems
- The process is abrupt and gradual at the same time, characterised by high pace in terms of ownership change and high commitment both during the process and after
- The outsourced unit is able to develop a strong resource base and a balanced customer base built up from the platform of a close and long-term relationship with the partner

Cullen and Willcocks (2003) went deeper with depicting the critical success factors. They are: Delivery performance, Good contract management, Strong relationships, Staff management, Cost management, Understanding the customer, Using Service Level Agreement, Maintaining control, Being flexible, Communication, and Technical expertise. They also identify critical failure factors to be: Cost management, Staff, Understanding, and Expertise.

Click and Duening (2005) argue that the most important added-value success factor is trust. They say that trust is essential if the partners to the outsourcing relationship are to make gains

that go beyond those articulated in the contract. Other ingredients of a successful outsourcer-vendor relationship are:

- The outsourcer must understand and respect the vendor's need to make a profit
- The contract should have provisions for the service level agreement recalibration
- The outsourcer's responsibilities should be clearly articulated
- Project management should include provisions for changing the project management team's structure or members
- The project management team should use systematic problem identification and resolution techniques
- The project management team should develop interpersonal relationship norms

On the other hand the relationship failure risk factors are (Click and Duening, 2005):

- Lack of appropriate buyer control
- Cultural differences
- Inflexibility of outsourcing agreements
- Inadequate specification and/or metrics of the service level agreement
- Inadequate governance
- Lack of goal alignment
- Lack of integration (especially information technology integration)

Lee (2001) emphasises the importance of implicit and explicit knowledge sharing between partners. A high-quality relationship allowing the flow of knowledge shall enable the partners to achieve a successful outsourcing outcome.

A similar situation has been noted among Danish companies. After the beginners' enthusiasm, and failures, Danish companies are slowly beginning to nearsource and backsource their activities.

According to PA Consulting, in 1998 the value of outsourcing in Denmark was around 5 billion US\$, a small figure compared to USA's 100 billion US\$. The Technological Institute reported that Denmark lagged 10 years behind USA and 5 years behind Sweden. However, 10 years after, Denmark is becoming a leading Nordic country in outsourcing of services. Approximately 90% of Danish companies have outsourced some of their services, in comparison to 70% of Swedish and 50% of Norwegian companies (Demoskop, 2006).

An increase of interest in outsourcing present among Danish companies made the Confederation of Danish Industries conduct the research project entitled "Global opportunities and growth – an analysis of Danish companies' outsourcing". According to the survey, almost 70% of participating companies (out of 246) have outsourced at least one business process or function within the last three years (Dansk Industri, 2004). Both large, and medium and small companies, across different industries, are engaged in the process. The activities outsourced present 10% of the companies' overall activities. Approximately 40% of the companies have outsourced to so-called low-cost countries, with the number projected to rise to 75% in the next three years. Danish outsourcers have a tendency to outsource standardized processes and functions to low-cost countries in order to reduce production costs. Hence, almost 90% of companies were satisfied with the outsourcing, which made research analysts conclude that 90% of them have decreased the costs.

A recent study from the University of Southern Denmark of 638 manufacturing SMEs revealed that Danish small manufacturing companies are also charmed by outsourcing



(Knudsen and Cederquist, 2006). One third of manufacturing SMEs have outsourced part of their production in the last 3 years, while 75 % of them expect to do the same in the next 3 years. Only 10 % of companies have outsourced more than 75% (total outsourcing) of their activities. The vendor’s location is in 31,6% Denmark, 31% new EU countries, and 27,5% of vendors are located in Asia.

Based on the interviews with 50 chief executives in Denmark, PA Consultancy reported that one in every four outsourcing arrangements fails to deliver the promised 75% of cost savings. This indicates three important things. Firstly, the expectations from outsourcing seem to be unrealistic since the cost cutting of 75% is an astronomical figure. Secondly, Danish companies predominantly outsource in order to decrease the costs. If costs are not reduced, the outsourcing is perceived as a failure. Apparently some other reasons to outsource haven’t been considered by this research. For example, the access to labour is currently considered among Danish business people to be one of the top reasons for outsourcing. Thirdly, the failure rate of 25% percent indicates that there is room for improvement in managing the outsourcing processes.

The Dansk Industri research was a bit more detailed in revealing the failure factors. They found that 40% of the companies have had problems in outsourcing as a result of their increased dependency on the vendor. The largest problems were endangered security, bad coordination opportunities and more expensive and complicated logistics. Around 20% of companies stated that revealing some of their core competences through outsourcing has caused some problems.

Similarly, a survey by the Danish Association of Managers and Executives listed the barriers to outsourcing as seen by 300 top managers who are leading approximately 200.000 employees (Table 2.8).

	Not a barrier	Small barrier	Large barrier
<b>Bad communication</b>	20%	62%	18%
<b>Cultural difference</b>	15%	68%	17%
<b>Time delays</b>	31%	54%	15%
<b>Internal opposition to outsourcing</b>	27%	58%	15%
<b>Bad documentation and specifications</b>	35%	56%	10%
<b>Low quality</b>	46%	48%	6%
<b>Larger travel costs</b>	28%	66%	5%
<b>Unforeseen costs</b>	28%	69%	3%
<b>Bad educational level</b>	61%	37%	1%
<b>Corruption</b>	65%	35%	0%
<b>Bad labour market in the vendor’s country</b>	53%	47%	0%
<b>High establishment costs</b>	48%	52%	0%

Table 2.8: Barriers to outsourcing (Top five barriers are highlighted and calculated as a cumulative of small and large barriers)

Source: Ledernes Hovedorganisation (2004)

Such developments have resulted in the emergence of backsourcing, though still in small numbers. Danish consulting company, Rambøll, has conducted a study on information technology (IT) outsourcing among 170 Danish outsourcers, and came across backsourcing

activities, especially in the areas of the network management and IT project management (Børsen, 2007).

## 2.6. The Sixth Element: Vendor's Perspective

The literature study of the outsourcing phenomenon indicates that the vendor's perspective has not been totally neglected, but it has yet to be thoroughly explored. The following text summarizes the main body of knowledge of the vendor's perspective in outsourcing we could find in the literature.

The engagement of a company in an outsourcing arrangement in terms of it becoming a vendor company brings several advantages and disadvantages (Rochester and Rochester, 1995). We present them in the Table 2.9.

Advantages	Disadvantages
Long-term contracts offer more stability Opportunity for profit and growth Ability to have multiple customers minimises risk of having ties to single customer Independence to run own organisation Long-term commitment Opportunity to advance own ideas Larger volume of business supports more sophisticated technology Opportunity to shift perspective from cost to value focused	More responsibility Contractual and legal risks are potentially greater Capital expenses of new technologies Training of employees Maintaining morale in employees transferred from the customer Protecting trade secrets of multiple customers Attracting best employees Inadequate client management

Table 2.9 – Advantages and disadvantages of engaging the company as a vendor in an outsourcing arrangement

When finally deciding to involve in outsourcing, the vendor is expected to carefully plan how to get the first contracts, how to manage them, and so forth. Although vendors share similar characteristics, predominantly centred on the profit motive, they rarely have the same approach to their customers, contracts and relationships (Cullen and Willcocks, 2003).

Getting an outsourcing contract may create a so called “winner’s curse” situation (Kern et al., 2003). It is a situation when suppliers make unrealistic bidding promises to ensure they win the contracts, but already know, or subsequently discover, that they are unable to recover their tendering, business, and operational costs for the near future. This causes problems in later phases of the outsourcing process, particularly in the managing relationship and reconsideration phases. The Winner’s curse deals typically end-up with relational trauma, imposing renegotiation costs or early contract termination. A supplier can avoid the winner’s curse syndrome through information gathering and bidding activities.

The source of the winner’s curse may be explained by Blois’ (2004) work on the supplier’s and customer’s values. According to him, for a customer the value of a purchase is the difference between the benefits that the purchase provides less the costs incurred in obtaining the good or service. To a supplier the value of being a supplier to a specific customer is the difference between the perceived benefits obtained and the perceived life cycle sacrifices incurred. Blois (2004) continues by explaining that suppliers constantly have to remember that it is the customer’s interpretation of value that is important and not what the supplier might think it ought to be. The problem is that it is all too easy for suppliers to assume that they understand a customer’s interpretation of value creation. The vital item of information that a supplier should possess is not only specific knowledge about the customer’s product and service requirements. Suppliers’ sacrifices may be reduced by: lowering the perceived life

cycle sacrifices that the customer associates with the purchase, and increasing the customer's perception of the value of the benefits it will receive. If the supplier's strategy of lowering the customer's costs only raises its own costs, a situation of winner's curse (Kern et al., 2003) may appear. If the value equation is to be used effectively it requires a lot of information.

Vendors and clients define their strategies in a way which influences their inter-Organisational relationships. They may engage in four distinctive relationships (Pinnington and Woolcock, 1997): reciprocal, client dominant, vendor dominant and preferred vendor. Reciprocal strategy appears when there is an open, competitive market environment including evenly balanced power relationships between clients and vendor organisation. Client dominant strategy occurs when the client organisation dominates the relationship with vendors by utilising transactional strategies to pursue the "divide and rule" policy. Vendor dominant strategy occurs when the vendor dominates the relationship by utilising relational strategies in an attempt to "infiltrate and occupy". An alternative strategic approach which is also vendor dominant is making a large profit in a short time scale by exploiting a client until termination of contract becomes inevitable. Preferred vendor strategy is characterised by a preferential relationship between the chosen vendor and client that can be characterised for both parties as resource intensive (and high cost), uncertain, high risk and yielding long-term added value.

Even though contracts tend to be short (three years or less), they often have renewal terms that make the relationship much longer and the potential nature of a relationship is worth investigating at an early stage (Cullen and Willcocks, 2003). Stability of an outsourcing relationship tends to be achieved through pushing the vendor-client relationship in the direction of strategic partnership, though it is probable over time that the power balance may shift in favour of the vendor, unless client organisations maintain countervailing leverage to support the basis of the partnership (Willcocks and Choi, 1995).

When a vendor and an outsourcer finally engage in the implementation of the outsourcing project, various relational issues emerge. The relational view argues that more successful partnerships are founded on commitment, coordination, interdependence and trust, supported by application of conflict resolution techniques and communication behaviour (Mohr and Spekman, 1994; Click and Duening, 2005). A high-quality relationship allowing the flow of knowledge shall enable the partners to create a successful outsourcing outcome (Lee, 2001). The barriers to mutual learning seem to relate to (Stjernström and Bengtsson, 2004): the customer's demand for price reduction, the customer's lack of interests in co-operating, unequal relations between the customer and supplier, and constraints regarding co-operation with the customer's competitors. The removal of these hindrances would most likely improve the conditions for mutual learning.

In order to promote the chances of upgrading outsourcing relationships to strategic partnerships, vendors should be perceived as *trustworthy* as well as *technically competent* (Zviran et al., 2001). One investigation (Oza et al., 2006) presents what vendor companies perceive about getting trust from client companies in outsourcing relationships. Vendors perceive that gaining the outsourcer's trust depends on the previous client's reference and experience of the vendor. Trust has to be maintained continuously. According to the same study, its maintenance depends on transparency, demonstrability, honesty, following the process, and commitment.

The outsourcing value proposition is shaped by the outsourcer's technical capability and strategic intent, interpersonal trust and contractual aspect, and the vendor's capabilities comprising its technical competence, understanding the customer's business, and relationship management (Levina and Ross, 2003). The vendors' capabilities and core competences have been recognised as the most important factors for the success of outsourcing. The vendor's core competences help build the client-vendor relationship and provide a higher level of client satisfaction, which improves the reputation and loops back to the vendors by enabling them to have a larger number and variety of projects controlled. This again leads to building the vendor's core competences (Levina and Ross, 2003).

A work of IMD scholars Vollman and Condor (2000) resulted in a step model that is conceptualised to describe how both suppliers and vendors shall build their relationships. Their work presents one of the first efforts to map the vendor's outsourcing process. They describe how each step of a supplier has to be followed by a step of the client. Along the way some challenges for suppliers emerged (Jenster et al., 2005): 1) a need for additional competences (which can be achieved through management education, recruitment, alliances, acquisitions, and outsourcing); 2) managing the entry phase (this challenge stems from activities around the assessment of the business opportunity i.e., assessing the potential client and the preparation of the bid); 3) running the contract. These three challenges are spread over a simplified outsourcing process. Based on our own research (Perunovic and Christoffersen, 2007) and after an insight into the literature we can propose that when seen from the vendor's perspective, the most important three stages of an outsourcing process are to win, run and renew outsourcing contracts (Figure 2.10).

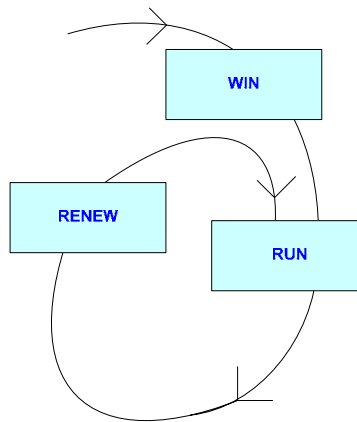


Figure 2.10– The Vendor's Outsourcing Circle

Vendors strive to win new customers, to satisfy their expectations by running the process satisfactorily and therefore to keep the existing customers in the loop with new projects or extended outsourcing contracts.

## 2.7. Map of Outsourcing

As we have seen, outsourcing shouldn't been considered as a simple business practice. Instead, it can be a very complex phenomenon which requires careful consideration throughout its lifecycle. The topographical map of outsourcing attempts to illustrate the complex relationships among outsourcing elements. (See Figure 2.11)

The central layer of the outsourcing topographical map is the outsourcing process. The most appropriate and realistic model that depicts the outsourcing process is a model with cyclic recurrent characteristics. Since the vendor is equally critical to the success of outsourcing, the vendor's process is the second in importance, although the quantity of the research targeted on the vendor's perspective suggests the opposite at the moment. The "individual" characteristics of the outsourcing partners and the relationships created between them are the main contributing factor to the outcomes of outsourcing. The whole outsourcing event has been explored, explained, and it will continue to be explored and explained by various economic, Organisational and social theories and concepts. Of course, we shouldn't forget that most of academics and practitioners agree that outsourcing has been pushed forward by enabler built around the developments in IT, globalization, and networking. The complex environment consists of many elements and their combinations creating numerous possibilities for detecting the types of outsourcing. They are important for establishing a common language among practitioners and academicians, since outsourcing terminology has been quite confusing.

Understanding each of the elements and their possible combinations is the only way to understand the outsourcing phenomenon. This is valid for both the industry and the academy. Outsourcing strategists and operatives need to understand that in order to achieve positive outcomes. Scholars, on the other hand, need to understand this topography in order to continue with unveiling the still existing mysteries within and around the elements of outsourcing.

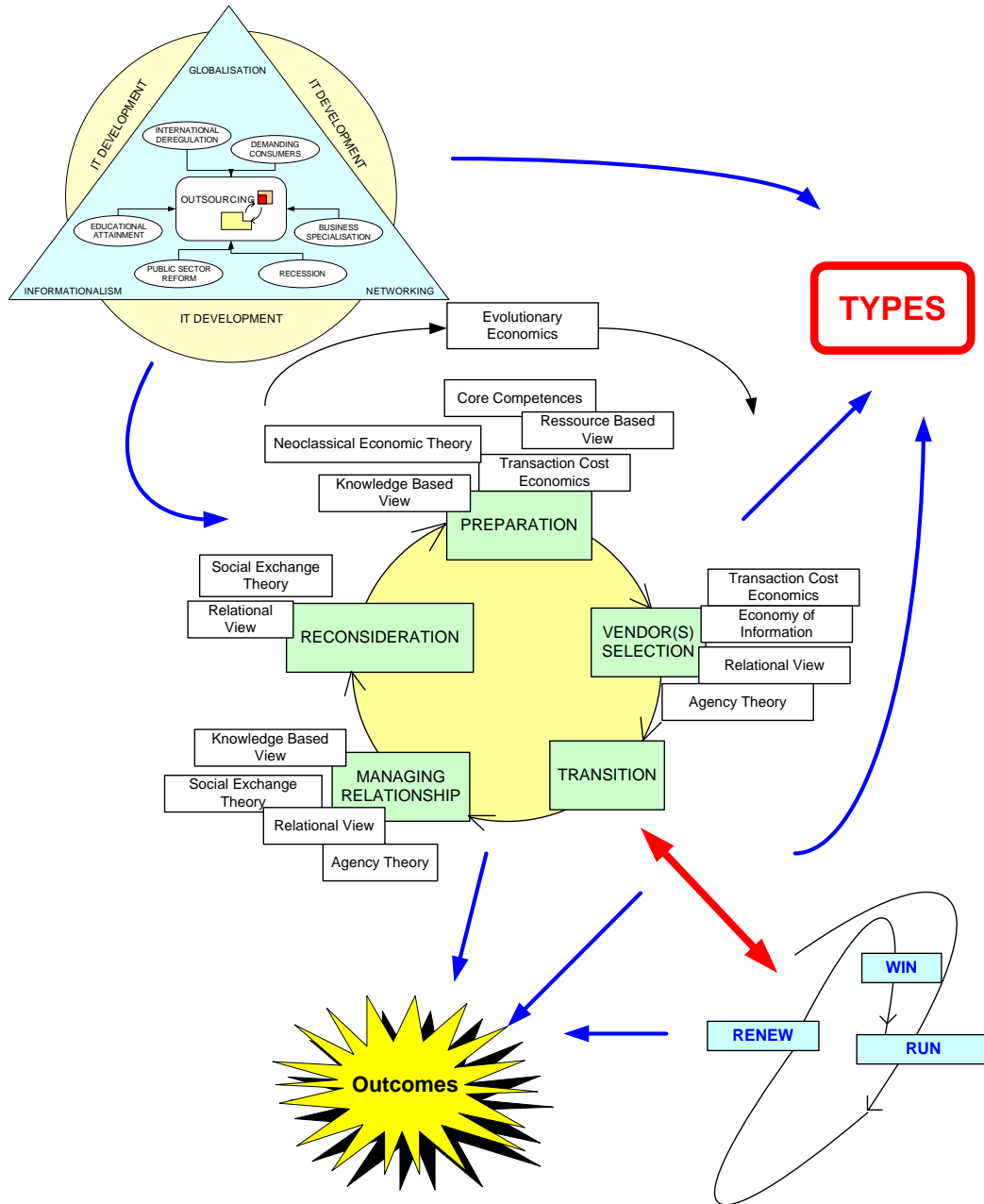


Figure 2.11 – Elements of the outsourcing phenomenon



**Utilisation of ICT across the Outsourcing Process  
- The Vendor's Perspective -**

**CHAPTER III**

**POSITIONING**



## CHAPTER 3

# POSITIONING

### 3.1. Positioning within the Outsourcing Phenomenon

Seeing the outsourcing process from the perspective of the outsourcer can give us a biased picture of the outsourcing phenomenon. The vendor is as critical to the success of outsourcing as the outsourcing company is. We have shown that for companies it is more important to focus on *how* to outsource instead on *whether* and *what* to outsource which was formerly the dominant line of thinking. Therefore we put the process into the core of our research agenda.

Further on, research on the vendor's perspective in outsourcing has been somehow understudied. The body of knowledge on the vendor's perspective in outsourcing contains a discussion of the advantages and disadvantages of a company's engagement in an outsourcing arrangement, (Rochester and Rochester, 1995), approaches to customers, contracts and relationships (Mohr and Spekman, 1994; Willcocks and Choi, 1995; Pinnington and Woolcock, 1997; Zviran et al., 2001; Kern et al., 2002; Cullen and Willcocks, 2003; Liang and Xue, 2004; Blois, 2004; Stjernström and Bengtsson, 2004; Click and Duening, 2005; Oza et al., 2006), the vendor's value proposition (Levina and Ross, 2003), the vendor's capabilities necessary to win and run outsourcing contracts (Feeny et al., 2005), and in some scattered fragments, the structure of the vendor's outsourcing process (Jenster et al., 2005; Vollman and Condor, 2000). Seen from the vendor's perspective, the most important three stages of an outsourcing process are to win, run and renew outsourcing contracts.

In comparison to the existing research on any given outsourcer's outsourcing process, there is very little research available on the vendor outsourcing process. In addition to that, the success of an outsourcing arrangement is determined by numerous factors, where the vendor's capabilities and competences seem to be some of the most important.

Therefore, our interest is to shed more light on the vendor's perspective in outsourcing, its process during outsourcing and the development of the vendor's competences and capabilities during that process.

### 3.2. Positioning within the Concept of Competences and Capabilities

Levina and Ross (2003) showed that vendors' capabilities have been recognised as the most important factors for the success of outsourcing. According to them, the vendor's capabilities comprise its technical competence, understanding the customer's business, and relationship management. These capabilities and competences can be perceived as generic and applicable across industries. However, one has to be careful because for different industries one may expect to find different capabilities and competences that count for winning and renewing the outsourcing contract. For instance, in the case of information technology (IT) outsourcing, Feeny et al. (2005) proposed that there are 12 competences grouped within 3 capabilities (they actually take competences for capabilities, but we shall explain the difference in the Method section) that are very important for winning the outsourcing contract. Those competences are

domain expertise, business management, behaviour management, sourcing, technology exploitation, process re-engineering, customer development, planning and contracting, organisational design, governance, programme management and leadership. They are grouped within three major capabilities that each outsourcer should be looking for i.e., delivery, relationship and transformation.

Capabilities and competences have been developed from the resource-based theory of a firm (Rumelt, 1984; Wernerfelt, 1984; Barney, 1986, 1991, 2002). The resource-based theory argues that the source of organisation's competitive advantage is based in the company, in its resources. Resources are tangible and intangible assets that can be drawn upon by the firm in order to achieve or sustain competitive advantage. The resources will provide the firm with the competitive advantage only if they are valuable for customers, rare, hard to imitate and if the firm is organized to exploit those resources. Processes that enable the exploitation of the "competitive" resources lead towards the creation of the firm's competences. Prahalad and Hamel (1990) observed that a portfolio of intangible competences is more important than the portfolio of tangible products or businesses, where competences are the skills, knowledge and technology. Competences are measures of the organisation's potential to conduct business at the state-of-the-art level in both the firm's input market (labour, capital, information and technology) and the output markets with its customers (Hatten and Rosenthal, 1990).

The highest order concept within the resource-based theory is capability. Capabilities are measures of the performance of business processes along dimensions defined by customers' needs and expectations, like for example, time, cost, and quality (Hatten and Rosenthal, 1990).

Vendors build competences and capabilities throughout outsourcing arrangements in order to achieve their strategic goals. Strategic goals of vendors may be embedded within the outsourcing business, meaning that vendors would like to win and renew the outsourcing contracts. On the other hand, a strategic goal of the vendor may be to build competences through outsourcing and thus put itself in a leading market position. In order to reflect the cyclic and evolutionary characteristic of the vendor's outsourcing process it is necessary to include time into the analysis. This shall help us understand how capabilities and competences enable competitive advantage in the regimes of rapid change. This is exactly the question asked by Teece et al. (1997) when they proposed the concept of dynamic capabilities. The authors argue that the essence of competences and capabilities is embedded in organisational processes. The content of these processes and the opportunities evolving from them are influenced by positions and paths. A company's positions are internal and external technological, financial, market, institutional and reputational assets, and the path is an evolutionary path the company has adopted or inherited. The evolutionary characteristic of the company's paths is embedded in the assertion that an organisation's history determines its future behaviour in combination with decisions made over time.

The graphical interpretation of the relations between resources, competences, capabilities, objectives, and processes under the condition of dynamic movement of an organisational system is given in Figure 3.1.

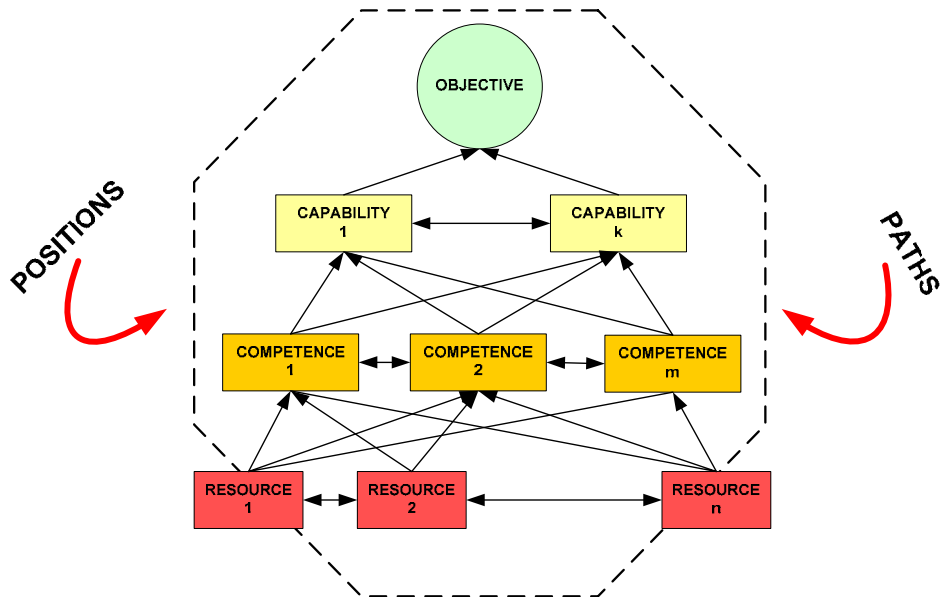


Figure 3.1 - Relationships between resources, competences and capabilities

### 3.3. Positioning within Information and Communication Technologies

Contemporary economy functions with tremendous support of information technology (Castells, 2000). Almost all business organisations all over the world utilise at least one of the features of ICT. The ICT are, without any doubt, one of the key assets and resources that are utilised by business organisations all over the world. ICT influences the performance of various business processes and organisational functions, and the company's competences and capabilities. Managing ICT could also be perceived as one of the key competences and capabilities of an organisation.

By building on the perceptions of Steele (1989), Post and Anderson (2003), Oz (2004), Frenzel and Frenzel (2004), Bocij et al. (2006) and Haag et al. (2007) we come to perceive ICT as a synonym for informatics, information technology, management information systems, business information systems, information systems, etc, all of which consist of three distinctive elements:

- Hardware
- Software
- Telecommunications and Networks

ICT tools are invaluable tools for organisations operating in today's networked and global markets. The stream of literature has argued how ICT can be applied in organisations. For example, Bowman et al (2005) developed a matrix showing how organisations use ICT for information sharing and communication in order to support various exchange processes. They distinguish between structured and unstructured business-related processes that could be performed both internally and externally (Table 3.2).

	Information	Communication	Transaction and registration	Integrated application
<b>Structured process</b>				
<b>Internal</b>	Databases, document management systems, ERP systems, human resource management systems	Electronic boardroom, group decision support systems	Monitoring systems (production control systems, planning systems, sales and stock systems), electronic agenda	Information sharing, application sharing, computer supported collaborative work, workflow management
<b>External</b>	Online-databases, Internet, call centres (inbound)	Call centres (outbound), e-mail, EDI	CRM, EDI, electronic fund transfer, ordering systems, supply chain management systems, reservation systems	Multimedia call centres
<b>Unstructured processes</b>				
<b>Internal</b>	Management information systems, intranet, knowledge management	Electronic boardroom, (mobile) telephone, e-mail, voice mail, computer-conferencing, videoconference, shared whiteboard		Computer-supported collaborative work (CSCW), communities of practice
<b>External</b>	Internet, online databases	E-mail, voice mail, videoconference		Communities of practice

Table 3.2 - Applications of ICT in an organisation (Adapted from Bowman et al., 2005)

Porter (2001) gives another prominent example of potential utilisation of ICT across internal and external value chains of an organisation. He identifies applications of ICT in managing a firm's infrastructure, human resources, technology development, procurement, inbound and outbound logistics, operations, marketing and sales, and after-sales services. The ways how organisations will operate under the influence of ICT have also been depicted in the Enterprise 2.0 concept suggesting that wikis, blogs, group-messaging software and the like could turn the corporate intranet into a constantly changing structure built by distributed autonomous peers, which will represent a new collaborative platform illustrating how the work is actually done in a networked organisation (McAfee, 2006).

The business potential of ICT was evident, but that potential had to be utilised. The practitioners were interested in what they could get in return for investing heavily in ICT. The emergent question became whether investments in ICT could pay off and create competitive advantage. Studies investigating the relationship between the investments in ICT and firm's performance have started to emerge. The results suggested that the investments seem not to influence business performance, at least not directly. Tam (1998) found that IT investments are not correlated with shareholders' return, and that there was little evidence that computerization is valued by the market in developed and newly developed countries. The relationship between IT sophistication and the performance in the service industries also couldn't be found (de Burca et al., 2006). The ICT weren't utilised correctly and there was a lack of adequate match between the corporate and the ICT strategy (Fletcher and Wright, 1996).

Apparently there was a missing element, or several, between the IT investment and the firm performance which would make the business potential of ICT be on the level predicted by many. The research opus in that area has depicted two essential intermediary elements that

influence the ICT's role in the business performance: the ICT capability and the ICT's fit with business processes.

It wasn't important anymore just to have IT assets. The accent was put on how to manage the corporate IT. Haeckel and Nolan (1993) envisioned a long time ago that managers will have to invest into IT capability to manage by wire, rather than to invest in isolated IT systems. Ross et al. (1996) argued that competitiveness can be achieved by developing effective IT capability. They perceived IT capability as an IT human resource, a reusable technology base, and a strong partnering relationship between IT and business management. By taking the resource-based perspective, Bharadwaj (2000) showed that firms with high IT capability tended to outperform firms with lower IT capability. He defined IT capability as a set of three assets (IT infrastructure, IT human capital, and IT intangibles with a common name). Huang et al. (2006) further expended Bharadwaj's work and showed that IT investments will increase the level of IT infrastructure and human IT capital, but only the IT intangibles (know-how, corporate culture, effective IT users, synergy with strategy and processes) will directly influence the firm's performance.

Another important element of adequate utilisation of ICT is that it fits with organisation's business processes. It has been argued that the firms which actually use IT in a way that fits business process requirements show better competitive positioning (Petruzzi and Garavelli, 2007). The primary mechanisms through which IT capabilities impact overall business performance are through the business process (King, 2002) but the alignment has to be carefully tailored because aligning a poorly operating IT system with an objective still won't get the objective accomplished (Shpilberg et al., 2007). Prahalad and Krishnan (2008) argue that in the new age of innovation, the innovation will be enabled by business process, and that business process is enabled by ICT infrastructure. They see the ICT infrastructure as consisting of four layers (Figure 3.3). The fourth and third layers focus on standardisation and efficiency. These layers are not considered to be a source of competitive advantage. Layer two focuses on business-specific application, while layer one represents the primary interfaces with customers, suppliers, partners and investors. Layers 1 and 2 are considered to be the potential sources of competitive advantage.

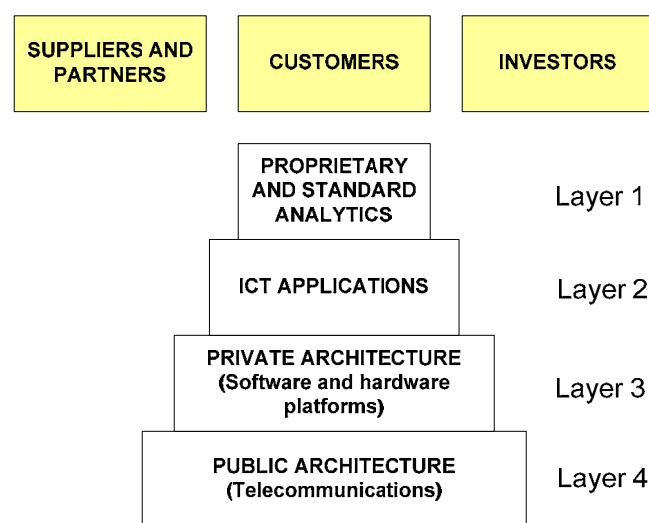


Figure 3.3 - Building blocks of ICT architecture  
Adapted from Prahalad and Krishnan (2008)

### 3.4. Positioning within Technology

We have seen that ICT offers many possibilities for business application within and among myriad organisations. In order to understand whether or how organisations explore ICT, we need to understand the ontology of technology *per se*.

Technology is associated with capability, i.e. the ability to do things. Therefore, technology is “knowledge of how to do things” (Steele, 1989). There are three theories of technology (Feenberg, 2002):

- *Instrumental theory* of technology sees technology as a neutral tool standing ready to serve the purposes of its users. Consequently, one may argue that utilisation of technology depends on how strongly potential users are interested in utilising and developing certain technology.
- *Substantive theory* argues that technology constitutes a new cultural system that restructures the entire social world. For example, contemporary outsourcing has been enabled, or at the very least improved, by the development of information and communication technology. Together with networking and globalization, information and communication technology has created a distinctive economic system: the network economy (Castells, 2000). In that respect, organisations must use technology because it is a part of their being.
- An alternative view of technology is given in the *critical theory* of technology. Contemporary technology is neither simply a tool, nor is it the framework of our society. We are supposed to have the freedom of choice of technology. Feenberg (2002) argues that the real issue is not technology or progress *per se* but the variety of possible technologies and paths of progress among which we must choose

One of the implications of these technology theories is that three distinctive types of organisations can also develop with respect to the context in which they utilise ICT. The first stems from instrumental theory and refers to the unlimited availability of technology where organisations **choose to use** certain technology. The second comes from substantive theory and says that the organisation is **forced to use** certain technology in order to survive in a networked economy. Critical theory suggests that organisations have to **decide which technology to use**.

According to Steele (1989), technology has two dimensions, regardless of which theory is applied:

- *The creation-application dimension* – this dimension embraces two aspects of a capability. The first is the knowledge of **creation** of a new capability. The second is the **application** and **extension** of a new and conventional capability. This dimension is the axis on which elements of another dimension are arranged.
- *Substantive dimension* – this dimension reflects that on which people actually work. For instance, the creation of new software, application of an existing hardware or extension (adaptation) of telecommunication solutions.

Consequently, the application of ICT in a business context can be understood as the ability to create new and apply existing ICT solutions, all for the purpose of satisfying business objectives. This ability is influenced by the organisation's perception of technology.

### 3.5. Research Framework and Questions

As we explained in the opening of the positioning section there are numerous ways one can study the relationship between the outsourcing and ICT. We have explored the themes within the outsourcing phenomenon and ICT, and deductively extracted certain learning points and assertions that will further guide us in phrasing the research questions. The ontological positions are presented in Table 3.4.

OUTSOURCING	ICT
The outsourcing process has been recognized as the most important element of the topography of outsourcing	Positive organisational performance can be achieved by developing effective IT capability
Vendor's competences and capabilities are important for the success of outsourcing	The primary mechanisms through which IT capabilities impact overall business performance are through the business process
Vendor's perspective in outsourcing is insufficiently studied. We know the least about the vendor's process in outsourcing	ICT capability consists of ICT infrastructure, ICT applications, and ICT human capital
The most important goals for the vendors are to win, successfully run, and renew outsourcing contracts	Regardless the theory of technology organisations can either create new or apply existing ICT solution(s). The creation/application choice may influence the characteristics of ICT capability

Table 3.4. – Ontological position of the outsourcing – ICT relationship

The assertions resulting from the analysis of the outsourcing phenomenon make the vendor's perspective interesting for studying. On the side of ICT we know that IT capability impacts overall performance only through the business process. By knowing that there is a need of understanding the vendor's process in outsourcing we raise the general research question:

*How do vendors utilise information and communication technologies across the outsourcing processes?*

The vendor has some strategic goals for the attainment of which it enters into an outsourcing arrangement. These goals could be to grow as a vendor in an outsourcing industry or to develop competences and capabilities that would help achieving strategic goals beyond the outsourcing business. We may also argue that in both cases, some of the most important vendor objectives are to win an outsourcing contract, and to successfully run it in order to retain the client and to build competences and capabilities that would further enable the vendor to gain new outsourcing clients, or new projects with existing clients. Winning, running and renewing outsourcing contracts could be interpreted as measures of the performance, or even as very general phases of the vendor's process in outsourcing (Figure 3.5).

Since the vendor's competencies and capabilities are proven to be important in winning, running and renewing outsourcing contracts, we shall explore the influence of ICT on the vendor's competences and capabilities. We assume that ICT can have an indirect influence on the performance by influencing the vendor's competences and capabilities, or a direct influence on the performance (Figure 3.5). Therefore we ask sub questions:

*How do ICT impact vendor's competences and capabilities?*

and

*In which situations do ICT have indirect and direct effects on the performance?*

Even though ICT infrastructure, ICT applications, and ICT human capital are considered to be the vendor's IT capability, we shall follow the reasoning of Hatten and Rosenthal (1999) in perceiving these three elements of IT. Accordingly, we may assume that ICT is one of the resources that, together with other vendor resources, lead towards winning, running and renewing outsourcing contracts. Therefore ICT as a resource can be perceived as:

- A physical resource - hardware, software, networks and telecommunications
- A competence – the vendor's deep knowledge and understanding of the ICT's elements and their utilisation in a company's business model
- A capability – the vendor's ability to mobilize ICT related competencies and physical resources in order to win, run and renew outsourcing contracts

Regardless the theory of technology, organisations can either create new or apply existing ICT solution(s). That creation-application choice may influence the characteristics of ICT capability. Therefore we may assume that ICT impacts competences and capabilities (and performance directly) differently given the different creation-application dimensional context. Consequently our last research question is

*Does ICT's impact on vendor's competences, capabilities and performance differ when ICT is created from the impact and when ICT is applied?*

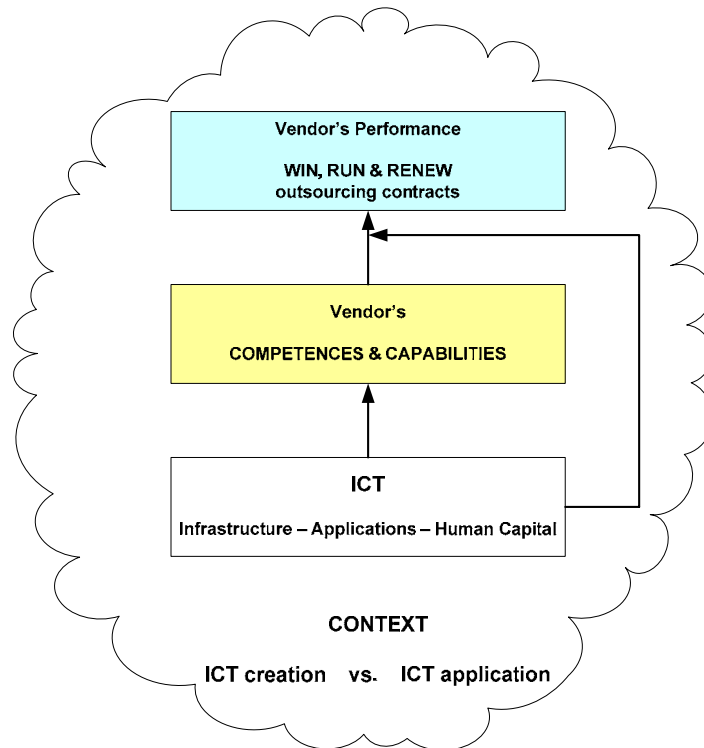


Figure 3.5 - A Framework for Studying How Vendors Utilise Information and Communication Technologies across the Outsourcing Process





**Utilisation of ICT across the Outsourcing Process  
- The Vendor's Perspective -**

**CHAPTER IV**

**METHOD**

## CHAPTER 4

### METHOD

The ontological perspectives discussed and framed in the Positioning part of the study left us with the impression that the elements of the vendor's utilisation of ICT across outsourcing process, captured in the research framework, still have to be uncovered and explained. Knowing that qualitative research is useful for the research that delves in depth into complexities and processes and has the purpose of investigating little-understood phenomena, identifying or discovering important categories of meaning, and generating hypotheses for further research (Marshall and Rossman, 1999), we embarked on qualitative research as an adequate method of inquiry.

The choice of qualitative method can also be justified by examining ten interconnected themes that qualitative research builds on (Patton, 1990). *Naturalistic inquiry* refers to studying real-world situations as they unfold naturally. *Inductive analysis* is the immersion in the details and specifics of the data to discover important categories, dimensions and interrelationships. The whole phenomenon under study is understood as a complex system that is more than the sum of its parts. Therefore we include the *holistic perspective* into the analysis. This means we include the people who utilise ICT and develop competences and capabilities. In order to uncover how they transform ICT utilisation into the winning and renewing of outsourcing contracts we need to get close to the people, situations and phenomenon under study, i.e. to establish *personal contact and insight*. To document findings, a detailed description of the *qualitative data* is necessary. Our attention to the processes implies study of the phenomenon in the context of *dynamic systems*. However, we deal with *context sensitivity* by placing our findings in a social, historical and temporal context. We shall depict *unique case(s)* that will to their best reveal how vendors utilise ICT across the outsourcing process. We are *empathically neutral* and aware that complete objectivity is impossible. However, we have *designed a flexible research framework* open to adaptation as understanding deepens and situations change.

The research framework positions the research within the areas of operations management, outsourcing and ICT. Although these fields have been traditionally studied by taking a positivist, quantitative approach, a number of case studies has been increasingly used in the past 10 years for exploring the same phenomena. Even more encouraging for constructivists and qualitative researchers has been the raise of interest in developing the methodology that encourages qualitative research in operations management (Eisenhardt, 1989; Voss et al., 2002) and ICT and management of information systems (Lee, 1989; Klein and Myers, 1999).

#### 4.1. Research Strategy

Qualitative inquiry is conducted through the deployment of various strategies. For studying groups or organisations within the society and culture genre, the case study is considered to be the most appropriate strategy (Marshall and Rossman, 1999). The case study has been praised for being suitable for early, exploratory investigations where the variables are still unknown

and the phenomenon not completely understood (Meredith, 1998). In an article about the use of case studies in operations management Chris Voss and colleagues (2002) argued that case studies are suitable for exploration (to uncover areas for research and theory development) and theory building (to identify key variables and linkages between variables and to identify why these relationships exist). Exploration of the assumptions can guide us in developing research ideas and questions that are worth pursuing further (Voss et al., 2002).

There are several types of case studies. They can be applied to *explain* the presumed causal links in real-life interventions, to *describe* an intervention and the real-life context in which it occurred, to *illustrate* certain topics, to *explore* those situations in which the interventions are evaluated, and to conduct *meta-evaluation* (Yin, 2003). Overall, the content of the themes of the qualitative inquiry, together with the characteristics of the case study as a research strategy suggest that the problem posed in the research questions and captured in the research framework could be tackled in a most efficient way by deploying an *exploratory case study*.

Apart from following the “classical” case research strategy (Eisenhardt, 1989; Lee, 1989; Patton, 1990; Marshak and Rossman, 1999; Vos et al., 2002; Yin, 2003), the exploratory nature of the research questions suggests the use of another qualitative research strategy – grounded theory. The grounded theory is an inductive methodology used to generate theory through a systematic and simultaneous process of data collection and analyses (Strauss and Corbin, 1998; Goulding, 2002). The major difference between the classical case study and the grounded theory is that the latter is based on the premises that the researchers are not supposed to develop any *a priori* theoretical frameworks. This premise has often been exaggerated by entering into the field without any previous literature study on the topic. However, reading is not forsaken during the initial stages – it is vital. The grounded theory researcher should read for ideas and conceptually connect these ideas to the developing theory (Goulding, 2002). We used the principles of grounded theory while going back and forth between data collection and data analysis stages in the qualitative research process.

## 4.2. Choosing the Cases

Case selection is a sensitive part of the case research design process. The results of the research could be flawed and misinterpreted if cases are wrongly selected, even though the interpretive approach and qualitative research allow the researcher to be free in her or his quest and interpretations. However, the first test of the quality of research design is to prove that the study can satisfy the condition of external validity. External validity refers to establishing the domain to which a study's findings can be generalized (Yin, 2003) and that's why there is a need for a justified case selection process. Nevertheless, the validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information-richness of the cases selected and the observation/analytical capabilities of the researcher than with sample size (Patton, 1990).

According to Voss and colleagues (2002), there should be three steps in the case selection process:

1. Deciding between single and multiple cases
2. Deciding between longitudinal and retrospective cases
3. Sampling

Choosing a single case allows greater in-depth observations. Single cases are considered to be more suitable in five situations when the case is a (Yin, 2003):

- Critical case in testing a well-formulated theory
- Extreme or unique case
- Representative or typical case
- Revelatory case
- Longitudinal case

The same case study may involve more than one unit of analysis. For example, the case study of one organisation that chose to use a certain ICT could focus on studying separately the impact of several different software packages on the company's performance. The different software packages would then be the objects of the multiple unit analysis. This type of single case study is called embedded single case study (Yin, 2003).

The risk of a biased interpretation of the findings from the single case study can be mitigated if the data are compared across multiple cases (Voss et al., 2002). If the researcher chooses to deploy the multiple case study strategy, she or he can count on reducing the depth, but increasing the generalizability of the case findings. A multiple case study can also consist of several units of analyses within single cases. If that is the case, that study is called the embedded multiple case study (Yinn, 2003).

A look into the research framework immediately implies that there could be two contextual settings in which a vendor company can utilise its ICT systems. The creation-application dimension of the technology implies that the study should analyze two vendors as a minimum, one that creates ICT solutions and the other that applies them. Therefore, we have used the *multiple-case study*.

The second step in choosing the cases is to decide between longitudinal and retrospective types of cases. Longitudinal case studies are suitable for identifying the relation between the cause and effect. That relation can be best determined if a phenomenon is studied over time (Voss et al., 2002). The retrospective case study, however, means a study that starts with the present condition of a unit of analysis and collects data about its past history to explain its present condition.

“A company's history determines its future behaviour” is a proposition that stems from the concept of dynamic capabilities (Teece et al., 1997). It pinpoints that a firm's strategic position could and should be examined through introspecting the firm's evolutionary paths and path dependencies. For the purpose of reflecting the dynamic nature of the vendor's development, its process in outsourcing, and the vendor's ICT utilisation across that process we have used the *retrospective case study* where data about the past history will be collected and analyzed in order to explain the present condition of a unit of analysis.

The final step in choosing the cases is sampling i.e., choosing particular participants in the analysis. In the case of this study, the unit of analysis is a company. The case companies should be selected on the basis of theoretical, rather than random sampling, which means that the cases may be chosen to reflect to one of the following options (Eisenhardt, 1989):

- Replicate previous cases
- Extend emergent theory
- Fill theoretical categories
- Provide examples of polar types.

Along the course of inquiry we combined the latter two options. Initially, we started with seeking to satisfy the “fill theoretical categories” option. Therefore, we planned to analyze minimum two case companies – one that applies existing ICT solutions and one that creates new ICT solutions. However, while searching for cases and conducting preliminary interviews with informants in potential cases we discovered that companies that apply existing ICT solutions could have various ICT set-ups regarding the infrastructure, application and human capital. In general, we have noted that the application of ICT can be conducted by the vendors either with a business supportive ICT set-up, or by the vendors whose infrastructure, applications and human capital are not business process supportive. We suppose that in the case when ICT has been created, the infrastructure, the applications, and the human capital can be characterized as generally “good” and business process oriented. Therefore we have decided to split the ICT application theoretical category into two embedded cases, one with a high level of business process supportiveness, and one with a lower level of business process supportiveness. Hence, we will analyse three cases: one that applies ICT solutions and does not have business supportive infrastructure, applications and human capital, one that applies ICT solutions and has business supportive infrastructure, applications and human capital, and one that creates ICT solutions (Table 4.1).

ICT APPLICATION		ICT CREATION
Not business process supportive	Business process supportive	
<b>CASE 1</b> <i>Prometheus</i>	<b>CASE 2</b> <i>Asterion</i>	<b>CASE 3</b> <i>Califia</i>

Table 4.1 – Desirable cases

In order to mitigate the contextual noise that could affect the data analysis and in order to assure a unique business environment in which the cases operate, the companies should ideally be from the same industry. Outsourcing is present in almost every industry but there are only few in which vendors are the dominant participants. Two prominent examples are the Off-shore Software Development, and Electronic Manufacturing Service (EMS) industries. ICT is obviously one of the software developers’ key competences and an essential element of their capabilities. ICT is their *raison d’etre*. Therefore, studying the true utilisation of ICT in the off-shore software development industry would be a “pleonasm” in a certain way. Instead, the EMS seemed to be a more appropriate industry for studying how vendors utilise ICT across the outsourcing process. A description of the EMS industry is given at the beginning of the Cases chapter. The choice of the PROMETHEUS was influenced by the professional relationship of the TEM centre with an Asian EMS, which was suitable for studying as a case of ICT application. The ASTERION was selected in Denmark after screening 10 Danish EMS companies, where two had been selected as potential cases. ASTERION accepted to participate in the research. The third case company, CALIFIA, had been pre-selected as one of eight potential cases after screening the USA Pacific coast’s EMS industry (the states of California, Oregon and Washington). After conducting preliminary interviews with the Chairman and the Chief Information Officer (CIO) we identified them as a vendor who creates ICT solutions. The EMS industry is globalized and operations are pretty much standardized (see the section on EMS industry in the Cases chapter), which legitimates the fact that three cases are from three different countries. However, we’ll keep it in mind to comment in the conclusion on any emerging national/regional contingencies.

### 4.3. Research Design

Two tests for the quality of research design i.e. construct validity and reliability are determined during the data collection, but have to be addressed in the protocol and instrumentation phase of the design process. *Construct validity* refers to establishing correct operational measures for the concept being studied and the tactics for obtaining the construct validity are to use multiple sources of evidence, establish chain of evidence, and have key informants review draft case study report (Yin, 2003). *Reliability* refers to demonstrating that the operations of a study, such as the data collection procedures, can be repeated, with the same results. Adequate tactics for having a reliable case study should be to use case study protocol, and develop a case study database (Yin, 2003).

#### 4.3.1. Protocol

Protocols contain procedures and general rules that should be used in using the instrument(s), and indicate from who or where different sets of information are to be sought (Voss et al., 2002). Instrumentation comprises specific methods for collecting data, such as interviews, observations, informal conversation, company publications, on-site measurements, etc. Case study instruments may be focused on qualitative or quantitatively organised information, and may be loosely to tightly structured (Miles and Huberman, 1994).

When developing the protocol and instruments, in order to improve validity and reliability of the study, the researcher has to address triangulation. Triangulation is the combination of methodologies in the study of the same phenomena or programs. There are four basic types of triangulation (Denzin, 1978):

- Data triangulation – the use of a variety of data sources in a study
- Investigator triangulation – the use of several different researchers or evaluators
- Theory triangulation – the use of multiple perspectives to interpret a single set of data
- Methodological triangulation – the use of multiple methods to study a single problem or program

Figure 4.2 depicts the research protocol in which it is visible that we plan to use key informants within case companies in order to verify the correctness of initial drafts. A fellow researcher will serve as an additional evaluator whose primary role will be to evaluate the correctness of transcripts, drafts and cross-case analyses. Finally, one more researcher will be asked to evaluate drafts of the analyses for the first two cases, and to evaluate the cross case analysis for all three cases. In this way we use investigator triangulation to ensure the construct validity and to increase the richness of data interpretation in the analyses. In addition, both researchers will be provided with the research protocol and instruments. In this way we hope to establish a sufficient level of reliability.

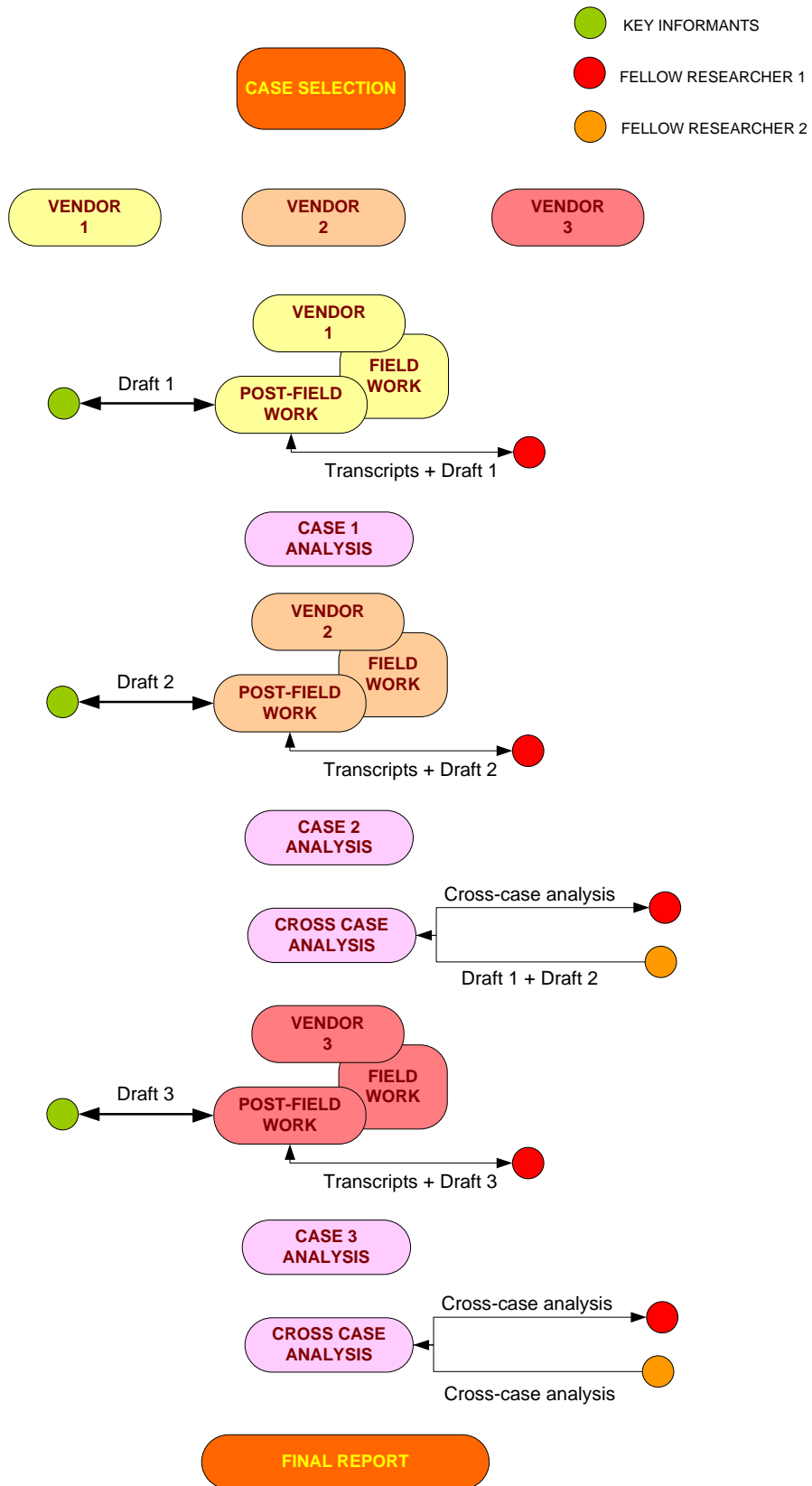


Figure 4.2 – Research protocol



Table 4.3 depicts a more detailed content of the field work activities.

<b>Pre-field work</b>	
<b>Activities</b>	<b>Instruments</b>
<b>Case selection</b>	
Identify the vendor's position in the Create-Apply system	Document review, word of mouth, mini interviews with key informants within the industry, companies, academics
<b>Field work</b>	
<b>PHASE ONE</b>	
<b>Activities</b>	<b>Instruments</b>
<b>Mapping the process</b>	
Establish the phases of the vendor's outsourcing process and the relationships among them	Interview, observation, document review
Identify which phases are the most critical to the success of outsourcing	Interview, observation, document review
<b>Competences and capabilities</b>	
Identify capabilities	Questionnaire to outsourcers, interview, document review
Identify competences	Interview, observation, document review
<b>Context</b>	
Describe assets and paths	Document review, interview
<b>PHASE TWO</b>	
<b>Activities</b>	<b>Instruments</b>
<b>ICT</b>	
Analyze general characteristics of the ICT	Interview, document review
Relationship between ICT and the phases of the process	Interview, document review
Relationship between ICT and competences	Interview, observation, document review
Relationship between ICT and capabilities	Interview, observation, document review
Relationship between ICT and winning and renewing outsourcing contracts	Interview, observation, document review
Relationship between ICT and paths	Interview, observation, document review
Relationship between ICT and other assets	Interview, observation, document review

Table 4.3 - Field work activities

In the first phase of the field work we should map the vendor's process in outsourcing. This would enable us to capture the phases of the process and to understand how they are supported by organisational functions. It is very important to identify which groups of activities are critical to winning and renewing outsourcing contracts. In parallel to mapping the process we should identify the vendor's capabilities and competences and establish their mutual relationships, particularly among those which are characteristic of the critical phases of the vendor's process in outsourcing. We should finish the first phase of field research with the identification of the context in which the vendor operates and from which it pulls its resources. In addition, we should pay attention to the historical development of the process, capabilities and competences. The outputs from the first phase (process, capabilities, and competences) would serve as a basis for conducting the second phase of the field work.

The second phase should depict the key issues surrounding the vendor's utilisation of ICT in the outsourcing process. Firstly, we should identify and analyze general characteristics of the

vendor's ICT. Afterwards, we should establish the relationship between ICT and the outsourcing process, competences, capabilities, assets and paths. Finally, the overall role of ICT in winning and renewing outsourcing contracts should be identified.

### 4.3.2. Instruments

When developing front-end instrumentation, the researcher has to find balance between having structured and unstructured instruments. Miles and Huberman (1994) advise that the amount and type of instrumentation should be a function of the researcher's conceptual focus, research questions, and sampling criteria. Further they provide a table that should help in determining the level of the instruments' determinism (Table 4.4). They distinguish three types of instrumentation:

- Little prior instrumentation puts emphasis on certain types of validity: construct, descriptive/contextual, interpretive, and natural.
- A lot of prior instrumentation emphasizes internal validity and generalizability.
- The category "It depends" is used when it is impossible to reach absolute answers in relative instances.

Shading in Table 4.4 marks the cells which best describe the present study's position regarding the conceptual framework, research question and sampling criteria.

Apparently, the variety and depth of appropriate instruments belong to the "It depends" category. The instruments' determinism should be balanced in a way that should satisfy the study's needs or as Miles and Huberman (1994) would encourage:

"Figure out first what kind of study you are doing and what kind of instruments you are likely to need at different moments within that study, and then go to work on the ones needed at the outset."

Little Prior instrumentation	It Depends	A Lot of Prior Instrumentation
Rich context description		Context less crucial
Concepts inductively grounded in local meanings		Concepts defined ahead by researcher
Exploratory, inductive		Confirmatory, theory-driven
Descriptive intent		Explanatory intent
Basic research emphasis		Applied, evaluation of policy emphasis
Single case		Multiple cases
Comparability not to important		Comparability important
Simple, manageable, single-level case		Complex, multilevel, overloading case
Generalizing not a concern		Generalizability/representativeness important
Need to avoid researcher impact		Researcher impact of less concern
Qualitative only, free-standing study		Multimethod study, quantitative included

Table 4.4 - Prior instrumentation: Key Decision Factors (Adapted from Miles and Huberman, 1994)

In order to achieve data triangulation we have used the multiple sources of evidence in terms of using various types of instruments (interviews, internal and industry documents), and in terms of conducting interviews with several key informants within the same company. However, the data have been collected predominantly through the interviews. The interview guide is given in the Appendix [INTERVIEW GUIDE](#). It consists of two phases. Phase one is aimed at capturing the process, capabilities, competences and the context in which the

company operates. Phase two has the aim of capturing the characteristics of the company's ICT and their relationships with winning contracts, the process, capabilities and competences.

Section A of the interview guide is aimed at guiding the researcher towards capturing the vendor's outsourcing process. We suggest that the chain of events should be established, which would help in drawing the sequence of phases of the vendor's process and the relationships among the phases. Additionally, the researcher should identify which phases are the most critical to the success of outsourcing.

After the vendor's process in outsourcing has been captured, the field research should reveal the company's competences, capabilities, positions and paths. By following Hatten and Rosenthal (1990) we look for the organisation's competences in the vendor's functions (organisational units) and for capabilities within the process. We use a modified questionnaire from Andriessen and Tissen (2000) as an interview guide for depicting the competences (See Appendix [COMPETENCES QUESTIONNAIRE](#)).

In order to identify the vendor's capabilities we wanted to use customers as key informants. They were supposed to help in identifying the market and the competitive tests of capabilities. The market test of a capability is whether it satisfies the firm's target customers. The competitive test is whether those customers judge the firm advantaged, compared to its rivals in that dimension, and positioned to be their preferred supplier (Hatten and Rosenthal, 1990). Knowing that it will be hard to get permission from the case company to reveal the customer's names and direct contact we prepared the same set of questions for both the customers and the key informants, as proposed by Levina and Ross (2003) and Feeney et al. (2005) (See Appendix [QUESTIONS TO THE CUSTOMER](#)). Where applicable, an introductory letter together with the questionnaire was sent to the customer.

The last part of the section B in the interview guide was to help in describing the historical development of the vendor and its key competences and capabilities. In addition, there it was to be identified whether the vendor is in possession of some unique assets.

Phase 2 of the interview guide consists of the suggestions and reminders that should guide the researcher in portraying the ICT system in the organisation, and its influence on outsourcing, competences and capabilities. For depicting the general characteristics of the ICT system we use the Bouwman et al. (2005) framework of ICT's utilisation in a business organisation.

#### **4.4. Data Collection**

Our data were primarily collected through interviews. Additional information was obtained through desk research (Internet pages of the cases and of the industry sources). The case companies provided us with a substantial amount of internal materials covering the layouts of their ICT systems, financial data, customer satisfaction reviews, sales materials, etc. In the following text we briefly describe the scope of interviewing and site visits.

##### ***Prometheus***

The field work in PROMETHEUS started in November 2006 when the first researcher visited their headquarters in Asia. At that time the current project was different but some of the points from the interviews could have been taken for exploring and explaining the key issues from this research framework. The visit in 2006 lasted for four working days. The same site was

visited, this time having the current research framework in mind, in August (two days) and November (four days) 2007. The European site was visited in April 2007. The fellow researcher 1 was present during the interviews in April 2007 in Europe and in August 2007 in Asia. During those four visits we talked to the following informants in PROMETHEUS:

- Corporate level
  - Executive Chairman; Chief Operating Officer; Corporate IT Manager; Corporate Business Development Director; Corporate Procurement Manager; Sales Manager for Nordic Region; Corporate Procurement Executives
- Asian unit level
  - General Manager; R&D Manager; Business Development Manager; Key Account Manager; MIS Section Head; NPI Manager; Supply Chain Section Head
- European unit level
  - General Manager; Business Development Manager

### ***Asterion***

The field work in ASTERION was conducted in February 2008. The project and the visit had been announced by the Confederation of Danish Industries. The first researcher spent two days visiting the facility and talking to the informants. The second researcher was present on the first day of the interviews. During these two days we interviewed the following key informants:

- Chief Operating Officer; Corporate Development and IT Manager; Sales Manager
- Development Manager; Supply Chain manager; Human Resources Manager; Production Manager

Additional visit to ASTERION took place in October 2008 for the purpose of verifying the results of the analysis and for additional collection of the data referring to ASTERION's general business context.

### ***Califia***

Interviews with key informants in CALIFIA happened on two occasions. The first visit was in May 2008 when the first researcher had the opportunity of conducting preliminary interviews with the Chairman and with the Chief Information Officer (CIO). The second visit was in July 2008 and on that occasion the first researcher interviewed the following key informants:

- Chairman; CIO; IT staff; Senior Vice President for Sales & Marketing; Manager of Program Management; Vice President for Materials; Purchasing Manager; Director of Manufacturing; Manager of Test Engineering; Financial Controller

## **4.5. Techniques for Data Analysis**

Qualitative data analysis is a continuous and iterative process during which its elements are in constant interaction as shown in Figure 4.5 (Miles and Huberman, 1994).

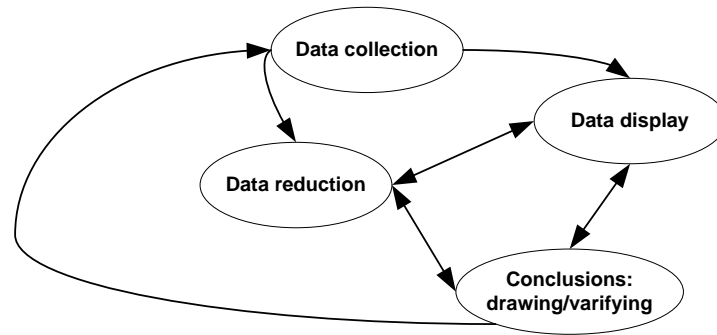


Figure 4.5 - Interactive Model

Miles and Huberman (1994) described data reduction as "the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions". In its essence, data reduction refers to the coding procedures. Since we had already determined which variables (or categories) we were interested in studying, the coding procedures we deployed were related to identifying and consecutively submitting and relating elements of a certain category (or subcategory) to the category. This procedure could be interpreted as axial coding i.e., relating and linking categories to the properties and dimensions (Strauss and Corbin, 1998). We were also guided by the seven principles of interpretative field research in information systems formulated by Klein and Myers (1999). However, the most utilised analytical techniques in the study came from the guidance for developing and analyzing displays provided by Miles and Huberman (1994). The analysis was conducted by deploying three single-case analyses and finishing with the multiple-case analysis.

For the single case analyses we used both exploratory and explanatory data capturing, displaying, and conclusion writing techniques (Miles and Huberman, 1998). In the multi-case analysis we used cross-case explanatory techniques. The first part of the data analysis concentrated on capturing each of the key variables we were interested in investigating i.e., the ICT, the process, competences, capabilities, and winning, running, and renewing outsourcing contracts. We started with mapping the EMS process, where we identified the phases and their sequence. For capturing competences, capabilities, and elements of ICT we used conceptually ordered displays i.e., a conceptually clustered matrix and a thematic conceptual matrix. For drawing the conclusions in describing competences, capabilities, and ICT several tactics were used, like noting relations between variables, making comparisons, clustering, and seeing patterns. The effects matrices were used to explore which competences influence which capabilities, and which competences and capabilities lead towards winning, running and renewing outsourcing contracts. Further on, the effect matrices were also used to explore which competences, capabilities and performance elements are influenced by which elements of the ICT system. To explain the ICT – competences/capabilities – vendor's performance triad we used the case dynamics matrix and causal networks. Finally, the three cases were aligned and cross-case analysis was deployed to explain the differences between the cases and to draw and verify conclusions. For this purpose we used some of the cross-case analysis displays (predictor-outcome matrices, causal models, cross-case causal networks), and almost all of the conclusion drawing and verifying tactics as suggested by Miles and Huberman (1998).

**Utilisation of ICT across the Outsourcing Process  
- The Vendor's Perspective -**

**CHAPTER V**

**CASES**

## CHAPTER 5

### CASES

Before we introduce the cases, we present a relatively short overview and analysis of the EMS industry. This step was important since the EMS industry has distinctive participants, dynamics, jargon, and other rules and characteristics. Thereafter we introduce the three case companies PROMETHEUS, ASTERION, and CALIFIA, followed by a summary of their key features.

Afterwards we look into the processes for at least two reasons. Firstly, when following Hatten and Rosenthal (1999) one could expect to capture an organisation's capabilities along the phases of process. Secondly, the primary mechanisms through which IT capabilities impact overall business performance are through the business process (King, 2002; Petruzzi and Garavelli, 2007; Prahalad and Krishan, 2008).

In the fourth part of the chapter we identify competences characteristic to each of the cases. The competences are grouped into two categories: the unit-based competences that reflect an organisational unit's or function's skills, knowledge and technologies, and; corporate competences, which are on the corporate level, and present an overall organisational competence.

Capabilities of three companies are given in the fifth part of this chapter. We have identified that companies may have three groups of capabilities i.e., those necessary to win, run, and renew outsourcing contracts. The dominant capabilities are those which are present across all three stages of the process.

The next section of the chapter outlines basic characteristics of three ICT systems. We explore the three ICT systems by analyzing the infrastructure, applications and ICT human capital.

We were interested in finding out how vendors utilise ICT across the outsourcing process and how that utilisation influences the vendor's primary goals of winning, successfully running, and renewing outsourcing contracts i.e. the vendor's performance. As shown in the research framework we suppose that ICT can have either a direct influence (wins, runs, and renews the contracts because of its ICT capability), or an indirect influence (ICT capability influences competences and capabilities that are key for winning, running, and renewing the outsourcing contracts). The latter case requires that we understand how competences impact capabilities, which further impact the vendor's performance. Therefore we continue the presentation of the cases by looking into the relationship in the competence-capability-performance triad.

Afterwards we examine how elements of the ICT systems, particularly applications, impact competences, capabilities, and the performance. We start with describing the ICT's impact on competences and identifying which competences have been influenced by the use of ICT. We continue by a more detailed elaboration of applications that have had the largest and most visible impact on the triad elements. At the end we summarise the ICT's impact on competences, capabilities, and performance in each of the case companies.

## 5.1. EMS Industry

The EMS industry is formed through the dynamics of several participants, such as OEMs, CEMs, ODMs, and OBMs. Even though OEMs are considered a part of the EMS industry, their turnovers and market share do not count in the analysis of the EMS industry. The CEMs, ODMs, and OBMs represent the dominant supplier's side and are also commonly referred to as EMS providers. Whenever we mention the EMS industry, we think only of these three types of companies. In the following text we describe each of the participants and the general trend in the industry.

Original Equipment Manufacturers (OEMs) are large manufacturers who traditionally have designed and manufactured products to sell under their own brand. The OEMs could come from various industries, such as communications (*Sony Ericsson*), computers (*IBM*), consumer electronics (*Bang & Olufsen*), automotive (*Magna Donnelly*), industrial (*Danfoss*), medical (*GE Medical*), commercial aviation (*Boeing*), defence (*BAE*) or other transportation industries (*Modular Mining*).

The main reason behind the rise of the EMS industry is the increasing needs of the OEMs to focus their resources on their marketing and design activities and their inability to cope in parallel with the increasing investments and management resources required by new manufacturing technologies. This led OEMs to outsource some of their manufacturing or even to divest some of their plants by selling them to EMS providers. Furthermore OEMs came under intense pressure to reduce costs of goods and had to relocate their production to lower-cost countries. They were then faced with the choice between establishing their own production operation or outsourcing to an EMS partner.

OEMs began to outsource the insertion of the electronic components on printed circuit boards (PCBs), in the process known as PCB assembly (PCBA), including its testing some 30 years ago. This marked the beginning of the growth of Electronic Manufacturing Service providers (EMS), or Contract Electronic Manufacturers (CEM), who provide manufacturing services to OEMs<sup>1</sup>. They manufacture products based on designs provided by OEMs, and sold by OEMs under the OEM brand name. Some of the leading tier-one EMS companies are *Hon Hai Precision Industry* (better known as "*Foxconn*"), *Flextronics* and *Elcoteq*.

Another type of company that participates in the EMS market are Original Design Manufacturers (ODMs), who provide design and manufacturing services to OEMs and brand them under their own name (*Asustek*, *Quanta*). ODMs are similar to the EMS providers, but they typically own the intellectual property rights (IPR) to the product itself, whilst the regular EMS providers build strictly to their customers' designs or sell their design services to their customers but in any case the IPR belong to the customer. EMS can make hundreds or even thousands of different products, whereas ODMs often specialise in only a handful of categories. Finally, the last group of companies in the EMS market are manufacturers who have upgraded their business from an EMS or/and ODM stage. They are known as Original Brand Manufacturers (OBMs), whose characteristic is that they design, manufacture and sell products under their own brand name (*Acer*).

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<sup>1</sup> We will be using abbreviations EMS providers and CEM as synonyms. They will always refer to the same type of company.



The top 10 EMS providers account for 70 % of the sales of the entire EMS industry. EMS providers are segmented according to revenue, competence and global reach into tier-one, tier-two and tier-three EMS providers. Tier-one EMS providers are the organisations with sales figures over US\$1 billion with a complete portfolio of competences and extensive global reach; tier-twos generate sales between US\$1 billion and 100 million, have a degree of vertical integration and presence on more than one continent and may offer design services as well, but very few offer a combination of all three; and tier-three EMS providers are those with sales below US\$100 million and are mainly smaller local companies specialised in, for example, PCB insertion for a particular market segment. The first five and last five among the top 50 EMS are given in Table 5.1.

Organisation	Headquarters	Sales (10 <sup>6</sup> \$US)	Notable customers
<b>Top 5 EMS</b>			
Hon Hai (Foxconn)	Tu-Cheng, Taiwan	39.100	Dell, Apple, HP, Motorola
Flextronics (incl. Solectron)	Singapore	28.811	Casio, Cisco, Dell, IBM
Jabil Circuit	St. Petersburg, Florida	11.087	Cisco, Nokia, Philips, HP
Sanmina-SCI	San Jose, California	10.872	IBM, Lenovo, HP, Tellabs
Celestica	Toronto, Canada	8.812	Avaya, Cisco, EMC
<b>Positions 45-50</b>			
COB Technology	Singapore	230	
MC Assembly	Palm Bay, Florida	230	
Kitron	Lysaker, Norway	226	Kongsberg, HemoCue
Creation Technologies	Burnaby Canada	213	
LaBarge	St.Louis, Missouri	213	Schlumberg, Northrop

Table 5.1 - TOP 50 EMS providers in 2006

Source: Adapted from Manufacturing Market Insider, March 2007

Large EMS providers predominantly serve the computing and telecommunication industries (Figure 5.2).

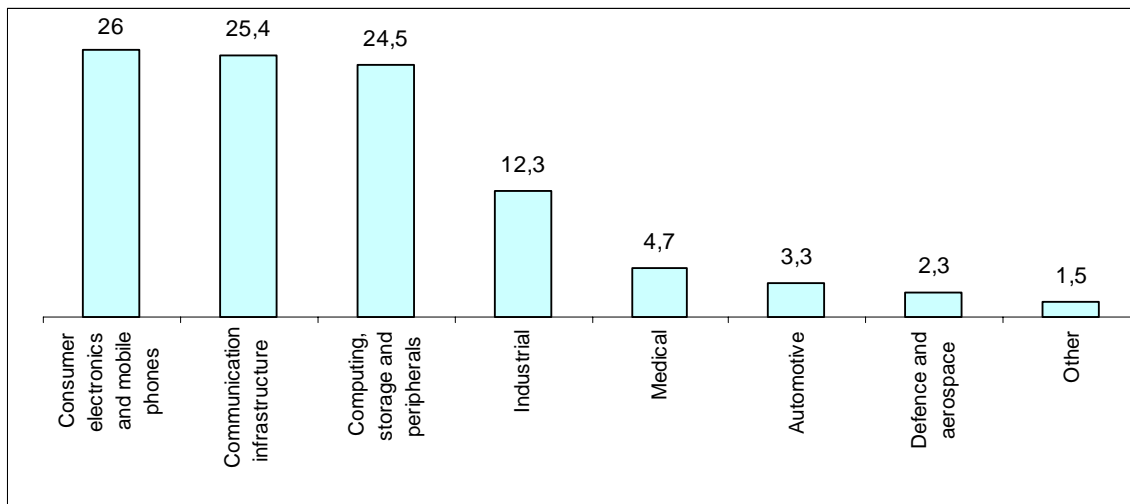


Figure 5.2 - Market Mix for TOP 50 EMS providers in 2006

Source: Adapted from Manufacturing Market Insider, April 2007

Companies like *Hon Hai*, *Flextronics*, and *Jabil* look for big deals worth several hundred-million or even billions of US\$. These deals typically come from large OEMs like *HP*, *Apple* and *Cisco*.

In 2006, the CEM and ODM markets were worth more than US\$ 200 billion. The CEM market still dominates the market with a share of 57% and is expected to be worth more than US\$350 billion in 2009, and more than US\$440 billion in 2011. Despite these optimistic prognoses, EMS providers are margin-limited in their core manufacturing businesses. Within the field, mergers and acquisitions (M&As) represent one of the most obvious paths to growth. However, M&A activities seem to be saturated among large EMS providers, whilst there is still room for tier-two and tier-three companies to grow through mergers and acquisitions, also as a means of adding manufacturing or design competences, of extending geographic reach, or of capturing attractive customers or markets via the acquisitions.

The number of cases in which OEMs are divesting their operations grew significantly in 2006, which broadened the number of possible acquisition targets. EMS market is still very attractive for new players, who increased in number in 2006 (Figure 5.3).

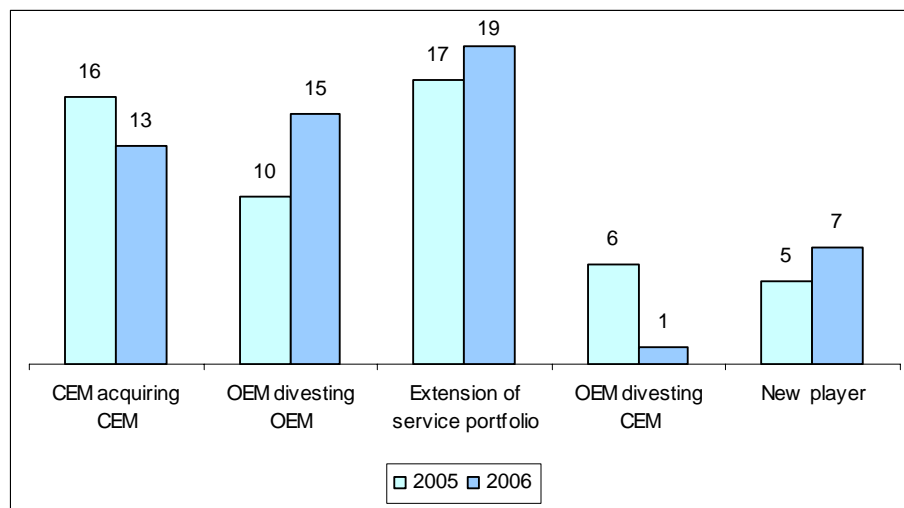


Figure 5.3 - EMS market dynamics

Source: Adapted from Manufacturing Market Insider, February 2007

## 5.2. Portraits of Companies

### 5.2.1. A brief portrait of PROMETHEUS

PROMETHEUS, a tier-two Electronic Manufacturing Services (EMS) provider, trace their roots to a precursor company founded in 1974 in Singapore. In 1983 PROMETHEUS spotted the opportunity to manufacture power supplies for HP 35/45/65 model calculators for HP worldwide. Scraping together capital from investors and taking on necessary loans, PROMETHEUS set up a small operation beside the Bayan Lepas Free Industrial Zone, where some giants in the electronics industry were already ensconced, among them Intel, Robert Bosch, Fairchild and Motorola. PROMETHEUS are still headquartered today in Penang, Malaysia, and run by a diverse team of international executives (Figure 5.4).

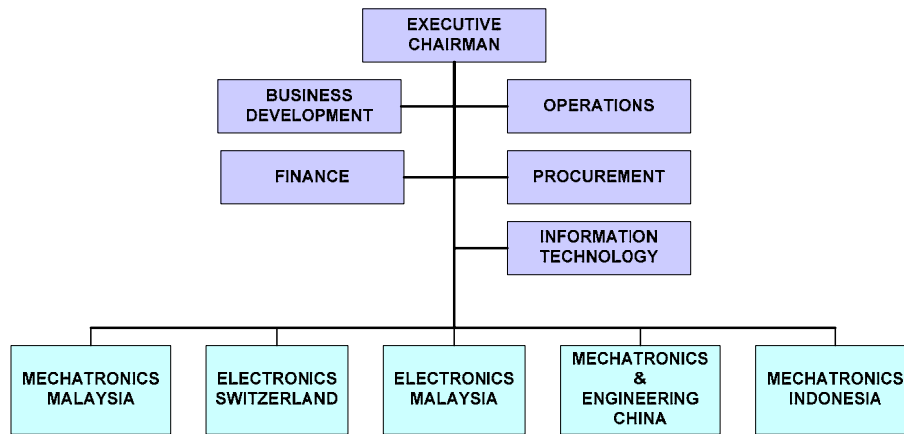


Figure 5.4 – Corporate organisational structure (Source: Internal company material)

Revenues and profits have grown steadily (Figure 5.5) over the years, providing the resources for organic growth as well as making acquisitions possible.

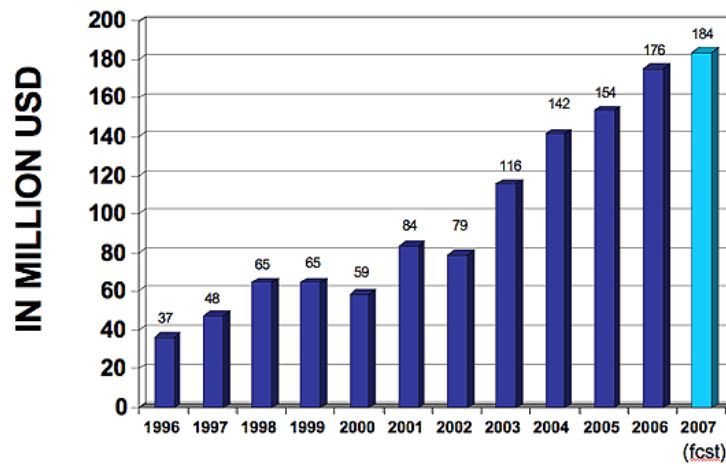


Figure 5.5 - Revenues from 1996 to 2007 (Source: Internal company material)

PROMETHEUS have built a stable portfolio of marquis OEM customers, mainly in industrial electronics, residential control, high-end consumer, and electrical products markets, while avoiding the known volatility in markets for computers and mobile phones (Figure 5.6).

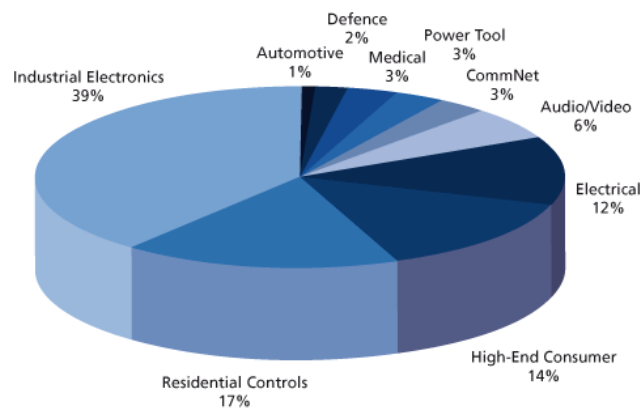


Figure 5.6 - Sales by industry in 2006 (in %) (Source: Internal company material)

By 2002, PROMETHEUS were operating in four countries, with roughly three-quarters of their sales to European customers and one-quarter to North American customers.

In January 2003, PROMETHEUS made a major acquisition by buying the Swiss-based, former electronic design, development and manufacturing arm of an electronic company. With the efforts of both Asian and Swiss management teams, PROMETHEUS believes that a new success formula seemed to have been born – a tier-two, vertically-integrated electronic design and manufacturing service provider with international reach that could offer a set of capabilities usually only found in tier-ones EMS providers.

Consequently the two sites with the most strategic contribution to PROMETHEUS's performance are located in Electronics Malaysia (Figure 5.7) and in Electronics Switzerland (Figure 5.8). Electronics Malaysia is the leading high volume production site with the facilities and resources for conducting both design and manufacturing of the complete “box-build” solutions. Electronics Switzerland is PROMETHEUS's design and development centre of excellence, with manufacturing resources for low volume and high mix production.

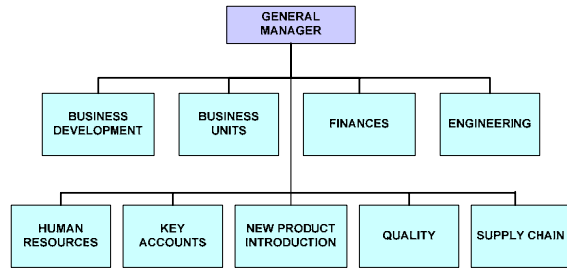


Figure 5.7 – Organisational structure in Electronics Malaysia (Source: Internal company material)

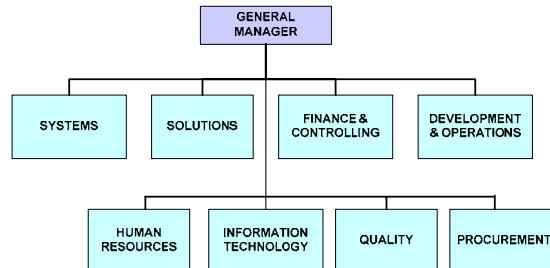


Figure 5.8 – Organisational structure in Electronics Switzerland (Source: Internal company material)

### 5.2.2. A brief portrait of ASTERION

ASTERION is a tier-three EMS company established in 2004 after the merger of MAN and DAV, two Danish electronics development and manufacturing companies. MAN was established in 1983 as an electronics manufacturing company. Most of their activities have been built around the development and production of customized electronics, in particular for ventilation and climate control systems. DEV, a more development-oriented arm of ASTERION was founded in 1990 by two entrepreneurs who used their competences in development of electronic control systems to develop a contract development business model. After a while they developed a satellite-based field treatment system. DEV have been developing their competences within the farming and agricultural industry ever since. 1990s were marked as DEV's specialization in computer vision technologies. In 2002 they developed the first computer vision operated robot. The two companies and two distinctive business cultures were merged in 2004 with the agenda of providing the contract development and contract manufacturing services of electronics, together with the development of automation solutions by utilising the computer vision technology. A heating and ventilation equipment manufacturer is a majority owner and major customer of ASTERION. The company is a tier-three EMS present in one country with about 150 employees. The organisational units directly reporting to the CEO are Finances, Supply Chain, Sales, Human Resources, and Design and Development (Figure 5.9).

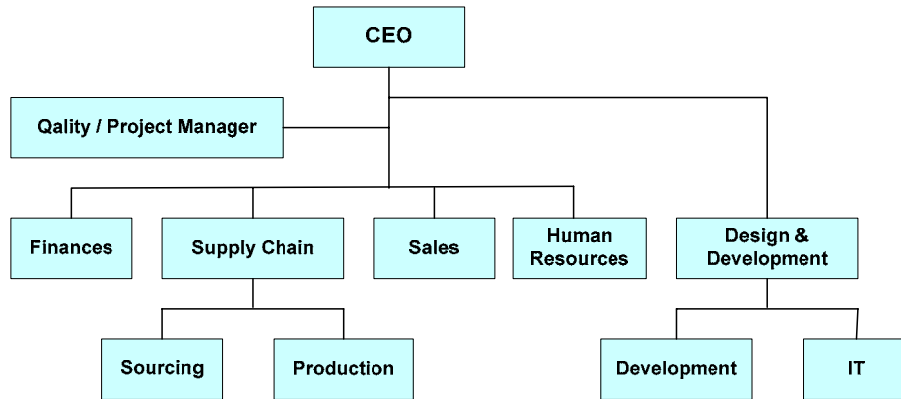


Figure 5.9 – Organisational structure (Source: Internal company material)

Manufacturing and sourcing are integrated and incorporated within the Supply Chain. The Design and Development (D&D) unit is led by a co-owner of ASTERION. The most of employees are former DEV employees and the unit’s culture predominantly mirrors DEV values.

ASTERION have specialized in the development of the electronic applications for the agriculture and ventilation industries. Therefore, the majority of their customers are more or less connected with these two industries. Almost all of the business activities (95 %) are oriented towards EMS provision; while a small fragment of projects (5 %) is dedicated to the so called automation projects i.e. the development and production of the testing equipment for manufacturing process. The most of orders from the customers include D&D and manufacturing (57%), manufacturing and box-build (18%), and D&D, manufacturing and box-build (17%). Only 8% of the incoming projects refer to the sole manufacturing service provision.

Since their inception both contributing companies to ASTERION had recorded growth until the merger and creation of ASTERION (Figure 5.10), when the company had started to experience the stagnation in revenues.

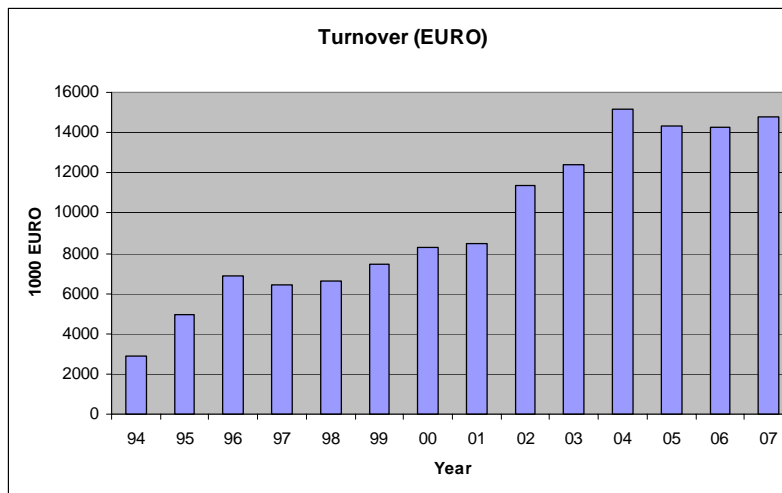


Figure 5.10 - Turnover (Source: Internal company material)

### 5.2.3. A Brief Portrait of CALIFIA

CALIFIA is a tier-three EMS company specialized in complex projects in low to medium volumes. It is headquartered in California and operates from three facilities, two in the USA, and one in Mexico.

CALIFIA was formed early in the 1980s as an OEM company. It designed, manufactured, and sold worldwide intelligent graphics terminals for IBM mainframe computers. However, in the very early 1990s IBM's mainframes became very unfashionable and the graphics terminals business was going to become obsolete. CALIFIA's customers were moving towards UNIX based engineering work stations. The management knew that CALIFIA had technological competences and capabilities to develop one, but the problem was that the field was already so competitive that they felt that, as their Chairman explains "scientific success will lead to commercial failure". At that time the field contained IBM, Digital Equipment, Hewlett Packard, Sun Microsystems, and Silicon Graphics. "They were all much larger than we were, probably spending as much in R&D every quarter as our annual revenues", continues the Chairman. New business directions were necessary, and CALIFIA pursued two options. Based on interviews with customers they developed a set of software products for engineering collaboration. They also took a look into the factory where they knew that with declining volume the terminal business would slowly die and the unit costs were going to raise. The management decided to see if they could also do a little bit of CEM. Initially that was a tactical decision rather than strategic. The software product won an array of reviews, everyone loved it but nobody bought enough of it. "We sold several million dollars worth but it wasn't enough to run a business", explains the Chairman. That part of business was closed down. In the meantime CALIFIA found out that they were more successful than they thought that they were going to be with CEM. That became their business and in 1996 they ended all businesses except CEM. That's what they've been doing ever since.

In 1996 CALIFIA was incorporated into a parent company Esplandian, which later (in 2004) acquired a Midwest based EMS company with a *maquiladore*<sup>2</sup> operation in Mexico. The operations of CALIFIA and her sister organisation in Midwest are managed by a team led by the Chairman and two Chief Operations Officers, one for each of the organisations. The forthcoming analysis is focused only on CALIFIA because their utilisation of ICT fitted well into the research framework i.e., into the creation dimension.

Esplandian has 435 employees, 190 of which are in CALIFIA, and of those there are 30 full-time but temporary employees. CALIFIA tries to keep 15 % to 30 % of their labor force temporary so it can be flexible when there is a change in demand without letting full-time permanent employees go. CALIFIA's 190 employees are organized as shown in Figure 5.11.

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<sup>2</sup> Wikipedia.com defines maquiladora (maquila) as "a factory that imports materials and equipment on a duty-free and tariff-free basis for assembly or manufacturing and then re-exports the assembled product, usually back to the originating country. A maquila is also referred to as a "twin plant", or "in-bond" industry. The term "maquiladora", in the Spanish language, refers to the practice of millers charging a "maquila", or "miller's portion" for processing other people's grain."

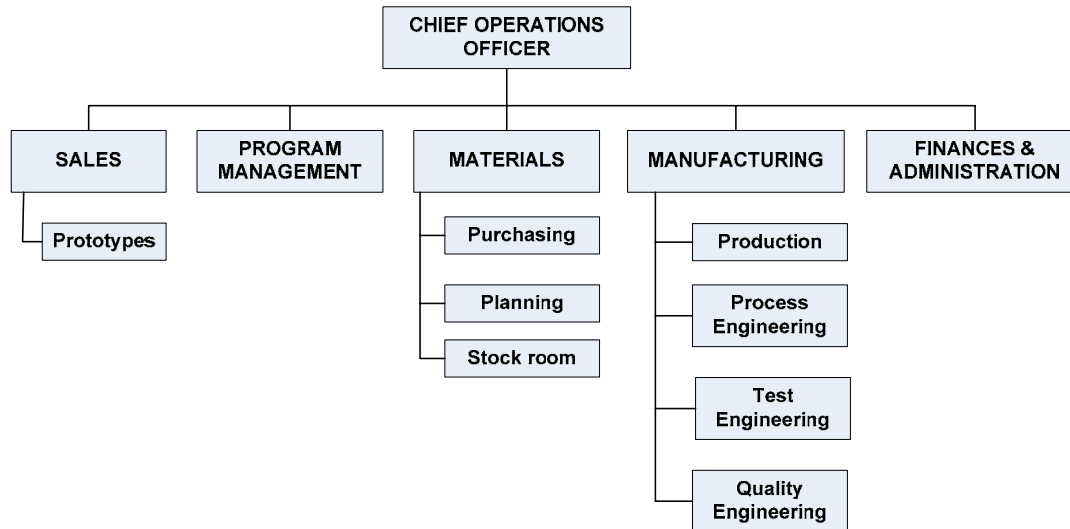


Figure 5.11 - Organisational structure (Source: Internal company material)

Sales, program management, materials, manufacturing, finance, and administration report to COO. The Sales Department consists of one salesman, who manages the department, and more than 15 employees within a group that does specialty business prototypes, i.e. small volumes very fast. Program Management is a coordinating body for the projects coming and running in CALIFIA. Materials Department embraces various operative activities. Vice President for Materials manages the work of Purchasing, Planning, and Inventory. Manufacturing Department is divided into production, and process, test, and quality engineering. Finances and Administration consist of accounting, human resources administration, and ICT.

Due to its exposure to volatile market conditions the company has been experiencing turnarounds in financial performance since the initiation of CEM operations in 1992. The CEM business was growing well in the first several years and in 2000 CALIFIA grew to the level of tier-two EMS with revenues of above 150 million US\$. However, in 2001, CALIFIA experienced the burst of IT bubble and decreased its operations to a third of the previous year's peak, to only 40 million US\$. Bad karma continued to influence CALIFIA when in 2003 their largest customer decided to backsource, minimizing the revenues to 25 million US\$. The management team didn't give up and regained strengths to see the organic growth to 35 million US\$ in just one year, and through the acquisition of the Midwest sister company which added additional 20 million, totaling revenues to 55 million US\$. At the time of interviews, CALIFIA expected to achieve combined group revenue of 70 million US\$ in 2008. The strategy has foreseen the annual revenue growth of 15%.

CALIFIA has been working with customers from different industries. The industry ratio has been changing over the time, which has been influenced by the demand. Currently, the dominant number of projects is in the Transportation & Automotive industry (45 %). This is followed by the Defense & Aerospace industry (25 %), Industrial Controls and Computer Peripherals (9 % each), and 3 % in the Medical industry. The rest are small accounts predominantly from the Communications industry. This may be changed very soon since there is a decrease of Transportation and Automotive customers because of the oil price crisis in the USA. In addition, CALIFIA has a growing number of projects coming from the Medical industry.

### 5.2.4. Brief portraits: Synthesis

The three cases have something in common to all, but also some special, internal features. We grouped them along the lines of properties such as age, type of ownership, locations, characteristics of manufacturing, etc. (for the complete list of properties see Figure 5.12). The grouping should help us in the later phase of the analysis to interrelate the research questions with the contextual factors that could emerge from the companies' features. There are some interesting features worth mentioning here. Both ASTERION and CALIFIA have had previous experience in OEM business. They are also similar in terms of their production capacity. Both companies can provide only low to medium volumes/high mix manufacturing. PROMETHEUS, on the other hand, have competences in both high and low volume manufacturing. They can also offer competences in the manufacturing of electronics, plastics and tooling. It is common for all three companies that they have a diversified industry portfolio, hence avoiding volatile markets of contract manufacturing for the information and telecommunications industries.

PORTRAITS	PROMETHEUS	ASTERION	CALIFIA
<b>In EMS business</b>	1974	2004	1996
<b>Ownership</b>	Private company	Established by merger. Daughter company of a heating and ventilation OEM	Private company which grew up as a transformation of an OEM
<b>Type</b>	Tier – two	Tier-three	Tier-three
<b>Location</b>	Multi-national locations	Single country	Two countries with three locations
<b>Revenue</b>	180 mil USD Stable growth	3 mil USD Stagnation in last 4 years, steady growth of two independent companies before the merger	70 mil USD Decline from tier-two, significant growth in last 4 years
<b>Number of employees</b>	1900	150	435 in the group, 190 in CALIFIA
<b>Manufacturing competences</b>	Electronics Mechatronics Tooling Box-build	Electronics Box-build	Electronics Box-build
<b>Production capacity characteristic</b>	High volume low cost High mix/Low volume	High mix/Low volume	High mix/Low to medium volume
<b>Vertical Integration</b>	Design and Development Manufacturing	Design and Development Manufacturing	Manufacturing
<b>Industry focus</b>	Versatile industries Industrial electronics are dominant	Major customers are from heating and ventilation, agricultural and farming machinery	Versatile industries Transportation and automotive are dominant

Figure 5.12 - Three portraits



### 5.3. Processes

One of the pioneering works in capturing the EMS process came from Hunt and Jones (1998). Even though they focused on describing the vendor's winning capabilities, by reading between the lines, one could see that they provided us with the basic elements of EMS process. According to them, the EMS process should consist of the following elements: sales, procurement, new product introduction (NPI), and volume manufacturing. In the following sections we will see how these elements are incorporated in the processes outlined in PROMETHEUS, ASTERIONA, and CALIFIA. Readers may notice that we've put more emphasis on the PROMETHEUS' process. The reason lies in the process's complexity, diversity, and availability of the standardised procedures that we could access.

#### 5.3.1. Process - PROMETHEUS

PROMETHEUS coined an unusual name for their service provision process: E<sup>2</sup>MS (Electronic Engineering Manufacturing Service), thus emphasizing the synergies gained from expanding and integrating their service portfolio. The E<sup>2</sup>MS (Figure 5.13) starts with the design phase and continues with the development, prototyping, tooling and production phases, going all the way to the testing and outbound logistics phases. These phases are supported by sales and procurement functions, which are conducted in and across the different locations of PROMETHEUS's facilities in Malaysia, Switzerland, Indonesia and China. The fine filament is constantly adapted in order to satisfy the customers—new as well as existing ones.

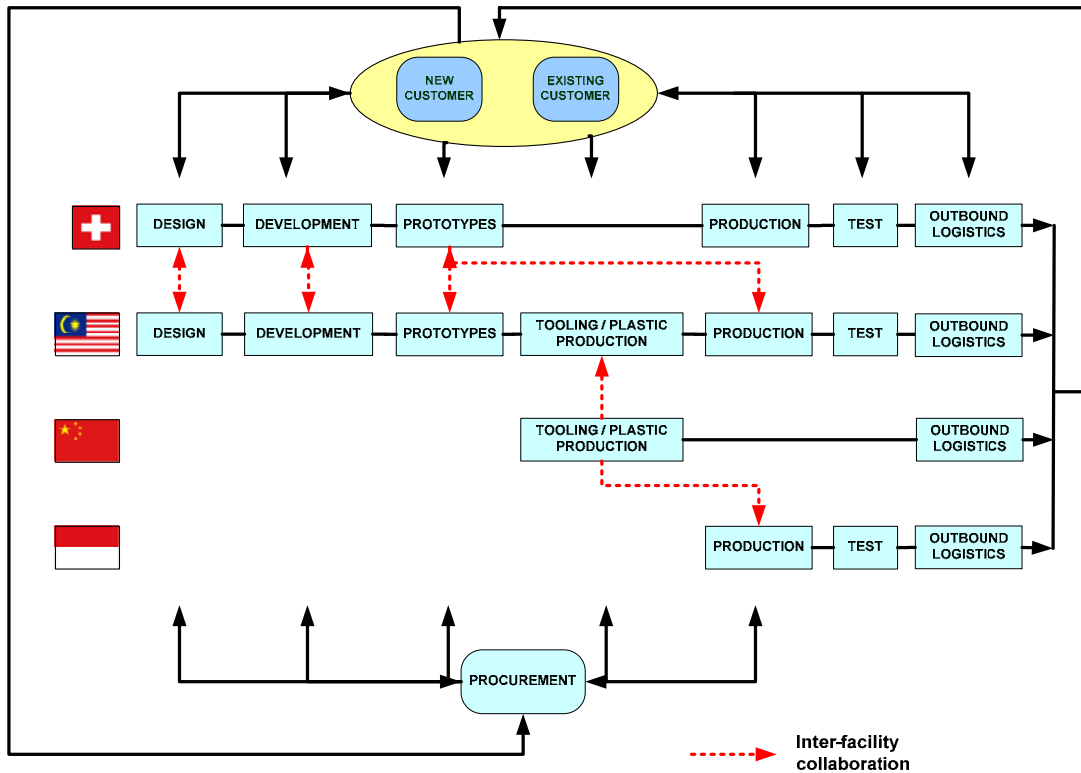


Figure 5.13 - E<sup>2</sup>MS (Developed from internal company material)

But in the highly competitive tier-two EMS market, winning the outsourcing contract is not that easy. So PROMETHEUS have developed a systematic way of approaching these: the so-

called Sales Funnel (Figure 5.14). PROMETHEUS's sales people are located in their most important markets: Switzerland, Germany, the UK, the Nordic countries, and the US, and their main tasks are to identify potential customers and to secure contacts. It is important at this stage that both the customer and PROMETHEUS become acquainted with each other, so that when the customer writes a request for quotations (RFQ), PROMETHEUS will have substantial knowledge about the customer and hence be in a better position to win the contract.

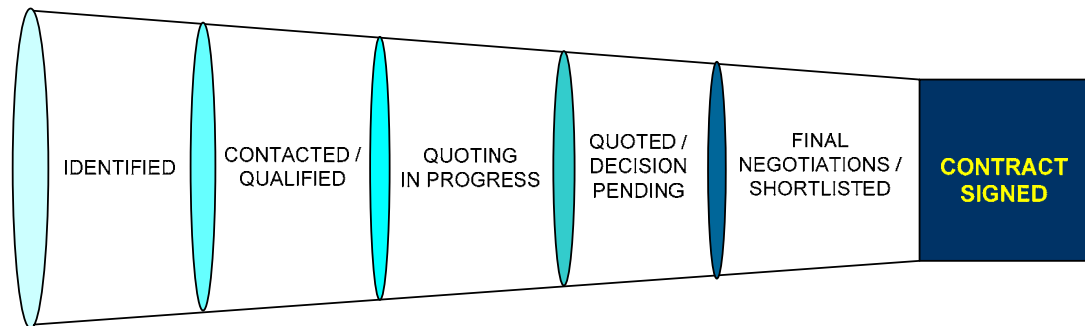


Figure 5.14 – Sales Funnel (Source: Internal company material)

A customer can be captured anywhere across the value chain. The sales teams are backed by the business development and D&D units, and operate according to various funnel models, addressing each market niche individually, both with respect to geography and the products. Potential customers are always informed about the design, development, tooling and manufacturing competences of the PROMETHEUS Group. “Sometimes PROMETHEUS have customers that are only interested in D&D in Switzerland. However, they may have the need for manufacturing more than 100.000 units per year, which makes Penang an interesting location”, explains Business Development Manager for PROMETHEUS Switzerland. Chief Operating Officer emphasises that the various alternative manufacturing locations are one of PROMETHEUS's competitive advantages over other tier-two EMS competitors. The project team evaluates a product based on its complexity and the customer's requirements, and then selects between Switzerland, Malaysia or Indonesia – or even more powerfully, starting a project in the D&D and new product introduction (NPI) phase, then managing a seamless internal transfer process for the customer when the product is ripe for mass production at Asian costs.

When the contract is signed, everything must then occur very quickly. Speed is crucial, as the customer often wants to see the product the next day. That's where the NPI team steps in. PROMETHEUS's approach to the NPI project management concept was formalised at PROMETHEUS Switzerland, and then rolled out across the entire PROMETHEUS Group. The main mission of NPI is literally to “introduce” a new product into manufacturing, taking it through the often iterative process of design, prototyping, and small series production until proven and stable. Depending on the point of departure in the E<sup>2</sup>MS process, there could be three types of NPI projects (Figure 5.15):

- The first type is a *pre-project*. It includes only design and development activities for the client.
- The second type is a *development project* that starts with the design, goes through the development phase and ends with product prototypes being developed for the client.
- The third type of project is the *industrialisation and displacement project*, the main aim of which is to prepare the assembly and/or manufacturing of the box-build for a

product that has been pre-designed outside of PROMETHEUS. This type of project starts at the tooling stage of the process.

The duration of these three projects can vary. “The industrialization and the transfer of manufacturing (displacement) project can’t be conducted in less than one month. But if we start the NPI from scratch, which eventually involves all stages from development to production, it can last for more than one year”, adds the NPI Manager in the Penang facilities.

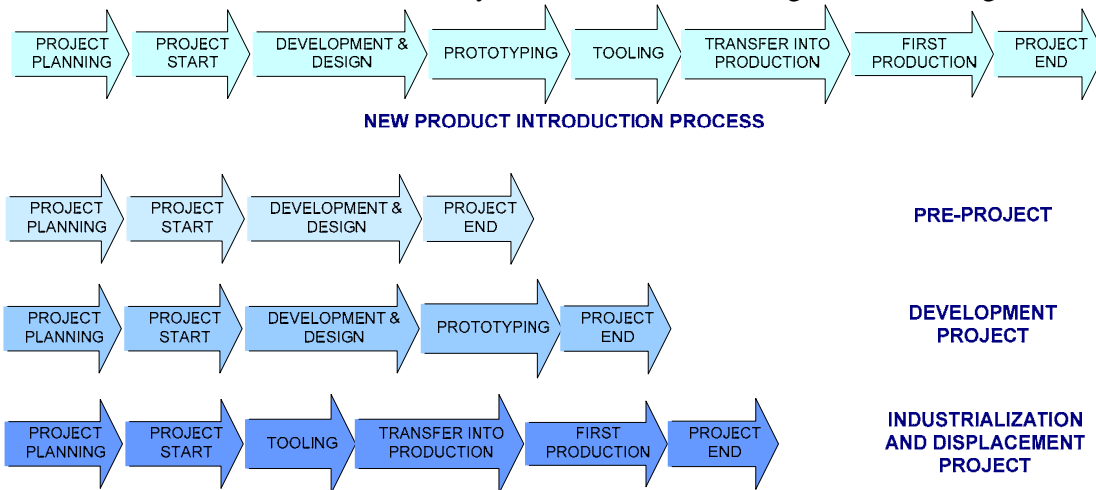


Figure 5.15 - NPI Process (Source: Internal company material)

The NPI team which consists of experts (often from both the Swiss and Malaysian sites) from various departments within PROMETHEUS, has to secure a smooth transfer of the product into the production phase. The team must also ensure that the project is being conducted simultaneously across all phases of E<sup>2</sup>MS in the reality of geographical distances.

In the cost-competitive contract manufacturing market, EMS providers often compete to purchase materials under competitive conditions, which brings the procurement function into specific focus. In order to win a contract, the most important thing is that procurement has competitive prices. Around 70 %, for some products even 85 %, of the production costs are allocated to material costs. PROMETHEUS can only control the remaining 15-30% of production costs when bidding. That is why the NPI team and the Procurement function must work with their suppliers with the same fervour that they use to collaborate with customers. “The trick”, reveals Chief Operating Officer, “is how much are we able to pool components. In order to promote the common material we need to have an Approved Vendor List (AVL). We have our own preferred manufacturers and we are trying to convince our customers to use this preferred list. The customers are therefore able to create the Bill of Material (BOM) based on our AVL”.

Another complex issue in the E<sup>2</sup>MS and NPI processes is how to successfully manage the production of plastic parts and tools. These operations are not perceived as the company’s “money makers”, rather, they’re strategic capabilities meant to bring in new customers for complete box-build services, and could eventually secure the entrance to new geographical markets, like the Shanghai-based tooling facility. However, this strategy is not always easy to support in the trenches of the operation. For Divisional Manager in charge of production of plastics, it can be a real headache to be in the position of constantly having to run small lot sizes of hundred of different parts required by the just-in-time (JIT) demands of box-build assembly. “I hope that they know how difficult it is to regularly re-layout a plant when it

entails moving such heavy machines around and to set up moulds on machines for short production runs”.

Manufacturing is conducted at various locations, depending on the volume and the customer's proximity. Low volumes are predominantly produced in Europe. However, the Malaysian facility is introducing low volume/high mix manufacturing. High volumes with relatively lower complexities are conducted in a dedicated facility in Indonesia. All manufacturing sites perform testing activities for quality control. One of characteristics of testing in PROMETHEUS is that sometimes Test phase has their own customers who were interested only in testing their products on PROMETHEUS' testing equipment.

### 5.3.2. Process - ASTERION

The process typically starts with getting an order from customers (Figure 5.16). The sales organisational unit is in charge of that. ASTERION have inherited the customer structure from the individual companies MAN and DEV and therefore the key account management is a dominant sales approach confirmed by the fact that almost 90% of orders come from their existing customers. ASTERION is in the process of growing the sales department through the employment of sales people who would be responsible for getting new customers.

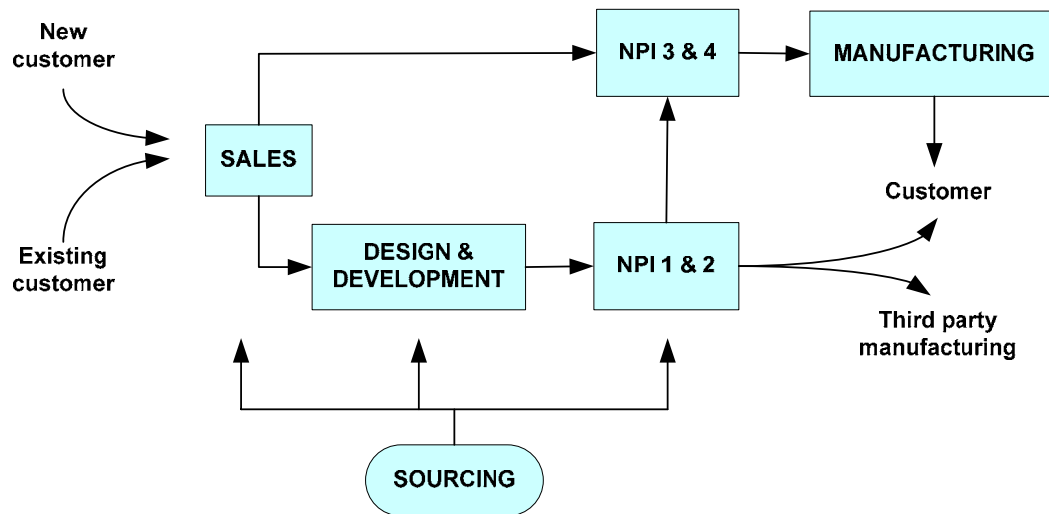


Figure 5.16 – EMS process in ASTERION

When a new project is about to come into being, the salesmen usually invite one or two engineers from the Design and development (D&D) department who together with the customer's engineers estimate the technical aspects of the job. When the technical requirements are clarified ASTERION is ready for the quotation process. “We don't go into detail but we can estimate the cost and the time”, the Development Manager confidently explains the attitude towards the quotation process.

Depending on the type of order, this process can take one of the two possible paths. The most common at ASTERION is that they receive outsourcing contracts that include D&D activities. The other possibility refers to only manufacturing or manufacturing and box-build deals. When D&D is involved in the process, its engineers are involved in negotiations with customers early on. Apart from designing the product, the engineers are in charge of planning

the resources. “When we start the project we ask the purchasing if we have a certain component in stock. If not then we need to find the components”, explains the Development Manager. In order to be prepared for manufacturing, the product has to undergo so called New Product Introduction (NPI) procedure. In ASTERION they have four types of NPI procedures. NPI 1 and NPI 2 are the procedures activated when outsourcing contracts include D&D activities. NPI 1 is the design, development, purchasing of components, and production of the first prototype with the following documentation necessary for manufacturing. NPI 2 refers to the preparation for serial production. NPI 2 is a border line procedure between NPI 3 and NPI 4, which are the responsibility of the manufacturing. NPI 3 and 4 follow after the NPI 1 and 2. NPI 3 is the manufacturing part of NPI 2. NPI 4 is a status for the product and documentation that occurs after the “0” series. NPI 3 and 4 can occur directly after the sales, if manufacturing is the only content of the outsourcing job

When the product gets to the manufacturing, 75 employees take care of it through manufacturing; alternatively, some jobs can include the box-build concept. Workers in the manufacturing are also responsible for performing various quality tests. The existing area cannot accommodate more machines, but free capacity lies in the fact that the production has only one shift operating five days a week.

### **5.3.3. Process -CALIFIA**

There are two groups of new customers requiring services from CALIFIA: customers placing larger and continuous orders for production, and customers placing orders for prototype development (Figure 5.17). The sales unit is responsible for finding new customers either for production or for prototype development. The prototype unit has its own small scale manufacturing line. Sometimes customers that started with prototypes can upgrade the collaboration with CALIFIA and place manufacturing orders for larger quantities of their product. Sales try to see if the customer meets CALIFIA’s criteria, because quotation and customer retentions are expensive processes for CALIFIA. If they decide to quote, Materials provide the materials cost, Manufacturing provides the labor costs, and Sales is responsible for integrating the information and knowledge about the competitive situation and to quote for the job. Once the order is won the process goes to NPI. Responsibility of the Sales department stops, and Program Management takes over the preparation for the launch of the product. Program Management is both a coordinating body for NPI and a Key Account Management unit that is responsible for growing existing customers. The importance of Program Management in CALIFIA’s process is huge, since 75 % of revenues come from the existing customers.

Once the new product is launched or CALIFIA receives an order for the existing product, Manufacturing takes responsibility. A group of engineers together with the blue collar workers secure that the product is manufactured with good quality and delivered to the customer on time. Purchasing the materials is one of the most important functions in the EMS industry. In the case of CALIFIA sourcing activities are present throughout the process, in the sales, NPI, Program Management and Manufacturing. However, the difference in comparison with other EMS companies is that CALIFIA hosts two largest suppliers with implant offices at its own premises.

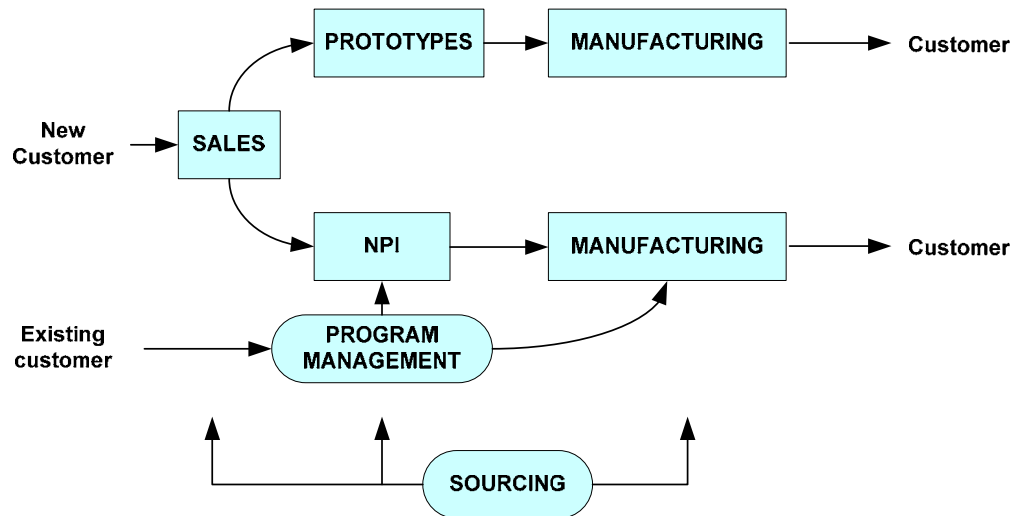


Figure 5.17 - Process

In principle, CALIFIA's process consists of three loops where the company has to have close coordination between different functions in order to succeed. The Chairman explains them in the following way: "One is the sales loop and that is going to involve sales, engineering for labor quoting, materials for materials estimating, and to some degree cost accounting. The other loop is the production loop and that involves materials buying, scheduling, factory production, and then accounting. There is another loop between them, which is NPI. Sales, Material, Engineering, Quality, and all disciplines have to be able to communicate with each other in order to make a successful product launch. They have something in common with Sales, and something in common with Manufacturing, but also something unique."

### 5.3.4. Processes: Synthesis

As suggested by Hunt and Jones (1998), all three companies have incorporated the elements critical to the EMS process. In general, the three processes do not stray much from having prescribed elements (sales, procurement, NPI, manufacturing), though preserving some uniqueness, characteristic to each of the companies (Figure 5.18). In addition, there are some idiosyncratic characteristics for the process in general, which we gave in the first row of the figure.

We were also able to identify some characteristics and trends not captured by Hunt and Jones (1998). For instance, the trends in EMS industry made CEMs start developing competences and capabilities beyond the Design for Manufacturing (DFM), and establish separate units and phases in the process that would address growing requests for custom designs. ASTERION and CALIFIA have these units focused on smaller customers who don't have these competences. PROMETHEUS' D&D is predominantly focused on larger customers. Another characteristic not recognized by Hunt and Jones (1998) is that the CEM process is cyclic and that there are two types of customers: new customers and existing customers.

PROCESS	PROMETHEUS	ASTERION	CALIFIA
<b>Idiosyncratic characteristics</b>	Addresses the nature of the industry Fully vertically integrated Modular Multiple locations that can serve various customers with various needs	Design and development involved in many stages of the process Design and development of products that others can manufacture	Multiple roles of program management Prototypes have large autonomy and dedicated manufacturing line
<b>Sales</b>	Systematic sales process Backed by design and development	Focused on existing customers Backed by design and development	Sales of volume production and prototypes Backed by engineering and procurement
<b>Design and development</b>	Own Design function Design for manufacturability (Part of NPI)	Own Design function Very much involved in the sales process	Design for manufacturability (Part of NPI)
<b>New Product Introduction</b>	Systematized multiple type NPI process	Systematized multiple type NPI process	Dedicated NPI for volume manufacturing coordinated by program management
<b>Sourcing</b>	Sending RFQs to many approved vendors	Many components are kept in stock. When a new component is needed procurement can find it fast and the cost is not an issue	Supports all stages of the process Two largest suppliers are in-house
<b>Manufacturing</b>	High and low volumes on various locations Manufacturing of electronics, tools, plastics, and box-build Testing can be a separate phase	Low volumes Manufacturing of electronics and box-build Highly systematized testing procedures throughout the process	Low and medium volumes on various locations Manufacturing of electronics and box-build Testing is systematized

Figure 5.18 - Three processes

## 5.4. Competences

We have followed suggestions from Hatten and Rosenthal (1999) to look for competences within organisational units and functions. We grouped competences into two categories according to the source of their creation. The first category is the *unit-based competences* that reflect the organisational unit's or team's set of skills, knowledge and technologies. The second category is the *corporate competences*. They are created as a result of the synergetic workings of the unit-based competences, together with the managerial decision-making on the corporate level. Both the unit-based and corporate competences for each of the cases are given in the tables below. Since we shall explore and explain the role of ICT in more detail, the ICT competences will be explored in a separate section.

### 5.4.1. Competences - PROMETHEUS

In order to identify PROMETHEUS's competences we looked into the functions depicted through organisational structures of the two main sites. Since the structures differ in their layout we grouped them into five units i.e., sales, design, operationalisation, manufacturing, and support activities. Sales refers to business development and key accounts; design to design and development; operationalisation to NPI, engineering, procurement, and supply chain management; manufacturing refers to various manufacturing processes of PCBs, plastics and tools; and finally, support activities refer to quality, testing, finances, human resources and IT (Table 5.19).

<b>COMPETENCES OF PROMETHEUS</b>	
<b>Sales</b>	
	Communication skills Responsiveness Technical knowledge Knowledge of PROMETHEUS's process and competences Customer focus Good relationship management Ability to transform requirements into new projects
<b>D&amp;D</b>	
	PCB and complete products High tech multi-layer boards Micro-opto-electro-mechanical systems (MOEMS) Fast prototyping
<b>Technical operationalisation</b>	
	Technical skills Development for manufacturing Know-how of the production process
<b>Commercial operationalisation</b>	
	Analytical skills Communication skills Fast quotation Relationship management with suppliers
<b>Electronics manufacturing</b>	
	High volume PCB assembly Low-volume/high-mix PCB assembly PCB manufacturing technologies
<b>Mechatronics manufacturing</b>	
	Tool design and tool making Plastic injection, in-sert, out-sert , and 2K moulding Progressive metal stamping Axial and torodial coil winding
<b>Support</b>	
	Occupation-specific competences Design and fabrication of testing equipment and software Various testing technologies
<b>Corporate</b>	
	Alternative locations for manufacturing Vertical integration Modular process Box build Ability to introduce new technologies Multilayered relationship management Preferred vendors list

Table 5.19 - Competences of PROMETHEUS



The task of business development is to get new customers, while key accounts are getting new projects from the existing customers. Business developers create relationships with new customers and key accounts maintain them. Key accounts are perceived as the customer's representatives in PROMETHEUS. It is believed that key accounts are those which fuel the growth since PROMETHEUS grows with the growth of their existing customers. Each customer has its specific requirements and the key account executives are the main bridge in satisfying those requirements. Competences of the sales units are communication skills, responsiveness, technical knowledge of the product, and knowledge of PROMETHEUS's process that can actually manufacture that product. Further sales competences are customer focus, good relationship management and the ability to transform the requirements into new projects, satisfying the quality, time, and price criteria. For example, the Key Account Manager explains: "a Swiss customer didn't have a contract designer in its vicinity and therefore we integrated design, tooling, and plastic moulding. They were looking for one partner that can accommodate their requirement with a quick turnaround time for the competitive price".

Design and development competences were present in the Asian facilities to some extent. They predominantly referred to the design of PCB layout. The more substantial influx of competences arrived to PROMETHEUS with the acquisition of the Swiss company where particular strength lies in the design know-how within optics and microelectronics. PROMETHEUS's D&D is able to create the concept and specifications for the whole product. "Some customers arrive with a preliminary prototype or even just a concept of a product, and we can offer them design for manufacturing. We can do electronic and mechanical design, as well as PCB layout according to their functional specification", says D&D manager.

The operationalisation process comprises a whole set of activities that transform the customer's order into the actual performance of a service, whether it is a design, prototyping or as in most cases, physical product. These activities are conducted by people organised into NPI and engineering (technical operationalisation), and procurement and supply chain (commercial operationalisation) functions. "We get the data from customers in different levels of quality and richness. When we get the project into NPI we can discover many black holes and we need to get back to customer. The data flow is back and forth during the NPI process", explained the NPI manager. Technical skills, development for manufacturing, and know-how of the production process are major competences of the NPI and engineering teams. To secure competitive prices for the components the procurement and supply chain staff rely on their technical knowledge and on the knowledge of the sourcing market. In order to do this they need to demonstrate their analytical and good communication skills. "Interpersonal communication skills are very important for an EMS company", says the corporate procurement manager. Procurement and supply chain need to be fast in sending the quotation to PROMETHEUS's preferred vendors list and to create new relations with new suppliers of components.

Over the years PROMETHEUS has been building competences in the manufacturing of electronics and mechatronics. They are able to apply various technologies in order to manufacture a PCB or the whole product. PROMETHEUS's competences in the electronics manufacturing are:

- High volume PCB assembly
- Low-volume/high-mix PCB assembly
- Chip-on-board, chip-on-glass, BGA, mBGA, and Flip Chip technologies

Competences within the area of the mechanical manufacturing are:

- Tool design and tool making
- Plastic injection, in-sert, out-sert , and 2K moulding
- Progressive metal stamping
- Axial and torodial coil winding

Employees in the supporting activities carry an opus of the occupation-specific skills, know how and technologies. Those are mostly rendered in the finances and human resources. Quality and testing departments are competent in designing and fabricating testing hardware and software, and in the Application of various technologies for the PCB testing.

The whole set of competences on the corporate level has emerged as a result of the strategies that led towards the geographic expansion and the expansion of the service portfolio. “We will evaluate the product based on its complexity and the customer’s requirements and then select Switzerland, Malaysia or Indonesia”, is how the Chief Operating Officer explained how PROMETHEUS manages alternative locations for manufacturing. PROMETHEUS’s value chain has been built around the process that consists of the design, development, prototyping, tooling and plastics production, electronic and mechatronic manufacturing, testing and outbound logistics. Having these elements structured in a meaningful sequence enables PROMETHEUS to be a truly vertically integrated tier-two EMS. The modular structure of the process enables PROMETHEUS to capture a customer anywhere across the value chain. Various teams contribute to this. Their breadth and depth enable PROMETHEUS to be able to introduce new technologies. “We are fast in investigating, learning and implementing new technology. Other EMSs tend to stick to their technologies”, claims the COO. Multilayered relationship management with customers helps PROMETHEUS to maintain very high customer retention rate. Five major customers have been with PROMETHEUS for more than 20 years in average, contributing to PROMETHEUS’s turnover with 47 %. In the situation imposed by the EMS industry characteristic, where a major source for the cost reduction is in the price of components, PROMETHEUS cultivates its relationship with preferred vendors. This enables them to pull the components very fast with competitive prices.

#### **5.4.2. Competences - ASTERION**

ASTERION’s Sales Department is strong in managing relationships with existing customers. In addition to good personal relationships and networks, the Key Account Executives use their analytical skills to follow latest developments within numerous customers (Figure 5.20).

The Design and Development (D&D) unit is perceived companywide as the treasury of ASTERION’s competences. D&D consists of two sub-units, Development, and IT. The IT competences will be described later in the section that deals with IT issues. Development have two groups of engineers, where the EMS group develops hardware and software for embedded control systems, micro control-based industrial control systems, and testing equipment development. The Automation group master vision technology, robot control, image processing, and programming skills in specialized software language. They develop vision control and inspection systems for industrial manufacturers of various kinds. Development consists of experienced engineers with knowledge of electronics and its application in some industries such as agriculture and agriculture-related moving equipment. “They even know how to run those machines”, Design and Development manager praises them and continues, “In D&D we have strong customer focus and never let them down”.

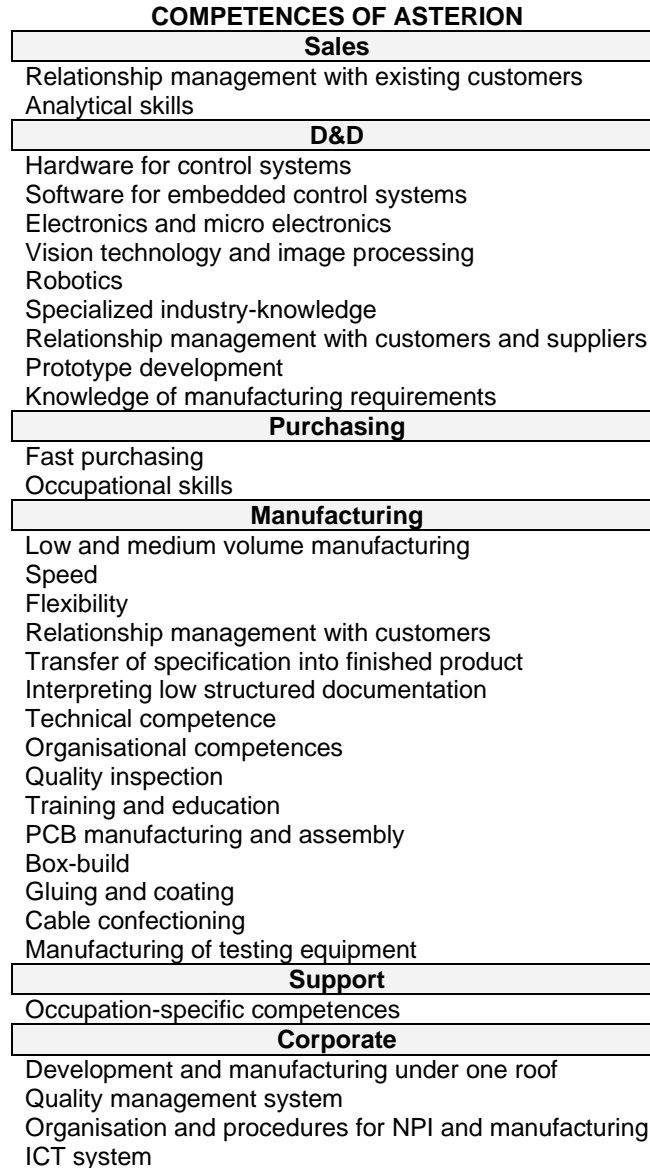


Figure 5.20 – Competences of ASTERION

In addition to their technical competences, D&D collaborates with both Sales and Purchasing units. They participate regularly in the sales activities, and in the purchasing of components. “Our Sales don’t have skills of interpreting the customer’s technical needs, so they invite one or two engineers to join with the sales and clarify the needs. My job is also to plan resources. When we start the project we check the stock status of certain components with purchasing. If they’re not in stock we need to find the components. We have a procedure how to get a new component into the house”, Development Manager explains their role in sales and purchasing.

It is not only design skills that rest in D&D. Developers are also responsible for New Product Introduction (NPI), i.e. the development of prototypes, which requires a certain knowledge of manufacturing processes.

Supply chain organisationally consists of the Purchasing sub-unit, and manufacturing. The purchasing unit is a small unit with traditional professional competences regarding purchasing techniques. However, one of their distinguishing characteristics is that they are “firefighters” who due to the uncertainties at both customers and ASTERION need to get components fast, and to know where to get them from.

“We are capable of organizing production of small and medium scale quantities, and we are capable of running through this process extremely fast, from placing the order to receiving the first product. We have the competence to understand the customer’s need”, Production Manager explains the key strengths of the Production unit. Speed and flexibility come partly from a good collaboration with customers, where Sales and Development are also involved. Manufacturing is competent in interpreting low-structured documentation and transforming the specifications into a finished product. Production is also responsible for quality management, where highly trained blue-collar workers are competent to perform technology-supported tests. “Each time we improve quality, we reduce the price of the product because we don’t need to put more hours in finding the mistake”. Production is the only ASTERION’s organisational unit that puts a lot of effort in developing and organizing training for its employees.

With respect to technologies used for manufacturing, ASTERION can offer the mounting of printed circuit boards soldered in a nitrogen atmosphere, along with assembly of complete electronic components. They are also capable of solving other production tasks, such as cable confectioning, painting of PCBs, ultrasonic soldering of plastic cabinets, and embedment and sealing via four-axis dispensing robots. Other fields of business include the development and manufacturing of specific testing equipment for functional control of finished equipment. They also produce a wide variety of equipment, such as all kinds of machine control units, detectors, electric vehicles, battery chargers, fire prevention equipment, up to and including electronics for medical purposes.

Support functions, i.e. Finances and Human Resources, maintain regular occupational competences characteristic to each of the functions.

Since ASTERION grew up from a merger of two different business cultures, one more manufacturing, another more development oriented, their natural competence still being exploited is having development and manufacturing under one roof. Having both development and manufacturing is rare among Danish EMS companies. Another corporate competence is ASTERION’s quality management system. The manufacturing process is decomposed into several phases where quality control is conducted after each of the stages, thus minimizing errors in the final product inspection stage. Design and Development Manager illustrates it this way: “Test as early as you can and make sure that your test is testing the process. Thereafter, you don’t need to test functionality, because functionality is guaranteed by design. We are moving from testing the equipment towards testing the process.” The way in which NPI and manufacturing are systematized and organized is also one of the competences. Production Manager argues that “we are not unique in manufacturing but the way we have organized NPI and manufacturing is good, which makes us fast and flexible“. Finally, the last corporate competence is an excellent ICT system that is completely business process oriented and almost fully integrated.

### 5.4.3. Competences - CALIFIA

Due to its position in the organisational structure, the Sales unit has a wide opus of competences. Besides typical sales skills that include relationship management, understanding the customer's needs, analytical skills and business acumen, helping them to identify a good fit between the customer and CALIFIA, the Prototype group adds competences like quick prototype development, which is the result of work of nimble, resourceful and technically competent employees. Additionally, it is natural to find ICT competences in a prototype group, but ICT competences and awareness about the ICT's possibilities, especially in the search engine optimization, are present within the "ordinary" sales staff as well (Figure 5.21).

Program management has a strong ability to coordinate the work of colleagues from other organisational units without having formal authority over them. The cross functional and cross organisational communication skills are believed to be vital for the success of the project. Program managers are product champions and work with a strong customer focus by frequently meeting with customers, tracking the status of the project, and working on cost reduction. Their responsibility is to make the customer satisfied.

The Materials are led by very experienced management who composed the teams of employees with sets of individual skills. The result is a multi-occupational competences department. Good relationship management with suppliers has been recognized as one of the key predispositions for the successful materials purchasing, planning and scheduling. Therefore the two largest suppliers are brought in-house and share the work space with CALIFIA's Materials department.

Manufacturing has inherited competences in PCB assembly and box-build from CALIFIA's OEM period. Trained work force deploys various sets of technologies such as Through-hole, SMT, BGA, microBGA, CGA, Flip Chip, Lead-free processing, and RF, to assemble PCBs and to build complete products (box-build). They are led by technically competent process and test engineers who, through DFM and DFT processes, prepare the help to conduct NPI. Test engineers also have a special focus on using numerous testing technologies (In-circuit Test, Functional Test, RF Test, X-ray Inspection, Flying Probe, Corelis Boundary Scan, Environmental Stress Screening) and on tracking quality. The Manager of Test Engineering is one of the key initiators and developers of some of CALIFIA's in-house tailored ICT applications.

Finances and Human Resources management have the traditional occupational skills necessary for successful functional operations. It is worth adding that the Finances unit is involved in the process of potential customer evaluation. The IT unit belongs organisationally to Finances and Administration, but we shall comment on its competences in the special ICT section coming later in the text.

<b>COMPETENCES OF CALIFIA</b>	
<b>Sales</b>	
	Analytical skills Customer relationship management Understanding customer's needs Business acumen Quick prototype development Nimble and resourceful prototype staff Technical competence ICT competence in optimizing the search engines
<b>Program Management</b>	
	Communication skills Project management and coordination skills Customer relationship management Ability to work with several layers of senior management Team work
<b>Materials</b>	
	Professional (occupational) skills in planning, scheduling, purchasing and quoting Supplier relationship management In-house based major suppliers Negotiation and communication skills Awareness of ICT utilisation and possibilities Diversity of competencies in purchasing
<b>Manufacturing</b>	
	PCB assembly Box-build NPI Design for manufacturability (DFM) Design for testability (DFM) Testing competences Skilful workforce IT competences in test engineering Quality management
<b>Finances and Administration</b>	
	Occupational skills Analytical skills
<b>Corporate</b>	
	Location Quality certificates Various industries Handling complexity Responsiveness Business process awareness shared among all employees Awareness of ICT utilisation and possibilities

Figure 5.21 - Competences CALIFIA

One of the corporate competences is CALIFIA's location i.e., proximity to its major customers who have been smaller customers that require short production runs or who have new products that are likely to need revision on the assembly line. Those customers typically won't use offshore partners for EMS. Different quality standards (ISO 9001:2000, ISO/TS 16949, QS-9000, & AS-9100), and being FDA registered, IPC-A-610 compliant, and NSA & COMSEC approved makes CALIFIA an attractive EMS partner who can serve customers from various industries. This also gives them independence from single industry turmoil so frequent in the EMS business. However, the Chairman sees responsiveness to the customer's change as CALIFIA's strongest point "It's not a single function but it is incorporated

everywhere across the company. If you want to do high volume, that's done in China. What is left here is high mix low or moderate volume. That means you have more changes. Our customers change the number of orders and their engineering is more frequent because the products are not typically matured." During the interviews the first researcher spotted that one of the key competences are actually CALIFIA's employees and their engagement with day-to-day operations. They are all very well informed about the business process, customer needs, internal requirements, ongoing projects and applications of ICT.

#### **5.4.4. Competences: Synthesis**

From its inception PROMETHEUS have been developing competences in contract electronics manufacturing. They started as a manual PCB assembly and moved to become a competence-versatile CEM with international operations. Most competences were developed from inside the company, organically, while most of D&D competences were acquired through the purchase of a Swiss based company. ASTERION have travelled a slightly different path where D&D and manufacturing competences were inherited from two companies that had merged into ASTERION. CALIFIA used to be an OEM company that had transformed into a contract manufacturer while keeping the competences gained in the OEM period.

According to Hatten and Rosenthal (1999) competences should be sought after within the organisational units and functions, but in order to get a new perspective, we will align them across the phases of the process. Figure 5.22 captures these and other characteristics of the competences within the three cases. Apart from having occupational competences characteristic for business functions or phase of the process, each company has some distinctive competences which we present in the Figure as well.

The sales activities in PROMETHEUS are performed by business developers for new customers and the key account managers for the existing customers. They are backed by D&D, purchasing and manufacturing departments, but still have a sufficient level of the technical knowledge. ASTERION's sales are very analytical and focused on the existing customers. They always partner with the D&D during the sales process with both new and existing customers.

CALIFIA's sales in the domain of large volumes are backed by purchasing and manufacturing departments. The prototype group is self-sufficient for the process in whole, plus they provide the sales function with the necessary technical competence in the negotiations process. A separate department is in charge of the existing customers. It is interesting to mention that CALIFIA's sales department has ICT competences in the search engine optimization and online database advertising.

D&D competences in PROMETHEUS gained in importance after the acquisition of the Swiss company. In ASTERION the D&D department is perceived as a core department which also participates in the sales and purchasing activities. They also have very strong ICT competences. On the other hand, CALIFIA has no D&D activities apart from some DFM work done in prototyping department and DFT in manufacturing.

COMPETENCES	PROMETHEUS	ASTERION	CALIFIA
<b>Origin</b>	Developed internally D&D competences were acquired	Inherited from two companies who merged to create ASTERION	Inherited from the OEM period
<b>Sales activities</b>	Dedicated departments for new and existing customers Backed by "technical" departments Technical knowledge in-unit	Existing customer focus Backed by D&D department	Sales is focused on new customers while programme management is focused on existing customers Prototypes group within the sales Backed by purchasing and manufacturing ICT competences
<b>D&amp;D</b>	Strong D&D competences mostly gained through the acquisition	ASTERION's core competence Participate in sales and purchasing ICT competences	No D&D apart from prototyping activities
<b>NPI</b>	Dedicated department In-unit technical competence	Two types of NPI processes in charge of two departments	Coordinating role of one department with no hierarchical power over other NPI team members
<b>Manufacturing</b>	High and low volumes on various locations Manufacturing of electronics, tools, plastics, and box-build Quality management in separate unit	Low volumes Manufacturing of electronics and box-build Quality management part of manufacturing	Low and medium volumes on various locations Manufacturing of electronics and box-build Quality management is part of manufacturing Strong ICT competences in quality management
<b>Purchasing</b>	Fast and cheap sourcing from a large pool of suppliers	Rapid fire fulfillment	Supplier relationship ICT potential awareness
<b>Corporate</b>	Alternative locations for manufacturing Vertical integration Modular process Box build Ability to introduce new technologies Multilayered relationship management Preferred vendors list	Development and manufacturing under one roof Quality management system Organisation and procedures for NPI and manufacturing ICT system	Location Quality certificates Various industries Handling complexity Responsiveness Business process awareness shared among all employees Awareness of ICT utilisation and possibilities

Figure 5.22 - Three sets of competences



PROMETHEUS have a dedicated NPI department with in-unit technical skills. D&D and manufacturing in ASTERION are responsible for two types of NPI activities. Program management department of CALIFIA has the coordinating role in NPI. This is their second activity apart from the key account management.

Although we have already mentioned the distinctiveness of the manufacturing competences in the section about the process, we repeat them in the table for overview purposes. We shall only add something on the position of quality management. The quality management in PROMETHEUS is a separate unit, while in ASTERION and CALIFIA it is organisationally part of Manufacturing. The Quality management in CALIFIA has very strong ICT competences.

The purchasing unit in PROMETHEUS is able to provide fast and cheap purchase of components from the large number of vendors. In CALIFIA employees in purchasing are able to provide a quick response when finding the components, which is not necessarily the cheapest. CALIFIA's purchasing is very strong in managing close relationship with the suppliers. They also have a high awareness of the potential ICT applications within their scope of responsibilities.

In the last row of the Figure we repeat the corporate competences of all three companies. We won't add new comments here since we have already referred to them in the separate sections about the competences of each of the cases. At this time we shall only pinpoint that one of ASTERION's competences is their ICT system, but more details will follow in the section about ICT. The presentation of corporate competences at this moment is only for overview purposes, while a more thorough cross-case analysis is expected in the forthcoming chapter on analysis.

## **5.5. Capabilities**

By following the Hatten and Rosenthal (1990) tests of capabilities we have divided capabilities into market capabilities and competitive capabilities. The market capabilities refer to how far the vendor is able to satisfy the customer's needs. The competitive capabilities refer to why the vendor had been chosen for the first time, and why the customer entrusted new projects to the vendor after the initial experiences.

Since companies and their customers do not necessarily share the same view of the capabilities, we have included the perception category into the display of the capabilities. There are two types of perceptions of capabilities, the vendor's perception and the customer's experience (See 5.23). Even though we had not been able to collect the data from all customers, we persisted in showing the capability displays in the above mentioned manner. In addition to identifying them, we grouped the capabilities into the winning, running and renewing capabilities.

### **5.5.1. Capabilities - PROMETHEUS**

In order to follow up how satisfied the customers are with services provided, PROMETHEUS have developed a customer satisfaction survey. We use the structure and the results from the

survey to identify PROMETHEUS's market capabilities. The customers marked from 1 to 10 the level of their satisfactions with the following elements:

- Deliveries – Ability to drive order delivery compliance and/or manage finished goods inventory level
- Flexibility – Ability to react to customer drop-in orders
- Quality - Ability to ship quality products
- Responsiveness – Promptness in reacting to feedback
- Initiative – Enthusiasm in driving action items towards closure
- Technical competence – Technical competence in resolving issues in related areas

On the scale from 1 (poor) to 10 (excellent) the customers ranked the majority of PROMETHEUS's market capabilities with 8.8. The quality capability was marked 8 on average.

PROMETHEUS's competitive capabilities are multiple and come in a package. The corporate Business development Manager explains: "We are not always the cheapest. Our goal is to end up in the top 2 or 3 vendors and make the customer visit us. Then we can win on the soft factors. We go into the total cost of partnership, like sending people, mutual design, etc. That's why we can operate with very high margins at the end. We try to position ourselves as a Swiss company operating in Asia, a Swiss company at the Asian cost". The first time contract competitive capabilities package consists of the ability to offer competitive prices stemming from the procurement's ability to pool components, which is followed by "soft factors" like relationship management, D&D competences and the vertical integration.

			PERCEPTIONS OF CAPABILITIES	
			Customers' experience	Vendor's perception
TYPE OF CAPABILITY	MARKET CAPABILITIES	Needs' satisfaction	Deliveries Flexibility Quality Responsiveness Initiative Technical competence	Deliveries Flexibility Quality Responsiveness Initiative Technical competence
	COMPETITIVE CAPABILITIES	Why chosen fist time?		Multiple step strategy 1. Competitive prices in order to be selected for visit 2. Wining over soft factors (relationship management, D&D, vertical integration)
		Why new project?		Relationship management Vertical integration D&D skills in optics Cost reduction Technical competence High mix manufacturing Quality

Table 5.23 – Capabilities of PROMETHEUS

To gain a new customer appears to be a very complex challenge. But retaining an existing customer is no less problematic. However, PROMETHEUS successfully manage to retain the loyalty of their long-lasting customers, from whom their new product pipeline predominantly comes. Figure 5.24 captures the renewing capabilities for four largest customers.

Customer	Share (% of turnover)	Industry	Retention reason
Switzerland-based customer for more than 15 years	20 %	Instrumentation	Design and development skills in optics Close collaboration
USA-based customer for more than 25 years	10 %	Residential controls	Cost reduction management Expertise in customer's product gained over time Vertical integration
Denmark-based customer for more than 20 years	10 %	High-End Consumer	Managing high mix Meeting extremely high quality targets
Finland-based customer for more than 20 years	7 %	Instrumentation	Open collaborative relationship Vertical integration

Figure 5.24 - Existing Customers

The General Manager of PROMETHEUS Switzerland posits that “The road to success is based on total customer satisfaction and deep customer relationship, starting with engineering services, moving through specialised electronic manufacturing, right through to after sale service and support”. Executive Chairman frequently calls or visits all of his customers from the largest to the smallest. His open and hands-on approach builds trust and PROMETHEUS’s fast and reliable response to fixing problems makes his customers ready to rely on his organisation.

In the Figure 5.25, we present capabilities organized around the goals of a vendor company, i.e., to win, successfully run and renew outsourcing contracts. According to the corporate management, the breaking moment for a vendor company to get the job is the ability to manage suppliers, and their prices are of the utmost importance. The general manager of the Penang-based facilities is aware that customers are those who make an EMS successful but “we lose 70% of the margin to the guys down in the supply chain. For some products it is 85%. Therefore we have to work with the supplier. Procurement is absolutely one of the most critical functions.”

When due to the cost management PROMETHEUS secures to receive a visit from the potential customer, it emphasises the total cost of ownership, meaning that it is not necessarily the cheapest bidder, but capabilities like relationship management, the possibility for a mutual design and development, and vertical integration play the most significant role in winning the business. When the outsourcing arrangement has been rolled-out, the market capabilities are those which become the most visible. After the initial rounds of outsourcing and the first experiences, the customers are better acquainted with the PROMETHEUS’s cost reduction capability, the new potential of the D&D, an even better relationship management, and new possibilities enabled by the vertical integration. However, some other capabilities, like high mix manufacturing, quality and PROMETHEUS’s technical competence, add to the initial portfolio and make customers entrust new projects to PROMETHEUS.

CAPABILITIES	PHASES OF THE PROMETHEUS OUTSOURCING PROCESS		
	WIN	RUN	RENEW
Cost management	x		x
D&D	x		x
Delivery		x	
Flexibility		x	
High mix manufacturing			x
Initiative		x	
Quality		x	x
Relationship management	x		x
Responsiveness		x	x
Technical competence		x	x
Vertical integration	x		x

Figure 5.25 - Cap – Win Matrix

### 5.5.2. Capabilities – ASTERION

The majority of customers have been with ASTERION for many years, thus making it relatively easy for the management to identify the renewing capabilities (Figure 5.26). However, when trying to recall why they got initial contracts with the existing customer and why they attract a small but steady flow of new customers, the story goes like this: The new customers are predominantly small and medium sized companies which would like to sell a product that requires a certain knowledge of electronics. Besides being able to manufacture electronics, ASTERION is armed with a, as D&D Manager calls it, “heavy electronics development tool-box”, which brings them very close to winning the outsourcing contracts. ASTERION accepts orders in very small quantities that have to be manufactured on short-time contract basis, thus bringing their flexibility and speed into the core of the winning capabilities. “We are capable of producing in small quantities, from 10 to 100 pieces per year. In overall picture we are a small volume driven company. That’s one of the main reason customers choose us. Another dimension is our capability to run through this process extremely fast”, Production Manager illustrates the management’s dominant opinion.

Although ASTERION do not demonstrate deliberate “lock-in” strategy, customers tend to stay with them for a long time. The D&D Manager explains that long term cooperation has been established and that customers don’t want to shop around for each new product. “We know their products and operations”, he claims. On top of that, customers are very satisfied with how ASTERION handle the NPI process, bringing it together with flexibility and speed among the most important renewing capabilities.

			PERCEPTIONS OF CAPABILITIES	
			Customers' experience	Vendor's perception
TYPE OF CAPABILITY	MARKET CAPABILITIES	Needs' satisfaction	Quick response time in NPD Technical competence Flexibility Understanding customer's business Delivery	
	COMPETITIVE CAPABILITIES	Why chosen first time?	Technical competence Flexibility Prior relationship management Delivery Sourcing Price	Having both contract development and manufacturing Technical competence Flexibility Speed Low volume Short-term contracts
		Why new project?	Technical competence Relationship management Flexibility	Long-term cooperation Relationship management NPI Flexibility Speed

Figure 5.26 - Capabilities

For the purpose of increasing the validity and reliability of customers' perceptions of capabilities, we sent out a questionnaire (See Appendix [Questions to CASE's customers](#)) designed to capture the ASTERION's winning, running and renewing capabilities. We offered (but not limited the answers to) potential capabilities which were earlier defined by Levina and Ross (2003) and Feeny et al. (2005). The questionnaire with an introductory letter was then sent by ASTERION to 19 out of 25 top customers. We received six answers. One of the customers declined to participate, while another couldn't reply since they hadn't outsourced development and manufacturing to ASTERION; they had subcontracted it to them. That left us with 4 usable questionnaires. We received responses from the two largest customers (a mother company and its China-based daughter company) which have both contract development and contract manufacturing, two mid level customers, one having development, manufacturing, and box-build, and another having only contract manufacturing (the size is reflected in the value of annual turnover). The customers' answers are given in the column Customer's experiences in Figure 5.26.

Customers unanimously agree that for winning, running and renewing contracts with ASTERION, their technical competence, flexibility and relationship management are the key winning cards or the most important capabilities present along all three phases of the process (Figure 5.27). The main contributors to flexibility (speed and low volume) are also decisive capabilities for winning the contract. Some customers had chosen ASTERION because of their bidding price, which apparently was lower compared to other Scandinavian competitors. Besides the company's technical competence, relationship management and flexibility, customers find the delivery an important capability as well.

CAPABILITIES	PHASES OF THE OUTSOURCING PROCESS		
	WIN	RUN	RENEW
Technical competence	x	x	x
Relationship management	x	x	x
Flexibility	x	x	x
Speed	x		x
Delivery	x	x	
Sourcing	x		
Price	x		
Contract design and manufacturing	x		
Low volume manufacturing	x		

Figure 5.27 - Cap-Win Matrix.

Customers had chosen ASTERION by evaluating them on many capabilities. Some of them diminished in importance during the running phase, while three of them excelled and became most important capabilities necessary for winning, running and renewing outsourcing contracts.

### 5.5.3. Capabilities - CALIFIA

Due to confidentiality issues we were not able to communicate with the customers regarding their reasons for choosing CALIFIA for the first time. However, we were able to use customers' testimonials to capture the market capabilities (Figure 5.28). Here are some of the examples:

- “I’ve been using CALIFIA since 1997. I keep going back because they always assemble my PC boards right and on-time, plus they are the most responsive contract manufacturer I have found in the area.”
- “I have had an association with CALIFIA for the past 6 years. I have found them to be responsive and highly competent in meeting our often aggressive prototyping needs. CALIFIA has consistently delivered quality product in addition to being able to transition a board design from the engineering development phase into a production run quickly and smoothly.”
- “CALIFIA's quality and on-time performance for PC board assemblies was very important to us. We had to meet internally driven compressed launch schedules. They came through for us. Additionally their value-add services for inventory management and innovative design were highly appreciated.”

We learn from the testimonials that the customers' experiences with market competences are also the reasons for renewing the projects with CALIFIA.

			PERCEPTIONS OF CAPABILITIES	
			Customers' experience	Vendor's perception
TYPE OF CAPABILITY	MARKET CAPABILITIES	Needs satisfaction	Quality On-time delivery Responsiveness	Quality On-time delivery Responsiveness
	COMPETITIVE CAPABILITIES	Why chosen first time?		Quality On-time delivery Handling prototypes and NPI Relationship management
		Why new project?	Quality On-time delivery Responsiveness	Relationship management Quality On-time delivery Responsiveness

Figure 5.28 - Capabilities

The participants in the interviewing process were also asked to comment on the reason for getting the customers for the first time, and for getting the new or expanded projects from the existing customers. We treated their answers as competitive capabilities. When it comes to winning the outsourcing contract, there are three elements that CALIFIA persuades its customers with. They are quality, on-time delivery and flexibility. The cost is also an issue, but not that important in the low volume high mix EMS. The Vice President of Materials argues that “The keys to this business are quality, on-time delivery and cost, but if you don’t have quality and on-time delivery, the cost doesn’t matter “. The variety of quality certificates and approvals enable CALIFIA to seek customers in various industries. Many times CALIFIA has got big deals through the work done by the prototype group, who demonstrated high skills in fast prototype development. The Chairman explains “We found a customer who needed a major change in the product and didn’t know how to do it. It wasn’t a problem in the design but how to put it all together in a package. Prototype did a good job so the customer started giving us small amounts of their production.” Relationship management is also an important capability that customers value when choosing CALIFIA. Some contracts were the result of prior relationships established by the Sales people.

Relationship management is one of the key capabilities that CALIFIA builds its customer retention strategy on. Senior Vice President of Sales and Marketing argues that “Once the relationship has been developed, and we have good quality and the time delivery for the competitive price, and they have confidence in what we can do, then developing new opportunities is much easier”. The Director of Manufacturing adds that “We are driving to build partnerships, which is a new concept to tier- three EMS. We don’t want to be just service providers; we want to be someone who is indispensable for them“. However, the complete top management was unanimous when stressing that they get new projects with existing customers because of the quality, on-time delivery and flexibility (responsiveness). The Chairman nicely illustrated CALIFIA’s responsiveness as follows: “We kept them because of our responsiveness. They are very bad in scheduling and they are growing rapidly. If we weren’t able to constantly adjust neither of us would have survived.”

The figure 5.29 shows the distribution of capabilities across three general phases of the vendor's process in outsourcing. Quality, on-time delivery and responsiveness are the three capabilities that make CALIFIA win, successfully run and renew the outsourcing contracts. Many times, the capabilities of prototyping and NPI made small one-term customers convert to more stable and larger volumes. The results of the relationship management are important for both winning and renewing the contract.

CAPABILITIES	PHASES OF THE CALIFIA's PROCESS		
	WIN	RUN	RENEW
Quality	x	x	x
On-time delivery	x	x	x
Responsiveness	x	x	x
Handling prototypes and NPI	x		
Relationship management	x		x

Figure 5.29 - Cap-Win Matrix

#### 5.5.4. Capabilities: Synthesis

Each stage of the outsourcing (contract manufacturing in this case) service provision process (win, run, and renew) requires a different portfolio of capabilities. All three cases have showed that we can distinguish between winning, running, and renewing capabilities. However, those capabilities are different for each of the cases. In Figure 5.30 we show dominant capabilities which are spread across all three stages in the vendor's process in outsourcing.

CAPABILITIES	PROMETHEUS	ASTERION	CALIFIA
<b>Dominant capabilities</b>	Cost management D&D Relationship management Vertical integration	Technical competence Relationship management Flexibility	Quality On-time delivery Responsiveness
<b>Capabilities in numbers</b>	Few to win - more to renew	More to win – few to renew	More to win – few to renew

Figure 5.30 - Dominant capabilities

The three cases have also showed that not all of capabilities are necessary for each of the stages. In the case of ASTERION and CALIFIA there were more capabilities necessary to win the contract than to renew it. In the case of PROMETHEUS the situation was the opposite; more to renew than to win.



## 5.6. Information and Communication Technology Systems

### 5.6.1. ICT System @ PROMETHEUS

Corporate IT staff is located in Penang facilities, where they take care of PROMETHEUS's servers and major Applications. At the time of the site visit, there were plans for upgrading the IT infrastructure. Current, expensive and unstable, Virtual Private Network (VPN) technology was being replaced by the multi protocol label switching (MPLS) technology. The Corporate Information Officer (CIO) had a plan to make the internal corporate users (various sites within PROMETHEUS) connect to the servers through MPLS technology, while external users, like suppliers, would access the servers through Internet. The external user would not get a direct effect from MPLS, but the switching from VPN to MPLS would free some bandwidth, which would increase the speed at which external users could connect to PROMETHEUS. However, global bandwidth is an obstruction to the fast flow of information on the global scale. "The infrastructure is good between Asia and North America, and between Europe and North America. But communication between Europe and Asia is very bad. We have our server located in Asia, and our Swiss part is communicating with that server. We could have two servers, one in Europe and one in Asia but that is not the trend. The whole IT world is moving toward the trend of having one server, and the technology is following. As users of technology we also have to follow that trend. We don't need to build IT resources on various locations. We need to strengthen the resources on one location and sooner or later the speed between Asia and Europe is going to be fast and we should be prepared for that", concludes CIO.

On the software side PROMETHEUS run several major packages:

- *Enterprise Resource Planning (ERP)* – Currently PROMETHEUS have two ERP systems in operations. The Asian facilities operate Baan, while the Swiss factory operates SAP. Corporate IT is in the process of establishing a single ERP system for the whole of PROMETHEUS. The chosen system is Infor ERP LN, which is the newest version of the previous Baan system. However, PROMETHEUS will not see the full version of LN, because modules for services, quality and human resource management will not be installed.
- *Computer Aided Design (CAD)* – PROMETHEUS's choice is AutoCAD.
- *Client-Server Collaborative Application* – PROMETHEUS use IBM's Lotus Notes. The Notes client is mainly used as an e-mail client, but also acts as an instant messaging client browser, notebook, and calendar/resource reservation client, as well as a platform for interacting with collaborative Applications.
- *Data acquisition, instrument control, and industrial automation* – PROMETHEUS use LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench), a platform and development environment for a visual programming language from National Instruments. The graphical language is named "G".
- *Quote Management* – QuoteWin is an Application chosen by PROMETHEUS to serve as a tool for supporting the quotation process with PROMETHEUS's suppliers. QuoteWin was developed to manage all aspects of the complex quote management process as well as sub-processes that contribute to the final price proposals submitted to end customers.
- *Human Resource Management (HRM)* – PROMETHEUS uses a locally developed Application HRMS.

Table 5.31 shows how ICTs are applied in PROMETHEUS with respect to information sharing, communication, and transactions and registration. The last, right-hand, column indicates whether there is any integration of the ICT Applications. The primary information sharing software tool is Lotus Notes. “Quick place is a virtual project within Lotus Notes where we have the information about a project. Even customers can access some folders within Quick place. It works as a virtual project room and it works quite well”, explained corporate Business Development Manager. Other software packages such as ERP, Quote Win and HRMS, also enable information sharing across structured processes, though to a lesser extent compared to Lotus Notes. E-mails and Internet are preferred information sharing tools for unstructured processes. Communication is by means of e-mails and telephones. VoIP (Voice over Internet Protocol) telephony is not recognised or approved as a means of communication. PROMETHEUS use video and voice conferences to communicate with their customers.

	Information	Communication	Transaction and registration	Integrated Application
<b>Structured process</b>				
<b>Internal</b>	Lotus Notes QuoteWin ERP HRMS	E-mail Telephone	Production control system ERP HRMS	ERP
<b>External</b>	Lotus Notes Quote Win ERP	E-mail Telephone Video conference Voice conference	Quote Win EDI	
<b>Unstructured processes</b>				
<b>Internal</b>	E-mail Lotus Notes	E-mail Telephone		
<b>External</b>	Internet	E-mail Telephone Video conference Voice conference		

Table 5.31 - Applications of ICT in PROMETHEUS

Transactions and registration are executed internally through production control systems, ERP and HRMS, and externally by Quote Win and EDI. It is worth mentioning that EDI was installed at the customers' request, but according to the CEO it has never been used properly. PROMETHEUS receives the Bill of Material (BOM) from the customer in EDI format, but needs to convert it to QuoteWin.

The lack of integration between software units is one of the characteristics of the PROMETHEUS IT system. The back bone of PROMETHEUS's business process support should be their ERP system. The current ERP is used in the supply chain management, manufacturing, finances, and outbound logistics, but without full integrative capacity. Most of the data are manually fed into ERP. This takes time and data are not always prompt and reliable. On the exiting side of the system, reports are created by the IT department and have

to be ordered two days in advance. The ERP system is also not integrated with other Applications which serve as stand alone Applications.

Another characteristic of PROMETHEUS's IT system is the personnel. They are highly technically competent, informed and knowledgeable about the latest techno trends. However, their expertise is used for developing the infrastructure and solving the IT technical problems, while the big picture about the ICT's role in supporting the business process is somehow decremented, almost omitted. The IT personnel perceive their role in the corporate perspective to be the establishment and maintenance of the IT infrastructure. According to them if there is no solid IT infrastructure, there won't be any environment enabling proper functioning of the software. Corporate IT manager ranked the most important priorities of IT systems in the following order:

1. Infrastructure
2. E-mail
3. ERP
4. Web-browsers

"We can afford an Application like Quote Win to be down if we have proper procedures for disaster recovery. We determine what business process is the most valuable and can't afford to be down. That's e-mails. We give the highest value to the ability to communicate internally and externally by e-mail." Not quite the opinion that users of IT share with CIO.

### **5.6.2. ICT System @ ASTERION**

ASTERION's information and communication system (ICT) is a state-of the art system. It is run on a solid infrastructure with a sufficient bandwidth for both internal and external communication. The IT department, with only few employees, is responsible that all applications run smoothly. The IT competences are present across the company, especially in its D&D department. As visible from the organisational chart, IT and D&D are sub-units, organisationally integrated and reporting to the Manager of Design and Development, who has been one of the key creators of ASTERION's ICT system.

The back-bone of the ICT system is Navision ERP system. The ERP system is designed to fully reflect the contract manufacturing process. In addition to the back-bone ERP, ASTERION utilise several other applications:

- *Spreadsheets* – used for various calculations, especially when negotiating contracts
- *PADS* – a CAD application that is a layout tool for printed circuit boards
- *TOSQA* – an internal collaboration tool containing the templates of various documents that support the business process. The application was developed by a Danish IT company.

D&D department develops embedded software solutions in programming languages like C++. One of the primary IT competences within the D&D is their knowledge of Lab VIEW. LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) is a platform and development environment for a visual programming language from National Instruments. The graphical language is named "G". Originally released for the Apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control, and industrial automation.

Table 5.32 shows how ICT is utilised in ASTERION in terms of information sharing, communication, and transactions and registration.

	Information	Communication	Transaction and registration	Integrated application
<b>Structured process</b>				
Internal	ERP TOSQA	E-mail Telephone	ERP Lab View	ERP
External	ERP	E-mail Telephone		
<b>Unstructured processes</b>				
Internal	E-mail Telephone	E-mail Telephone		
External	Internet	E-mail Telephone		

Table 5.32 - Applications of ICT in ASTERION

The primary characteristic of the system is that applications are very well integrated and with a lead of ERP, highly supportive to the manufacturing process (Figure 5.33). “Everything is working in the same direction, with purpose of avoiding raw material entering the system and finished goods leaving it in no more than 5 minutes after they have been sold”, explains D&D Manager with satisfaction. “The corporate IT is how you set up the ERP”, he concluded.

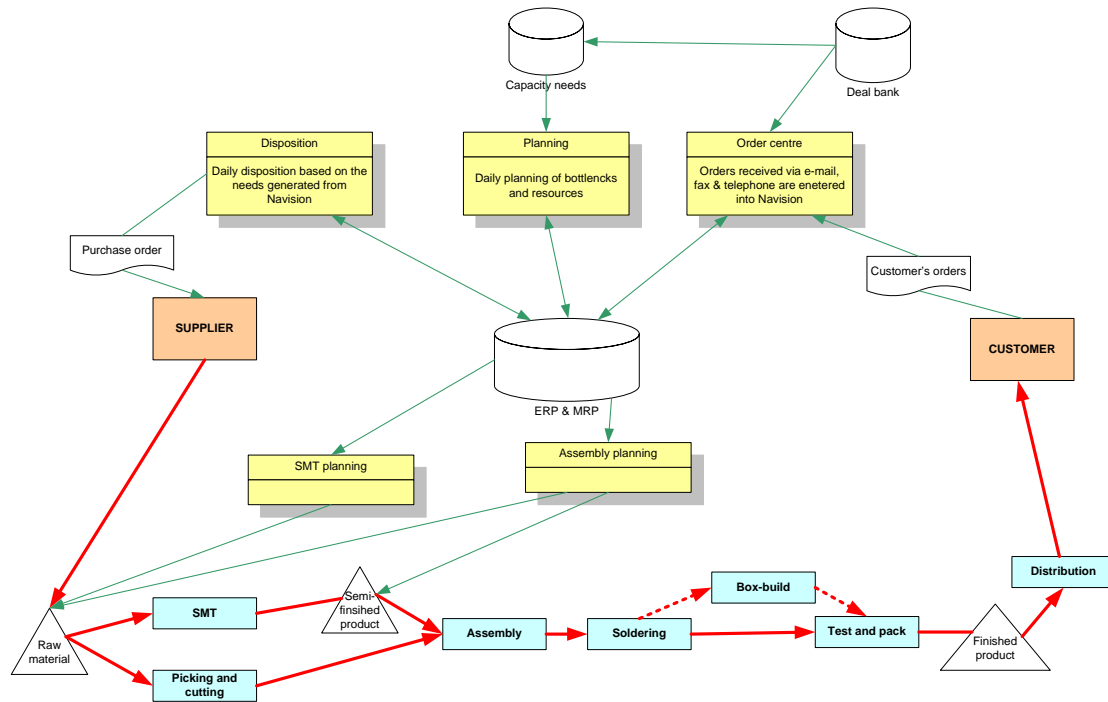


Figure 5.33 - ERP system (simplified)

### 5.6.3. ICT System @ CALIFIA

The ICT infrastructure in CALIFIA can be characterized as stable and fast, which could have been expected given the fact that CALIFIA is based in California, the state with a highly developed IT public infrastructure.

In terms of application, which is the case with other manufacturing companies, the back bone is an ERP system. CALIFIA uses a Swedish IFS. It was purchased in 2006. Until then, CALIFIA had been using an old flat-file MRP system, Maxcim. The system became obsolete, and after the Midwest sister company was acquired (with an outdated system as well) the management decided to purchase a new ERP system. It was installed in Midwest in the first half of 2006 and in CALIFIA in the second half of 2006. Each of the two divisions has tailored it to the way each runs its operations.

Almost all processes are conducted with the help from ERP (90 %), but there are some other applications which are loosely integrated. We briefly present them here:

- IFS – an ERP application covering the sales cycle, pre-production flow, new product ramp, and production flow.
- CIRCAM– CAD CAM software specialized for the electrical engineering industry. This program allows hardware design engineers to design an electrical project with ease, and even includes features for reverse engineering.
- KRONOS – a time attendant system to track the labor to see how much the company is really spending on customers. The payroll goes through it as well.
- Sage ABRA HR – Human Resource Management software

In CALIFIA they prefer to have these systems as stand alone systems because they can be secured very easily, and they don't feel the need for their integration into ERP. Apart from the off-the-shelf application, there are two applications developed in-house. We briefly present them here but will explain them in the later text. They are:

- the BOM upload system –a system for automatic and semi-automatic upload of Bills Of Materials into CALIFIA's ERP, and
- the Quality tracking system – software helping CALIFIA to track quality throughout the various stages of the manufacturing process.

The IT department is run by the IT Manager and two other employees, where one is responsible for the network and infrastructure, while the other is in charge of programming. The IT Manager also does some programming and works as a back up to his colleagues. The program languages used are C++, C Sharp, Visual Basic, and database “languages” such as SQL and CQL. The IT's function in CALIFIA is to maintain the ICT system and develop the ICT support for EMS. They are very much business process oriented and completely aware of the CM process in the company. They identify requirements, possibilities to minimize the time in the process, and opportunities for improving the process. “We are a very much business process oriented IT. We are a small company. Economy has been very poor in the last years so we've been looking at how to use IT resources to improve the process”, explained IT Manager. The IT department is also engaged in the development of company-wide processes. The IT Manager is aware that “if you want to have the process automated you must know exactly what your processes are. Without having a good process it is very hard to automate.”

They have created some extensions to the existing system to support the manufacturing process, i.e, the quality tracking system and the BOM upload system. “Being a CM we have

very requiring customers. Therefore we have to tailor a lot of our systems, especially the quality tracking system. It usually takes 2 to 4 weeks to develop them but then we expand them or modify them for other customers. Tracking systems exist on the market but they are for OEMs with 10 stable products”, the IT Manager explains situation. The reason for developing the quality tracking application also lies in the fact that, according to the Manager of Test Engineering, the IFS is not able to provide that function sufficiently well. He explains: “I don’t believe that the IFS’s quality module does a good job in tracking and controlling”. With the strategy to grow in the medical field where quality controls are rigorous, CALIFIA had to develop such a system. Part of the initiative for this software started in the sister company. The reason why they needed it is that they wanted to have an idea of how the flow is working on the floor. They wanted more flexibility for each product that they run; even if there are multiple steps, they wanted to scan certain points. The Test Engineering Manager explains how it works: “It is a check and balance software. It doesn’t allow the product to go out without being checked. It doesn’t allow mishandlings. It gives us real time yield.” The system is in the testing phase and improvements are targeted towards making consistent data visible to everyone across the company. By early 2009 CALIFIA should be ready to use the software to its full potential. The system is being developed predominantly by the Manager of Test Engineering with some help from the IT department.

Another home grown application is the BOM Upload System, which is used by Prototypes and Production. It was developed due to the complexity of the existing IFS system. When CALIFIA quotes for a new product or when new products or prototypes are being manufactured, the customer sends the Bill of Material (BOM). The BOM contains the information about the components required to be on the product. The BOM usually arrives in CALIFIA in various electronic formats which have to be uploaded into the IFS. The trouble is that IFS has 5 part catalogues, 2 product structures and a cross reference catalogue which have to be uploaded. They refer to the same components but with different catalogue numeration. In the situation in which one BOM typically has 200 to 250 parts (in prototypes even around 500 parts) it would have taken 2 to 3 days to upload 7 catalogues plus cross references into ERP. That was an impossible situation, especially for Prototypes where new BOMs can arrive on daily basis. The IT department’s programmer developed the software which minimized that process to the level of a couple of hours. The BOM Upload System takes the customer’s output and with few steps transfers the data into IFS.

The economic situation, the size of CALIFIA, and the unsuitability of the ERP system drive a lot of the way IT department handle things. Luckily, there are strong IT competences in the company and CALIFIA was able to create applications to improve the process. However, the IT Manager is wondering that “the software development is going to consume a lot of our time and that’s why I am concerned about it. I think that we could definitely add more money in infrastructure.”

#### **5.6.4. ICT Systems: Synthesis**

The basic characteristics of the three ICT parameters (infrastructure, applications, and human capital) within these cases are given in the Figure 5.34.

PROMETHEUS experience relatively frequent instabilities of the ICT system and the bandwidth does not have sufficient capacity to enable the employees to have a satisfactory experience of high Internet speed. The corporate IT function is in the process of improving

the infrastructure through the centralisation of servers, a change of communication protocols and an increase in the Internet speed. The infrastructure for Video Conferencing and Telephone Conferencing is frequently and efficiently used. PROMETHEUS have major software Applications in-house. The back bone of the software part of ICT is an ERP system, around which there are many specialized stand-alone Applications utilised in one or few organisational units. PROMETHEUS's software portfolio is asynchronous with not integrated stand-alone Applications. The ICT Application is developed and utilised in a way which neither reflects the structure of PROMETHEUS's business process nor supports the actual logic in the flow of goods and information. ICT human resources are of a techno-centric orientation, i.e. they are technically competent and follow contemporary techno trends. They perceive infrastructure as the most important part of the organisational ICT system. They see their responsibilities within the areas of development and maintenance of the infrastructure. The role of ICT in supporting the business process in an integrative and meaningful manner is not visible in the corporate IT function.

The ICT infrastructure in ASTERION is stable and provides fast internal and external communication. There are not many versatile ICT applications in ASTERION. They are all integrated and synchronized around the ERP system. The ICT applications are business process supportive. The ICT human capital is spread across the company and it is very much business process oriented.

ICT	PROMETHEUS	ASTERION	CALIFIA
<b>Infrastructure</b>	Unstable Slow VC/TC good	Stable Fast	Stable Fast
<b>Applications</b>	Asynchronous Not integrated Not business process supportive	Synchronous Integrated Business process supportive	Business process supportive Integrated Creation of some applications
<b>Human capital</b>	Techno-centric Emphasis on Infrastructure Not business process oriented	Spread across company Business process oriented	Strong ICT competences in other departments Strong business process knowledge in IT department

Figure 5.34 - Three ICT systems

CALIFIA is the case of a *creation company* in which some applications have been created in order to improve the support of the business process. The basic characteristics of CALIFIA's ICT system are that it is run on a stable and fast infrastructure, though not that expensive. Apart from utilising two in-house created applications, CALIFIA have a business process supportive ERP system with integrated or loosely integrated applications. The key difference in comparison with other cases is in the human capital. CALIFIA have strong ICT competences present across many departments, and employees in the ICT department have very strong knowledge about the business process and very strong awareness of the ways of improving it through the use of ICT.

## 5.7. Competences, Capabilities, and Performance

### 5.7.1. PROMETHEUS

The 5.35 illustrates how competences impact capabilities in PROMETHEUS. The capabilities shaded in black are dominant capabilities.

The sales group consists of business developers and key account executives. Business developers are in charge of finding new customers and managing the quotation process. They use their competences to persuade new customers that the job can be done in PROMETHEUS for a good price and quality, and that customers can benefit from their vertical integration and various locations. Key Account Executives have almost the same role but in retaining the customer. In addition, they need to secure that the ongoing projects run smoothly. The Asia-based key account executive describes his job in this way: “we are responsible for providing competitive quotations, we are responsible for the quality, we need to be responsive to the changes our customers have, and we need to secure agreed turnaround time”.

The competences in the D&D of optics, electronics and mechanic are one of PROMETHEUS' strongest competences. They have enabled the D&D capability, as well as strong influences on relationship management, and vertical integration. The Corporate Business development Manager comments: “We had a small design team of maybe 6 or 8 people in Asia and they had to do some PCB engineering, but that didn't really count as a real design. By acquiring the Swiss company we acquired all D&D competences, and it was a conscious strategic decision and goal of the group to build this up. We have added a lot of value by integrating them because there are high margins in this, and we are locking the customer because you work in such a close relationship with them during this life cycle.”

In the previous chapter we presented the NPI process with its basic set of competences. The NPI is presented within the Technical operationalisation. Technically competent, business process oriented and initiative-driven employees influence D&D, on-time delivery, flexibility, high-mix manufacturing, responsiveness, and technical competence capabilities.

Procurement and supply chain management, which are part of the operationalisation unit's competences, enable capabilities such as cost management, delivery, and relationship management (with suppliers).

Manufacturing of both electronics and mechatronics has as its output various products that have to satisfy strict quality levels. Failing to achieve this capability would discourage customers in renewing outsourcing contracts with PROMETHEUS. Competences in manufacturing are also characterised by competent technical mastering of various technologies that PROMETHEUS have, and flexibility in handling the high mix-low volume production. Adding the manufacturing of plastic parts to the PROMETHEUS portfolio of services significantly influenced the capability of vertical integration.



COMPETENCES	CAPABILITIES										
	CM	D&D	D	F	HMM	I	Q	RM	R	TC	VI
<b>Sales</b>											
Communication skills	•		•			•	•	•	•		•
Responsiveness	•		•			•	•	•	•		•
Technical knowledge	•		•			•	•	•	•	•	•
Knowledge of PROMETHEUS's process and competences	•		•			•	•	•	•		•
Customer focus	•		•			•	•	•	•		•
Good relationship management	•		•			•	•	•	•		•
Ability to transform requirements into new projects	•		•			•	•	•	•		•
<b>D&amp;D</b>											
PCB and complete products		•						•			•
High tech multi-layer boards		•						•			•
Micro-opto-electro-mechanical systems (MOEMS)		•						•			•
Fast prototyping		•						•			•
<b>Technical operationalisation</b>											
Technical skills		•	•	•	•	•			•	•	
Development for manufacturing		•	•	•	•	•			•	•	
Know-how of the production process		•	•	•	•	•			•	•	
<b>Commercial operationalisation</b>											
Analytical skills	•		•					•			
Communication skills	•		•					•			
Fast quotation	•		•					•			
Relationship management with suppliers	•		•					•			
<b>Electronics manufacturing</b>											
High volume PCB assembly				•		•				•	
Low-volume/high-mix PCB assembly				•	•	•				•	
PCB manufacturing technologies				•		•				•	
<b>Mechatronics manufacturing</b>											
Tool design and tool making				•		•				•	•
Plastic injection, in-sert, out-sert , and 2K moulding				•		•				•	•
Progressive metal stamping				•		•				•	•
Axial and torodial coil winding				•		•				•	•
<b>Support</b>											
Occupation-specific competences											
Design and fabrication of testing equipment and software							•				•
Various testing technologies							•				•
<b>Corporate</b>											
Alternative locations for manufacturing	•				•						•
Vertical integration	•										•
Modular process	•					•					•
Box build	•										•
Ability to introduce new technologies	•			•		•				•	•
Multilayered relationship management	•							•	•		•
Preferred vendors list	•							•			•

CM – cost management

D&D - design and development

D – delivery

F – flexibility

HMM – high-mix manufacturing

I – initiative

Q – quality

RM – relationship management

R – responsiveness

TC – technical competence

VI – vertical integration

Figure 5.35 - Com – Cap Matrix

Competences coming from specialised support activities, such as finances and human resource management, do not directly influence any of PROMETHEUS's capabilities. However, competences within the quality department, which is responsible for the testing phase of the process, have a strong influence on the capability of vertical integration. Competences in testing, and in general in securing the quality of PROMETHEUS's products, influence the quality capability which is recognised as one of the capabilities enabling the inflow of new projects from the existing customers.

Corporate competences have a scattered influence over the capabilities, while unit-based competences tend to have a rather concentrated influence. Alternative locations for manufacturing enable PROMETHEUS to perform cost management and to engage some sites for high-mix manufacturing. The vertical integration competence is recognised as a capability. The modular process enables initiative and vertical integration, while the box build is also an enabler of the vertical integration. The ability to introduce new technologies is reflected in PROMETHEUS's capabilities of flexibility, initiative, responsiveness, and technical competence. Multilayered relationship management enables the capabilities of relationship management and responsiveness, while PROMETHEUS's preferred list of vendors has good cost management as a consequence.

Various competences have different influences on capabilities (See Figure 5.36). Competences in sales influence all three groups of capabilities, i.e. winning and renewing (cost management, relationship management, and vertical integration) and running (delivery, initiative, responsiveness). D&D competences are significant contributors to the winning and renewing capabilities (D&D, relationship management, and? vertical integration). The technical part of the operationalisation competences contributes significantly to the running capabilities and renewing capabilities, while there is a relatively small influence on winning capabilities (based on the count of • signs in Figure 5.35). The commercial part of the operationalisation competences contributes significantly to the winning capabilities and renewing capabilities, and to a lesser extent to some running capabilities. Manufacturing competences are strong contributors to the running capabilities, and mechatronics (to some extent) to the winning and renewing capabilities. Support competences are a modest contributor to all three groups of capabilities. Corporate competences influence strongly all three groups of capabilities. However, the majority of corporate competences are concentrated in supporting the winning and the renewing capabilities.

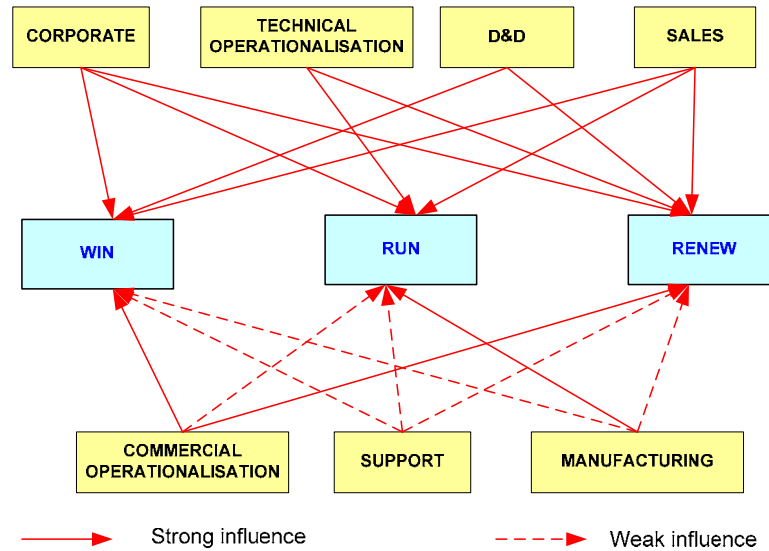


Figure 5.36 – Influence of competences on capabilities

### 5.7.2. ASTERION

The analysis of ASTERION’s competences, and their influence on capabilities and further on the goals starts with the analysis of the impact of competences on capabilities (Figure 5.37). The capabilities shaded in black are dominant capabilities.

The Sales Department has two groups of competences and both influence Relationship Management capability. Key Account Executives maintain close relationships with the customers, but also apply a handful of skills to follow the status of customers’ projects.

The Design and Development Department is the kernel of technical competence. Their competences are highly recognized and appreciated among customers. D&D’s early involvement even in the sales process, and their care for customers also resulted in their influence on the relationship management. “We never let down our customers”, proudly says the Design and Development Manager.

The purchasing unit contributes to the flexibility, speed, and sourcing through their ability to pool the components when necessary.

Support functions do not influence any of the capabilities directly. The corporate competences predominantly influence flexibility- related capabilities, such as flexibility and speed.

COMPETENCES	CAPABILITIES								
	TC	RM	F	S	D	SR	P	CDM	LVM
<b>Corporate</b>									
Development and manufacturing under one roof	•							•	
Quality management system			•				•		
Organisation and procedures for NPI and manufacturing			•	•		•			
ICT system			•	•					
<b>Sales</b>									
Relationship management with existing customers		•							
Analytical skills		•							
<b>D&amp;D</b>									
Hardware for control systems	•								
Software for embedded control systems	•								
Electronics and micro electronics	•								
Vision technology and image processing	•								
Robotics	•								
Specialized industry-knowledge	•								
Relationship management with customers and suppliers		•							
Prototype development	•			•					
Knowledge of manufacturing requirements	•		•	•				•	
<b>Purchasing</b>									
Fast purchasing			•	•		•			
Occupational skills									
<b>Manufacturing</b>									
Low and medium volume manufacturing			•	•					•
Speed			•	•	•				
Flexibility			•		•				
Relationship management with customers		•							
Transfer of specification into finished product			•	•					
Interpreting low structured documentation	•								
Technical competence	•								
Organisational competences			•	•					
Quality inspection							•		
Training and education	•								
PCB manufacturing and assembly									
Box-build									
Gluing and coating									
Cable confectioning									
Manufacturing of testing equipment									
<b>Support</b>									
Occupation-specific competences									

TC – technical competence      D - delivery      LVM – low volume manufacturing  
 RM – relationship management      SR – sourcing  
 F – flexibility      P – price  
 S – speed      CDM – contract design and manufacturing

Figure 5.37 - Com – Cap Matrix

At this point we shall group the competences and analyse their influence on the capabilities, which are also grouped into the winning, running, and renewing capabilities (Figure 5.38). Corporate competences have a strong influence on all three groups of capabilities. Even though mentioned several times by ASTERION management as one of the key contract winners, having both contract development and manufacturing didn't receive significant recognition from customers. However, the way that D&D, NPI, and manufacturing are

organized and supported by ICT and quality systems has a strong impact on flexibility, which was pinpointed as one of key capabilities. By having a typical Key Account Executive approach and by still remaining predominantly on the portfolio of existing customers, the sales competences have a strong influence on renewing capabilities and to some extent on one winning and running capability (relationship management). The D&D competences have spread their influence over all three groups of capabilities. The same is valid for the manufacturing competences. Purchasing competences have a significant influence on winning and running capabilities, while the impact on renewing capabilities has been influenced by D&D, manufacturing, and sales competences.

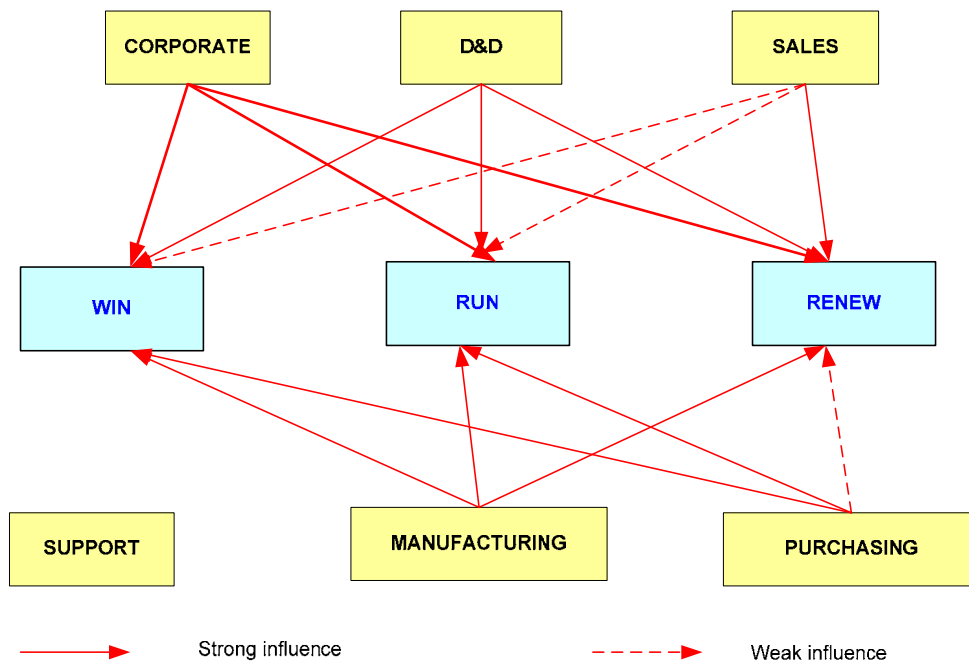


Figure 5.38 - Influence of competences on capabilities

### 5.7.3. CALIFIA

The influence of single competences on capabilities is shown on Figure – 5.39. The capabilities shaded in black are dominant capabilities.

Quality, one of the most important capabilities delivered by CALIFIA, is predominantly influenced by competences within the Manufacturing department, and to a large extent by Materials through their acting in securing the right components with trusted and in-house based suppliers. Coordinating and project management skills of Program management also contribute to the quality levels. It is certain the corporate policy towards certifications in general led CALIFA towards achieving high quality standards.

Criticality to on-time delivery is equally shared by Materials and Manufacturing. If components were not in place on time, and if the workforce were not able to manufacture and inspect on time, it wouldn't be possible to achieve this capability. The Prototype group also has a very high contribution to the on-time delivery. Their competence to work on short-term notice without any rules is impressive and often leads towards winning contracts with larger volumes.



The responsiveness and flexibility are naturally one of the results of the corporate strategy to build partnerships with customers. The relationship management has gained significant momentum. It is led by the Sales with new customers, Program management with the existing customers, and Materials with suppliers.

Prototypes and NPI are also very strong capabilities of CALIFIA. We have already mentioned how the Prototypes group is important for winning the contracts. Competences at Program management, Manufacturing and Materials are the key to a successful NPI, which makes CALIFIA deliver on time with good quality and deepen relational elements (trust and commitment) with the customer.

The causal diagram of the influences of competences on capabilities grouped within the winning, running, and renewing clusters is shown on Figure 5.40. The strength of the influence was determined by counting the •s in Figure 5.39. Unit-based competences with more Xs have a stronger influence on capability. Figure 5.40 shows a nice balance in the contribution of competences to capabilities and to winning, running and renewing outsourcing contracts.

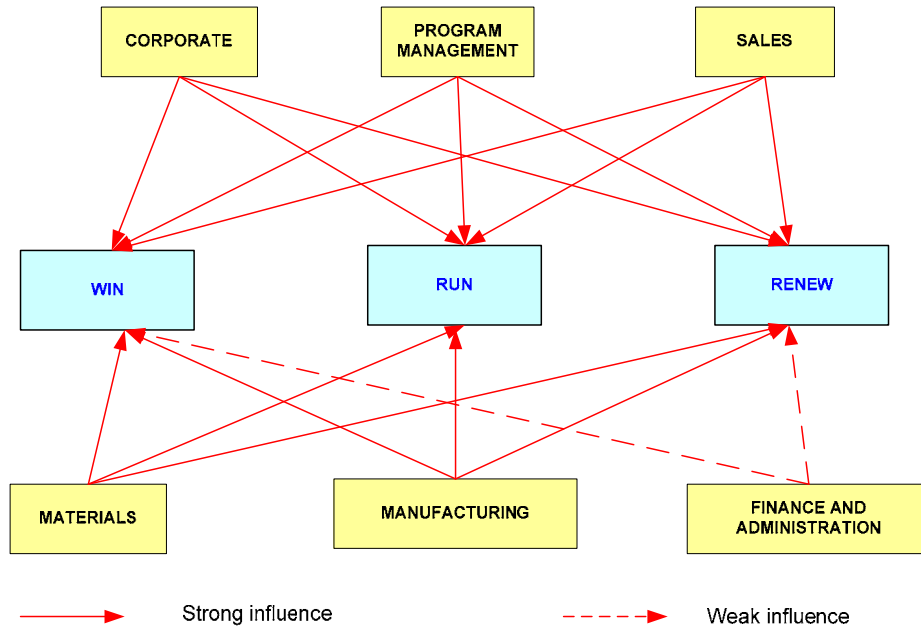


Figure 5.40 - Influence of competences on capabilities

#### 5.7.4. Competences, Capabilities, and Performance: Synthesis

Each of the cases shows different paths of how competences influence capabilities and performance (Figure 5.41).

Most of PROMETHEUS's capabilities are influenced by the sales, technical operationalisation (NPI), and corporate competences. However, the dominant capabilities (cost management, D&D, relationship management, and vertical integration) are impacted by other competences. For instance, cost management is influenced by sales, commercial operationalisation, and corporate competences. D&D is influenced by the competences of

D&D and NPI; relationship management by the sales, D&D, commercial operationalisation and corporate competences; while vertical integration is influenced by the sales, D&D, mechatronics, support and corporate competences.

COMPETENCES – CAPABILITIES - PERFORMANCE	PROMETHEUS	ASTERION	CALIFIA
<b>Competences that influence most capabilities</b>	Sales Technical Operationalisation (NPI) Corporate	Design & Development Manufacturing Corporate	Sales Programme Management Materials Manufacturing Corporate
<b>Concentration of competences that influence dominant capabilities</b>	Scattered across various units and different from competences that influence most capabilities	Concentrated in two most influential units	All units contribute almost equally
<b>Concentration of competences that influence winning</b>	Sales Design & Development Commercial operationalisation Corporate	Design & Development Purchasing Manufacturing Corporate	Sales Programme Management Materials Manufacturing Corporate
<b>Concentration of competences that influence running</b>	Sales Technical operationalisation Manufacturing Corporate	Design & Development Purchasing Manufacturing Corporate	Sales Programme Management Materials Manufacturing Corporate
<b>Concentration of competences that influence renewing</b>	Sales Design & Development Technical operationalisation Commercial operationalisation Corporate	Sales Design & Development Manufacturing Corporate	Sales Programme Management Materials Manufacturing Corporate
<b>Competences – Capabilities – Performance triad</b>	Versatile	Unit dominant	Balanced

Figure 5.41 - Three triads

Apparently, competences in PROMETHEUS differ in the *competence breadth* (how many capabilities are impacted), and *competence depth* (competences that impact dominant capabilities). In addition, the concentration of competences that influence capabilities grouped around the stages of the process also differs from stage to stage. Because of the nature of the



PROMETHEUS's competences to change and fluctuate readily their impact on capabilities, we perceive this competence-capability-performance triad as *versatile*.

Two organisational units in ASTERION are emitters of the majority of competences that influence key capabilities. Design and development is a kernel of technical competence while manufacturing is a source of flexibility. They are both engaged in the sales process and have strong customer focus, therefore strongly influencing the relationship management capability. Managerial and organisational processes on the corporate level strive to merge the two sources of competences into an efficient process. Therefore the corporate competences also significantly influence one of the key capabilities – flexibility. These two competences, together with the corporate competences, influence the winning, running, and renewing capabilities, while a less dominant group of competences (sales and purchasing) interchange during the process. Since competences in design and development and manufacturing are powerful and prevailing over all others, we perceive this competence-capability-performance triad as *unit dominant*.

In the case of CALIFIA we have an even distribution of the impact of competences on capabilities. All unit-based competences with the support from the corporate competences have an almost equal impact on all capabilities and on the dominant capabilities (competence breadth and competence depth). In addition, all competences impact evenly the capabilities grouped around winning, running, and renewing the contracts. For these reasons we perceive this competence-capability-performance triad as *balanced*.

## 5.8. The Impact of ICT on the Competences-Capabilities-Performance Triad

### 5.8.1. PROMETHEUS

Business development and key account management use spreadsheets as Customer Relationship Management (CRM) tools and basic tools for data storage and analyses. Lotus Notes is also used for internal communication, especially with the NPI team.

COMPETENCES	ICT
<b>Sales</b>	
Communication skills <b>Responsiveness</b> Technical knowledge Knowledge of PROMETHEUS's process and competences <b>Customer focus</b> <b>Good relationship management</b> Ability to transform requirements into new projects	Lotus Notes Video and telephone conferences
<b>D&amp;D</b>	
<b>PCB and complete products</b> <b>High tech multi-layer boards</b> <b>Micro-opto-electro-mechanical systems (MOEMS)</b> Fast prototyping	Auto CAD Lab VIEW Lotus Notes
<b>Technical operationalisation</b>	
Technical skills Development for manufacturing Know-how of the production process	Lotus Notes Video and telephone conferences
<b>Commercial operationalisation</b>	
<b>Analytical skills</b> <b>Communication skills</b> <b>Fast quotation</b> <b>Relationship management with suppliers</b>	ERP Lotus Notes Quote Win
<b>Electronics manufacturing</b>	
High volume PCB assembly Low-volume/high-mix PCB assembly PCB manufacturing technologies	ERP
<b>Mechatronics manufacturing</b>	
<b>Tool design and tool making</b> Plastic injection, in-sert, out-sert , and 2K moulding Progressive metal stamping Axial and torodial coil winding	ERP Auto CAD
<b>Support</b>	
Occupation-specific competences <b>Design and fabrication of testing equipment and software</b> Various testing technologies	ERP HRMS Auto CAD / Lab View
<b>Corporate</b>	
Alternative locations for manufacturing Vertical integration Modular process Box build Ability to introduce new technologies Multilayered relationship management Preferred vendors list	

Table 5.42 – The influence of ICT on competences (Competences influenced by IT are in bold)

Communication with customers is enhanced by means of video and telephone conferences. “We use fixed schedules for video and telephone conferencing to review together with customers the introduction of new products”, explained the Key Account Manager. Data from customers are received in various forms, volumes, quality and richness, hence influencing the increase of the volume of communication. However, communication with customers is not supported by some specialized tools, nor is the data from customers integrated with the ERP system. Still, internal collaboration tools and video and phone conferences help PROMETHEUS’s sales teams to show their customers focus and dedication, which results in good relationship management (See Table 5.42).

ICT’s connection with D&D competences can also be described as a supportive one. D&D teams concentrate on the development of products and they use standard design support tools such as Auto CAD and Lab View. Again, Lotus Notes is a primary internal collaboration tool. The output from the teams’ work is not integrated with the ERP system. The D&D work is performed on ICT and it would have been hard to imagine D&D engineers working with rulers and pencils in an electronics industry. The ICT provided engineers with the means to demonstrate their competences.

Engineering and NPI teams are the core of technical operationalisation. “When we get a project into NPI we can discover many black holes and we need to get back to the customer. The data flow is back and forth during the NPI”, says NPI manager, and continues by explaining the need for more IT support,” We have a lot of paperwork and we need to overcome repetitive jobs. We need a system that would transfer the information from customers in a proper way. We need more integration with customers, and we need better communication systems.” The volume of work diminishes NPI’s ability to track all changes in products and procedures that occur during the NPI process. Therefore they have high expectations from the promised integration of NPI into the new ERP system. The technical operations unit is the biggest user of Lotus Notes since they need to coordinate the NPI, both upstream and downstream, internally and externally. However, none of the technical operationalisation competences seem to be supported by ICT.

The users of IT in the commercial operationalisation are primarily the procurement and the supply chain organisational units. They use Lotus Notes, ERP and Quote Win software to support their processes. Since the collaboration tool Lotus Notes and the ERP system are widely known applications, we shall focus on the role of the specialised application - Quote Win.

PROMETHEUS installed Quote Win in 2005, the year from which PROMETHEUS’s performance has changed significantly. The corporate Business Development Manager recalls: “When I got here we were not competitive on material. We kept prices of components in the Baan and only in the case we had won the deal and purchased those components. If we wanted to analyse the prices we had to go and dig all the quotations, which we didn’t have time to do. With Quote Win we have the history of quoting and of won and lost deals. We can see the previous quotes for the same components and we can see how much they were, so we can expect the price for new quotations for the same components. The Quote Win has made it possible for us to have *organisational memory*“. A corporate procurement executive agrees that the Quote Win’s utilisation helped in optimizing prices and improving the analytical skills. It also makes savings on communication and paper work, helps tracking the request for proposals and enables the selection of multiple suppliers. This same executive explained to us that Quote Win depicted the quotation process as it used to be (supported by spreadsheets at

that time though) and that they can now handle much more suppliers in a week and respond to the growing number of projects.

Specialists, the procurement executives, operate Quote Win from various PROMETHEUS's sites in Asia and Europe. The Key Account Executives (from the sales unit) manually insert the information about the bill of material (BOM) into Quote Win and send a note that a new quotation is ready to the procurement executives. It is interesting to mention that the procurement executives also browse the information about projects in Quote Win and sometimes know, before receiving a note from the Key Account Executives, that new components are pending for RFQ and from which region the customer is, and which PROMETHEUS's facility is due to quote and receive components. Quote Win has enabled internal visibility of the project in terms of region and the level of completion.

After BOM's inception into Quote Win, the Request For Quotations (RFQ) is sent to the suppliers. Procurement executives compare the data from the customer's list of approved manufacturers with the relevant intelligence data about PROMETHEUS's vendor approved list, and decide which suppliers are the most eligible to receive the RFQ. Corporate procurement executive explained the supplier selection in the following way: "All our suppliers are managed by individual corporate procurement executives. We will know whom to select. I know whether someone is better for supplying components for the low volume or high volume production. Quote Win helps us in selecting potential suppliers based on their history of quotations. We choose the selection criteria such as price, quality, and delivery on time, etc., and Quote Win provides us with a list of potential suppliers." Analytical competences are undoubtedly enhanced, even created, by Quote Win. Corporate procurement executives know the history of suppliers and their capabilities to supply components. They can determine the best supplier for each of the projects. When the RFQ is sent out the selected suppliers use Supply Win software (suppliers' version of Quote Win) to send their quotations to PROMETHEUS. Corporate procurement executives have to react again and choose among the suppliers.

However, corporate procurement experiences many problems with the IT infrastructure and software integration. When asked to explain how ICT could support procurement in the future the Corporate Procurement Officer was very clear: "ICT need to enhance the reliability and speed of the network. We don't need more software. At this moment, the most important thing is to have Quote Win and ERP integrated. We are doing manual synchronization. If they were totally integrated, everyone would be referring to one system, and data mining would also be easier." But the corporate IT don't have plans of integrating these two systems "ERP is a general system. Quote Win is a specialised system and it is for our suppliers. It will not be a part of the new ERP."

Supply chain management, an executive branch that takes care of orders and purchasing from the selected suppliers, is also asking for more IT support. The Supply Chain Manager said: "Many models are coming in and I have to react to them and provide an answer within 3 to 4 days, and I have a problem replying to that. I depend on IT. If I want to make a query, I cannot do it myself and I have to ask IT and wait, sometimes up to two days, to receive the data. I want tools. These tools are very essential to doing it myself."

Manufacturing utilises the ERP system, but none of the manufacturing competences have been influenced by ERP. In the case of manufacturing of plastics, PROMETHEUS's

engineers use Auto CAD for designing the tools and plastic parts, where the ICT's role is perceived as enabling.

Support functions use IT in various forms. The financial function mainly operates with ERP's financial module; the human resource management uses specialised HRMS software, while quality uses Auto CAD and Lab View, which help them when designing the testing and control equipment and software.

As far as corporate competences are concerned, PROMETHEUS's IT system is not in favour of supporting them to some more significant extent. The sole example might be Quote Win with its role in having an overview and good management of the relationship with the preferred vendors.

Among all of PROMETHEUS's capabilities, the cost management is the only capability directly influenced by ICT. The Corporate Business Development Manager explains: "Quote Win enabled us to reduce the material cost to up to 20%, which makes the difference in bringing the customers here and winning them over the soft factors. Previously we had been using spreadsheets. Because we are faster on the sourcing side, we quote about 30% more now, and we win much more now", but he ended his thought with: "However, the soft factors are huge". We couldn't identify any direct impact of ICT on the performance (win, run, renew) apart from the moderating influence via the cost management capability.

### 5.8.2. ASTERION

The influence of ICT on competences is given in Figure 5.43. The competences printed in bold are competences influenced by ICT.

The Sales Department use ERP, spreadsheets and some small databases. Spreadsheets are used to calculate liability and supplier and customer delivery times. ERP and spreadsheets are used when negotiating the contract. "Then we come up with the figure to see how many components we have in stock and who is going to be financially responsible for them", clarifies D&D Manager. There is no special CRM application, but the sales executives use various databases to screen potential new customers. ERP is used to follow up the sales and margins of the existing customers, which will determine the sales tactics towards renewing the outsourcing contracts. The use of ICT system in the Sales department has improved analytical skills of the Key Account Executives.

D&D department has a team of electrical engineers with very strong IT competences, especially in programming languages, such as C++ and Lab VIEW. C++ is used to program products developed in ASTERION. "95 % of our products have software components", explains D&D Manager. Another, even stronger set of language skills is connected with Lab VIEW. The former DEV company started to experiment with Lab VIEW in 1990s. They gradually learned to master the application and use it intensively in the development of the automation and industrial control systems. ASTERION engineers applied the knowledge of Lab VIEW and robotics to develop their own testing equipment for ASTERION's manufacturing process. The PADS (CAD system) is used for the design and layout of circuit boards. PADS transfers the Bill Of Material (which comes out of PADS) into the ERP (mostly manually). However, the SMT machines are programmed automatically from PADS. The system also has a database with the components which is unfortunately not the same

database of ERP. Therefore there is some manual work involved in designing a new circuit. D&D Manager explained that: “We have to look in the ERP database to see what components we have in the warehouse. We have to choose the components that are already in the ERP database. We are working on the integration of PADS’ and ERP’s component databases.”

COMPETENCES	ICT
<b>Corporate</b>	
Development and manufacturing under one roof <b>Quality management system</b> <b>Organisation and procedures for NPI and manufacturing</b> <b>ICT system</b>	ERP Lab VIEW
<b>Sales</b>	
Relationship management with existing customers <b>Analytical skills</b>	ERP Spreadsheets Internet
<b>D&amp;D</b>	
<b>Hardware for control systems</b> <b>Software for embedded control systems</b> <b>Electronics and micro electronics</b> <b>Vision technology and image processing</b> <b>Robotics</b> Specialized industry-knowledge Relationship management with customers and suppliers <b>Prototype development</b> Knowledge of manufacturing requirements	C++ Lab VIEW ERP CAD system
<b>Purchasing</b>	
Fast purchasing Occupational skills	ERP
<b>Manufacturing</b>	
Low and medium volume manufacturing <b>Speed</b> <b>Flexibility</b> Relationship management with customers <b>Transfer of specification into finished product</b> Interpreting low structured documentation Technical competence <b>Organisational competences</b> <b>Quality inspection</b> Training and education <b>PCB manufacturing and assembly</b> Box-build Gluing and coating Cable confectioning <b>Manufacturing of testing equipment</b>	ERP Lab VIEW
<b>Support</b>	
Occupation-specific competences	ERP

Figure 5.43 - ICT-COM

The NPI process is, according to the Development Manager, supported by the ERP system in combination with the programming languages. The shift from NPI<sub>1,2</sub> to NPI<sub>3,4</sub> is well supported by IT so the shift from D&D to the manufacturing is quite smooth.

The ERP was set up to fully support the manufacturing process. Another interesting characteristic of the ICT and manufacturing is, as mentioned above, the utilisation of existing ICT competences to develop the testing equipment in house. “We have our own test units developed with the help of Lab VIEW. Lab VIEW will look into ERP, and based on the product description (drawing) it will decide which test procedure to take. The test system recognizes the product and the series and tests the product and stores data into the database. That is a separate database. We have a web solution where employees in manufacturing can

see by reading the bar code, exactly where the error comes from. If I have 2 to 3 products from the same series, I can say that I may have a problem with all the others from the same production series”, comments D&D Manager. The testing equipment enabled ASTERION to achieve significant improvements in learning the quality system. “The system gathers the measuring data (makes a report) that is connected with a knowledge data base. Afterwards we can analyze the report and suggest where we need to improve. We can either change the design, or if it is a bad component we address the supplier, or if the problem’s in manufacturing or in NPI, we can react in those areas “, the Production Manager explains the importance of the Lab VIEW supported quality testing and its backwards integration with the phases of the EMS process. D&D Manager adds that the benefit of having the computer vision technology in testing is to get more consistent test results that could be used for a statistical analysis. “When the test systems were on different platforms it was very difficult to retrieve the data that could be used for the statistical analysis.” ICT enables the transfer of documentation into the finished product, organisational competences, PCB manufacturing and assembly, speed, and flexibility, and helps to develop quality inspection and the manufacturing of testing equipment.

Purchasing and support functions also use ERP in their daily operations. However, we couldn’t identify any influence of ICT on some of the purchasing and support competences.

Competences on the corporate level are very much connected with ICT. First of all, ICT is one of ASTERION’s competences. D&D Manager is persuasive when saying that ASTERION has a tool box consisting of the knowledge in the: “Microcontrollers that we know from top to the bottom, programming languages, Lab VIEW, and our manufacturing. Just give us a problem that involves all this. We will solve the problem and manufacture it for you.”

He also continues in commenting the strategic importance of having the Lab VIEW competences in house: “Embedded computers are getting smaller and faster and cheaper. This opens the possibility of using higher level languages of programming, and this is where National Instruments (producer of Lab VIEW) is trying to get on the market. We have specialized in small to medium series. That means that the overall process is not that critical compared to mobile phones and consumer electronics. We produce professional electronics. If we are faster and with better quality, then it really doesn’t matter if we are paying more for the components. That means that we can use higher level programming languages, be faster and pay 5% more for the components if necessary “.

Finally, Lab VIEW and ERP influenced flexibility and pricing. The Production Manager explains that role by reflecting on the testing: “Each time we increase the quality, we reduce costs. Testing equipment developed on the principles of vision automation also influences the flexibility because the knowledge database provides the operator with guidelines where the error could be, so he can fix it easily. Also, by automating the test sequence we have decreased the labour time, thus decreasing the costs “.

### **5.8.3. CALIFIA**

In order to explore the influence of ICT on competences and capabilities we shall take a more detailed look into the ICT utilisation within each of the organisational or process units. The

influence of ICT on the competences is given in Figure 5.44. The competences printed in bold are competences influenced by ICT.

According to the Vice President of Sales and Marketing, CALIFIA get very few leads from networking, but the majority of the leads come from their presence on the Internet. They have pretty good visibility through search engines. The VP for Sales and Marketing didn't want to reveal the secret of web site optimization, but as he says: "The tricks I put there some years ago seem to work OK". CALIFIA is also present on the industry specialized databases like Thomas net that covers the whole of USA. Sales get around 70% of the calls thanks to being visible in that database. "That's my only paid advertising", continues VP. "In Thomas net you pay for ranking. And the results are there. Other advertising in this business doesn't work. I had experience in trying newspapers, magazines, conferences, trade shows. The only thing that really has a continuous effect is the Internet." ERP is used in the Sales for analytical purposes, while Prototypes group with its own line uses it much more. When CALIFIA is quoting, the BOM Upload system and spreadsheets are used to quote for material and labour. The Director of Program Management argues that the BOM Upload system improves the process in quoting. "The perception for most customers is that we can turn the quote around in few days, which difficult to do. The sooner we upload the BOM into our system, the sooner purchasing can start buying. That is the key in our business. It takes some time to get quotes out and to wait for suppliers to come back", he concludes. The BOM Upload system is even more vital for the Prototype group in terms of minimizing errors and enabling fast prototype turns. The IT Manager explained: "Proto gets BOMs almost daily. Sometimes they need to quote in one day. They get the work instructions and everything from the customer and they have to start building that day. It is not only a time saver. When you have many parts to enter there is a lot of room for mistakes. With this software the chances for errors have been reduced."

The organisational role of Programme Management, as explained earlier, requires their coordination of the teams composed from various organisational units, without giving the Program Management actual supervision powers. They also serve as key account managers. In that pursuit, their task is to communicate with customers and to provide them with all possible information in order to secure new contracts. Program management practices good customer relationship management, and understanding CALIFIA's process and being able to retrieve the information from systems like ERP, Quality tracking and BOM upload helps them communicate efficiently with the existing customers.

The ERP system is a key ICT system for materials. Planning, scheduling and purchasing are exercised with the help of IFS. The Chairman explained to us how important ERP is for this function: "It is in the nature of our business that if we bring material too early it uses cash which we can't afford to do. We like to bring our inventory if not JIT then within a small buffer of time. There is no magic, there is no rocket science, there is no brilliant marketing in our business. It is tremendous attention to details. If you have a product that you make that has 700 components it does no good to you to have 699 of them here on time if you don't have the 700<sup>th</sup> component. Inventory management is critical. With schedules changing all the time, what we've done is when we win a particular program, we have selected our vendors for different components, and for the largest ones that have the largest part of components, we connect them directly to our ERP system When we get the schedule changes from our customers and we put them in our system it automatically exports to them what our demand is going to be for their share of the parts of the BOM. That saves tremendous phone calls, faxing, e-mail etc."



COMPETENCES	ICT
<b>Corporate</b>	
Location Quality certificates Various industries Handling complexity <b>Responsiveness</b> Business process awareness shared among all employees Awareness of ICT utilisation and possibilities	BOM Upload Quality tracking
<b>Sales</b>	
<b>Analytical skills</b> Customer relationship management Understanding customer needs Business acumen <b>Quick prototype development</b> Nimble and resourceful prototype staff Technical competence <b>ICT competence in optimizing the search engines</b>	Internet ERP BOM Upload CAD
<b>Programme Management</b>	
Communication skills Project management and coordination skills <b>Customer relationship management</b> Ability to work with several layers of senior management Team work	ERP Quality tracking BOM Upload
<b>Materials</b>	
<b>Professional (occupational) skills in planning, scheduling, purchasing and quoting</b> <b>Supplier relationship management</b> In-house based major suppliers Negotiation and communication skills Awareness of ICT utilisation and possibilities Diversity of competencies in purchasing	ERP Spreadsheets BOM Upload
<b>Manufacturing</b>	
<b>PCB assembly</b> <b>Box-build</b> <b>NPI</b> <b>Design for manufacturability (DFM)</b> <b>Design for testability (DFM)</b> <b>Testing competences</b> Skilful workforce IT competences in test engineering <b>Quality management</b>	CAD ERP Spreadsheets BOM Upload Quality tracking
<b>Finances and Administration</b>	
Occupational skills <b>Analytical skills</b>	ERP KRONOS ALBA

Figure 5.44 - ICT – COM

The purchasing group within Materials Department is a very active user of ICT. They download information about components from ERP in the format that their in-house suppliers can take and apply in their own system. “That has taken a lot of work from our desk. Sometimes the ERP portion goes right to them. Everything is done pretty much through the system, utilising PDF files, sending them to the suppliers, and they send acknowledgments back to us. That allows easy access to anyone in the company to look into our files”, explained Purchasing Manager. Purchasing in CALIFIA had been using Quote Win but dropped it. Instead, they decided to use spreadsheets because that was much easier. They could download the parts from ERP very quickly and send a request to the suppliers in a spreadsheet format. Suppliers have no problems with entering spreadsheets into their systems. By dropping Quote Win CALIFIA hasn’t lost the quotation speed. The IT Manager argues that: “the key to get the quote quickly is to get the structure of the board (BOM) into our system and generating the quantities of parts. Putting the BOM into Quote Win took the

longest. If the BOM is in any reasonable spreadsheet or text format, our program can bring it into ERP in less than 30 minutes“. Purchasing Manager stresses that Quote Win is suitable for certain sales strategy and supplier relationship set-ups: “You got to have all the right information to make it work right. In order to make all that work right, you need to have resources to do that. We are not quoting as much as we used to. We used to quote a lot just to bring the business opportunity. Now we do a much smarter job about evaluating the customer. Before the organisation that we bring could affect us with a disease we evaluate if it fits into our business and whether it makes sense to proceed. Once we have done that, we think that we can manage it with the use of spreadsheets.” She further explained the supply side set-up: “I have less than 10 suppliers. Number 1 and 2 suppliers are here, and number 3 and 4 suppliers are actually our customers”. However, she admits that Quote Win could give them more intelligence: “Sometimes we can optimize purchasing by having the information on the same parts used by different customers. That’s why we go back from time to time and analyze the spreadsheets to see that information. We could do a better job on the price knowing that it’s used here, and here and here”.

Materials department is very much interested in broadening the utilisation in ICT. They are considering how to integrate CALIFIA’s systems with the SCM tools utilised by their in-house suppliers. The introduction of bar coding is also being considered. The corporate strategy to increase the share in the Medical industry is partly responsible for this increased interest in ICT utilisation “When we go into the medical business traceability becomes very critical”, concludes Purchasing Manager. The Vice President for Materials sees ICT as an important element for maintaining and improving customer relationships. The management would like to implement finite scheduling: “If we had finite scheduling, we would give to our customers more realistic scheduling.”

The ERP system is mostly utilised by Manufacturing. There are some other elements of ICT in CALIFIA which manufacturing uses a lot in their work. Apart from workers in production, Manufacturing consists of various groups of engineers. Process engineers are involved in the preparation of work instructions by utilising the CAD system. Further on, it is the engineers who operate the BOM Upload system. Apart from contributing to other units in the process, the BOM Upload system gives the engineers the flexibility to change the parts before they move the item into production. Finally, the quality management performed in Manufacturing is supported by Quality tracking software developed by Test Engineering Manager.

Finances and administration are also users of several applications. Finances rely on ERP to perform the financial analyses. The controller explained to us that: “When we get the product we can compare the costs when bidding with the actual costs. We can see where the scraps occurred. That’s what we use ERP for. Everything that we do is used by the ERP system. Everything that is done in the company creates transactions that go into the ERP system which creates charts. We examine the charts, and if they don’t make sense we go to see why and where and by whom those mistakes occurred.” HR uses two systems for operating their usual HR activities.

Finally, the responsiveness as one of the key competences sitting at the corporate level is influenced by BOM upload and Quality tracking applications. The Test Engineering Manager put it in the following way: “We can answer questions from our customers about the yields. A couple of months ago it was really a problem to answer these questions.”

#### 5.8.4. The Impact of ICT on the Competences-Capabilities-Performance Triad: Synthesis

The ICT's impact on the competence-capability-performance triad varies across the cases in intensity and implication. In order to capture that variety we introduce several categories of impact (Figure 5.45).

- When ICT influences competences in a supplementary way to the already existing staff's personal competences, i.e. provides the employees or organisation with the means to demonstrate their competences, we perceive the role of ICT as a *competence enabler*.
- When ICT significantly improves or creates a competence that didn't exist or wasn't practiced in a significant manner before being influenced by ICT, we perceive the role of ICT as a *competence developer*.
- When ICT is embedded into the portfolio of a unit's competences, we perceive *ICT as a competence*.
- When ICT significantly improves the measures of performance defined or perceived by customers, we perceive the role of ICT as a *capability enabler*.
- When ICT helps in creating the vendor's capability, we perceive the role of ICT as a *capability developer*.
- When ICT has been recognised explicitly or implicitly by the customers and/or vendors as one of the measures of the performance, we perceive *ICT as a capability*. However, we couldn't recognise ICT as a capability in any of the three cases.

Even in an inharmonious and business-process incongruous ICT system, some elements of the IT system can influence the organisation's competences and capabilities. Some of PROMETHEUS's stand-alone applications serve as tools that are utilised as platforms on which employees can perform some of their competences, making the role of the ICT system that of a competence enabler. That is the case with some of the sales, D&D, support, and corporate competences. In the case of the commercial operationalisation competences, all competences are strongly influenced by one of the ICT's stand alone applications. These competences, especially the analytical skills and the fast quotation, have been significantly improved after the implementation of the quotation software. In this case the ICT system is a competence developer.

The quotation application directly influences the cost management capability, which is one of PROMETHEUS's key capabilities. The ICT's influence on the key capability also went through its influence on the competences which have a strong impact on the key capability. Therefore we may argue that when a competence developer, the IT system could influence some of the most important capabilities. In both cases, more directly as a capability enabler or indirectly as a competence developer, the ICT influenced two of PROMETHEUS's goals, i.e. to win and renew outsourcing contracts.

The case analysis showed how ICT demonstrated two types of influences on ASTERION's competences. When employees use the ICT as a support to perform certain competences, ICT is perceived as a competence enabler. This is the case with the sales and manufacturing competences. The second type of influence is actually the ICT's embedment into the portfolio of the unit's competences. ICT as a competence is present among corporate and D&D competences.

ICT – TRIAD	PROMETHEUS	ASTERION	CALIFIA
<b>Competence enabler</b>	Sales D&D Support	Sales Manufacturing	Sales Programme management Materials Manufacturing Finances and administration
<b>Competence developer</b>	Commercial operationalisation (purchasing)	Quality inspection in Manufacturing	Quality tracking in Manufacturing
<b>ICT as competence</b>		D&D Corporate	Sales Materials Manufacturing Corporate
<b>Competences not supported by ICT</b>	Technical operationalisation (NPI) Electronics manufacturing Mechatronics manufacturing (apart from the enabling role in tool design and making) Corporate	Purchasing Support	
<b>Capability enabler</b>	Cost management	Flexibility Speed	Quality On-time delivery Responsiveness Handling prototypes and NPI Relationship management
<b>Capability developer</b>		Technical competence	
<b>ICT as capability</b>			
<b>ICT on performance (indirect impact)</b>	Win and Renew via commercial operationalisation (competence developer) and cost management (capability enabler)	Win, Run, and Renew via D&D, manufacturing, corporate (competence developer and ICT as competence) and flexibility (capability enabler)	Win, Run, Renew via all capabilities supported with all competences
<b>ICT on performance (direct impact)</b>		Win, Run, and Renew via Technical competence (capability developer) though not explicitly said by the customers	

Figure 5.45 - Three impacts of ICT on the triad

Since ICT has enabled ASTERION to conduct flexible manufacturing and to establish flexible and fast business process in general, with process time decreased due to improvements in the quality inspection, we perceive the role of ICT as a capability enabler. In the case of the technical competence as ASTERION's key capability, ICT has the role of a capability developer. ICT made it possible for ASTERION to develop high-tech electronic products with sophisticated software components.

Customers rank ASTERION's technical competence as one of the most important criteria for choosing them as their contract developer and contract manufacturer. Therefore, even though it wasn't explicitly said, ICT as a capability developer impacted directly the winning and renewing of outsourcing contracts.

The utilisation of ICT is demonstrated in its widest extent in the case of CALIFIA. Sales, materials, and manufacturing units complemented with the corporate level all have competences in ICT. Therefore there is no wonder that ICT has the role as a competence enabler in all organisational units of CALIFIA, where numerous competences impact capabilities, and many of them with the help of the ICT system. Here are some of the examples: In the sales department, presence in an electronic database helps CALIFIA to win contracts, ERP helps in improving analytical skills, the BOM Upload system helps faster prototype development, the BOM Upload system also helps faster quoting and purchase of materials which influences on-time delivery and flexibility, and finally, the BOM Upload system helps improve quality. Further, the ability to interpret information from systems like ERP, Quality tracking and BOM upload helps Program Management to communicate efficiently with the existing customers. Materials management is one of the crucial competences necessary for successful EMS operations. The ERP system is very helpful for planning and scheduling materials. Utilising ERP in materials management helps CALIFIA to perform their on-time delivery. ICT also plays a significant role in developing strong relationships with suppliers. Manufacturing utilises almost all ICT applications, and ICT systems have the widest impact on competences in the Manufacturing department. Strong emphasis on ICT utilisation in manufacturing comes from strong ICT competences that Manufacturing has. These competences were inherited from previous OEM business in terms of long time employed personnel (such as Test Engineering Manager).

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**CHAPTER VI**

**DISCUSSION**

## CHAPTER 6

### DISCUSSION

We found that ICT can have six roles when impacting the vendor's performance in outsourcing. These roles are perceived in the context of a resource-based view and they are presented in four ways of how ICT impacts competences and capabilities, and two resource-based view states of ICT. They are:

- Competence enabler - ICT influence competences in a supplementary way to the already existing staff's personal competences i.e, provides the employees or organisation with the means to demonstrate their competences
- Competence developer - When ICT significantly improves or creates a competence that didn't exist or wasn't practiced in a significant manner before being influenced by ICT
- ICT as competence - When ICT is embedded into the portfolio of the unit's competences,
- Capability enabler - When ICT significantly improves the measures of performance defined or perceived by customers
- Capability developer - When ICT helps in creating the vendor's capability
- ICT as capability - When ICT has been recognised explicitly or implicitly by the customers and/or vendors as one of the measures of the performance

In the Figure 6.1 we captured the roles of ICTs in impacting the performance of the three EMS providers and in the Figure 6.2 we show a conceptual model of that impact. The blue box in the figures represents the performance level, consisting of the win, run, and renew objectives. The yellow box refers to the level of capability, representing the ICT as the capability, capability developer, and capability enabler. The orange box refers to the competence level, representing the three roles of ICT i.e., the ICT as competence, competence developer, and competence enabler. The white boxes capture the three elements of ICT i.e., the infrastructure, the applications, and the human capital. ICT can impact the winning, running and renewing of outsourcing contracts both directly and indirectly. The full red line pinpoints the direct impact of ICT on the performance; the dotted line shows the indirect impact. The thin full line shows the necessary prerequisites for fulfilling the direct impact and is given only in the Figure 6.2.

The direct impact of ICT on the vendor's performance in the EMS industry is possible in the situation when ICT acts as capability developer. The prerequisite for ICT role of capability developer is that there should be strong ICT competences in the unit that has created the particular capability. In addition, there should be a strong ICT competence on the corporate level which should take care of providing a strong corporate ICT infrastructure and applications. This is the case of ASTERION where strong ICT competences in the Design and Development unit led towards the development of the capability of Technical Competence, for which ASTERION is praised by its customers and which enables ASTERION to win, run, and renew outsourcing contracts.

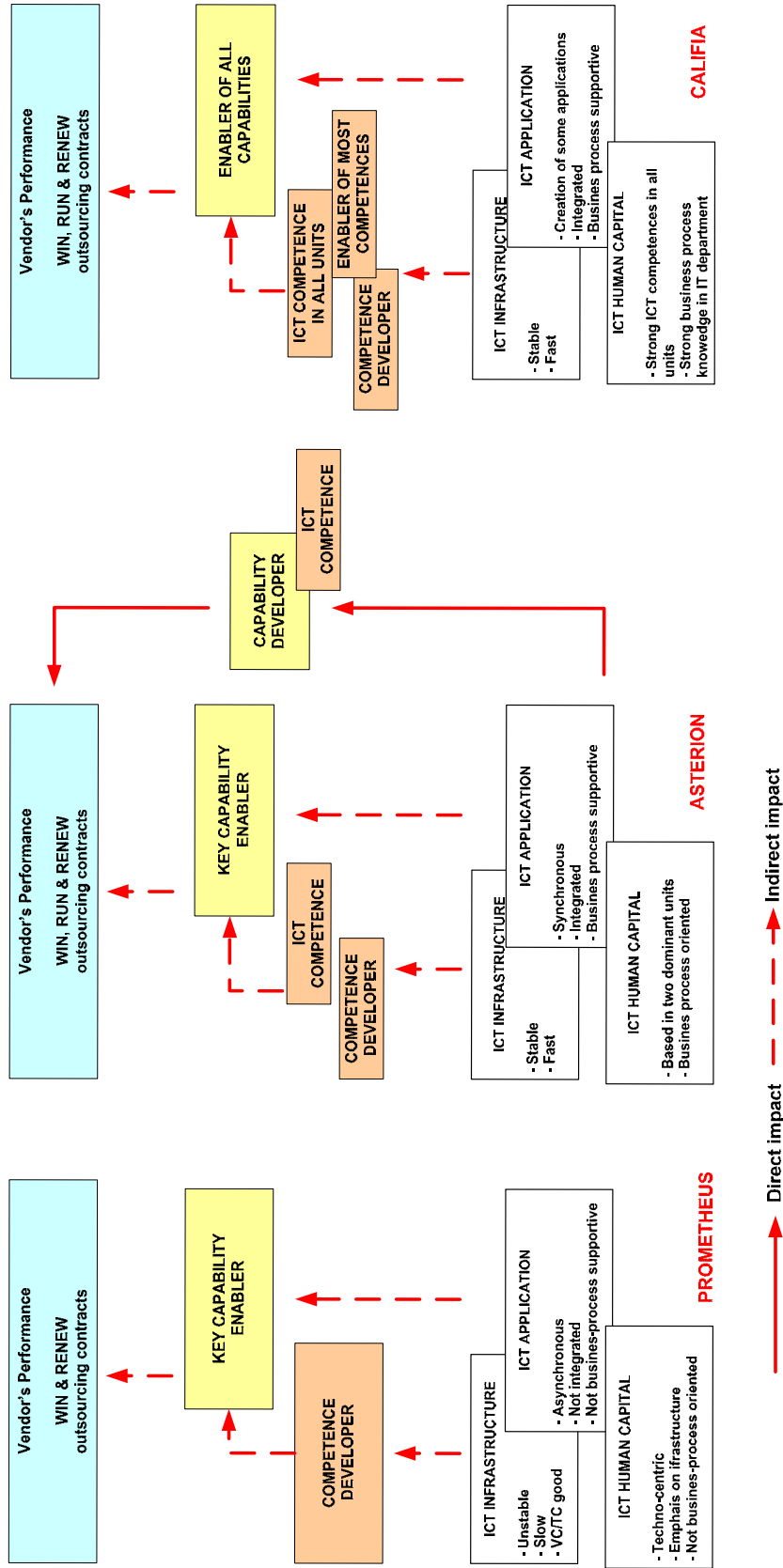


Figure 6.1 - ICT in cases



An indirect impact of ICT on the performance can occur when ICT enables one or several capabilities. In principle, ICT can enable a capability directly, or help develop a competence that has strong influences on the particular capability. For example, Quote Win application in PROMETHEUS acted as a competence developer of analytical skills which improved the cost management capability. However, Quote Win also had a direct impact on reducing the component costs. Further on, the application of LabVIEW in ASTERION impacted the development of quality tracking competences in manufacturing which further led towards improving speed. ASTERION's flexibility too was impacted by LabVIEW and also by a well organised and integrated corporate ICT system. The same thing happened with CALIFIA where the in-house tailored application for tracking quality developed CALIFIA's quality tracking competences in manufacturing, which further led to improving several capabilities. That application, together with the BOM Upload system had also enabled many of CALIFIA's capabilities like quality, on-time delivery, responsiveness, and handling the NPI and prototyping. The ICT as competence role in the indirect impact scenario is more of a "scaling" nature. The EMS provider can have ICT competences in certain units or phases, but that is not a prerequisite for the fulfilment of this type of ICT impact on the performance. However, the more ICT competences are present in more units, the wider and more versatile the impact of ICT on the performance that can be expected.

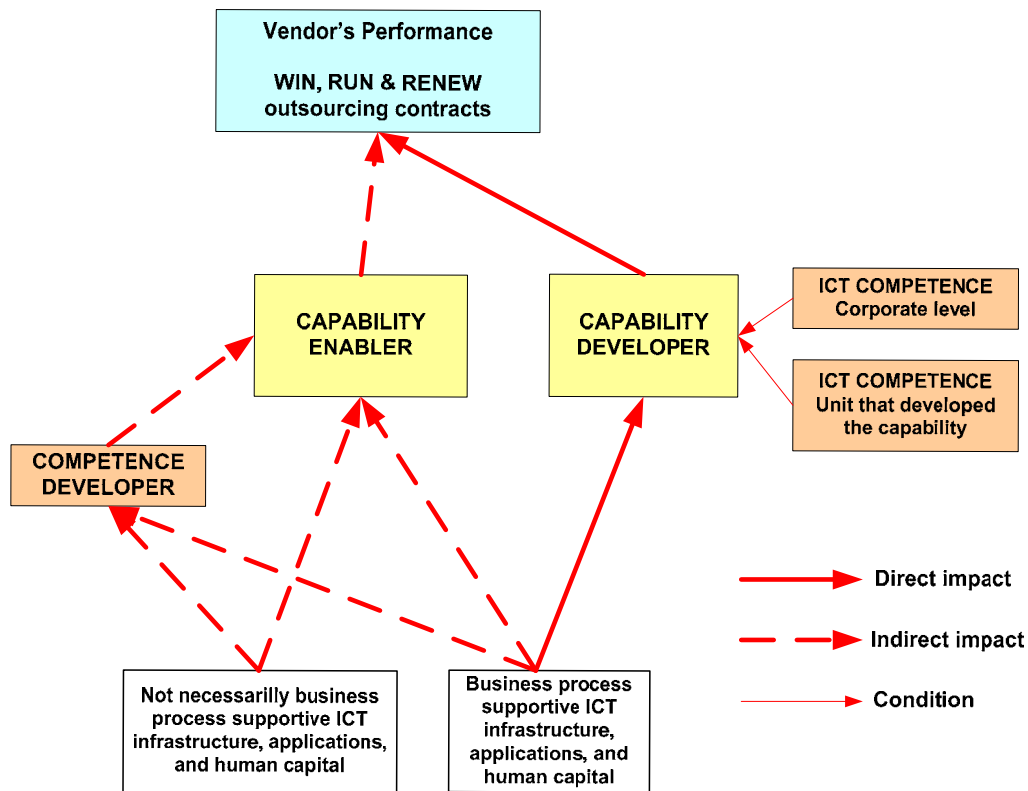


Figure 6.2 - Vendor's ICT in outsourcing

The model proposes that in the case of indirect impact the ICT infrastructure, applications, and human capital do not need to be business process supportive. However, direct impact can take place only when the three ICT elements (infrastructure, applications, human capital) fully support the business process. The creation-application dimension of technology (Steele, 1989) does not have any influence on the roles of ICT.

There are several characteristics of the conceptual model given in Figure 6.2 that distinguish its position on the landscape of the utilisation of ICT in outsourcing and in business practices in general. They are:

- The impact of ICT on performance should be observed through the mediating effect of competences and capabilities
- ICT capability should be perceived as suggested by Hatten and Rosenthal (1999)
- For the most effective impact of ICT on the vendor's performance, the collaboration between the ICT department and the rest of the organisation should be established in all units and across the process, not only on the corporate level as suggested by the literature
- The model emphasises the HOW dimension of ICT utilisation arguing that it is more important how firms use ICT and what they choose to use, instead of who invests more in ICT and chooses to use certain applications.

Haeckel and Nolan (1993) and Ross et al. (1996) argued that more investments in ICT would lead towards competitive advantage and supreme financial performance. Indeed, Bharadwaj (2000) found that firms with higher ICT capability will outperform (cost based) the firms with lower ICT capabilities. However, the work of Huang et al. (2006) showed that investments in ICT will improve the infrastructure, but not the performance. The ICT infrastructure is becoming increasingly important (Robertson and Sribar, 2002) but ICT impact on the performance more likely depends on the ways of how vendors utilise ICT. Therefore we propose that the impact of ICT on the performance should be observed in the light of the mediating effect of competences and capabilities.

ICT capability in our model is perceived in the light of the resource-based view approach which was suggested by Hatten and Rosenthal (1999). In contradiction to the dominating view in the management information systems (MIS) literature (Ross et al., 1996; Bharadwaj, 2000; Huang et al., 2006) we perceive the ICT infrastructure, applications and human capital as the organisation's resource which can impact competences and capabilities, or act itself as a competence or capability. ICT capability in our view is when ICT has been recognised as one of the reasons for winning, successfully running or renewing outsourcing contracts. However, among the three cases we couldn't find the role of ICT as a capability. This supports the thesis of Davis et al. (2003) that competitive advantage due to an IT-enabled strategy is discernable by market participants, and is apparent as a competitive advantage obtained through other means.

The direct impact of ICT on the performance, like in the case of ASTERION, and the widest impact of ICT on competences and capabilities, like in the case of CALIFIA, is possible only when ICT human capital has strong knowledge about the EMS processes and when there are strong ICT competences on the corporate level and across the organisational units. Our findings show that there must be a strong collaboration between the ICT department and the business departments, which is still not the case in the majority of organisations. This is in line with recent calls for ICT and corporate managers to join the strengths in utilising the ICT in benefiting their organisations (Hong and Kim 2002; Rettig, 2007; Shpilberg et al., 2007).

Still, we need to keep in mind that the vendor whose level of the three ICT elements was the lowest among the cases, outperformed the other two companies financially. This can lead to the argument raised by Porter (2001) that ICT is a supplement to the strategy. There have been many illustrations of the potential ICT's utilisation in value chains (Porter, 2001), organisations in general (Bouwman et al., 2005), e-business (Cagliano et al., 2003), and

supply chain management (Guimenez and Lourenco, 2005). However, in the end, it turns out not to be important who invests more or who chooses to use a certain application; it is more important how firms use ICT and what they choose to use. Our findings support this argumentation. For example, the three companies use ERP systems in different ways. PROMETHEUS is in the process of integrating two different ERP systems, but still keeps it not business process supportive and other applications are not integrated in it. CALIFIA has an exceptional ERP system that supports the business process and acts as a real ICT backbone, being used by all organisational units. CALIFIA has implemented the ERP system that does not completely support the business process. Therefore the ICT department, with the help from the departments with strong ICT competences, has created applications that fill in the gaps left by the ERP. In addition, both PROMETHEUS and ASTERION are using LabView programming language, but it is only ASTERION that gets ICT as a competence developer and capability enabler out of its utilisation. Finally, PROMETHEUS have had great success with the QuoteWin application whose utilisation developed the Analytical skills competence and enabled the Cost management capability. In contrast to that CALIFIA have declined to use the QuoteWin since it doesn't create value in their purchasing strategy because the two most important component suppliers are sitting in-house, just next to the purchasing executives. The how element in ICT utilisation stresses that the organisations should decide which technology to use for supporting their operations and strategy. This view is given in the critical theory of technology (Feenberg, 2002) where the author argues that we are supposed to have the freedom of choice of technology and that the real issue is not technology or progress *per se* but the variety of possible technologies and paths of progress among which we must choose.

A significant part of the dissertation contains the analysis of competences and capabilities of EMS providers. Hence, in the following text we discuss some the findings that came out of that analysis.

Each stage of the outsourcing (contract manufacturing in this case) service provision process (win, run, and renew) requires a different portfolio of capabilities. All three cases showed that we can distinguish between the winning, running, and renewing capabilities. If we draw a parallel between those capabilities with the groups of capabilities suggested by Hatten and Rosenthal (1999), we may suppose that the winning and renewing capabilities correspond to the competitive capabilities, while the running capabilities correspond to the market capabilities. The dynamics of the capabilities across the outsourcing process can take different patterns. In the case of PROMETHEUS the renewing capabilities are the sum of the winning and running capabilities. In ASTERION some of the capabilities that play an important role in winning the contracts diminished in importance during the running phase, while three of them excelled and became the most important capabilities necessary for winning, running and renewing the outsourcing contracts. In the case of CALIFIA most of the capabilities played an equal role in each of the stages of the vendor's process in outsourcing. Let us remember that the research framework was built on the premises of the resource based view. The resource based view alleges that a firm's competitive advantage can be achieved if the firm is in possession of the resources, which are valuable, rare, inimitable and non-substitutable (Barney, 1991). However, none of the case companies have their resources, including the competences and capabilities, associated with one of those parameters. This is not only due to the fact that none of the resources could be exactly associated with one of the four parameters, but also due to the classical resource based view's lack of a dynamic component. The dynamic capability approach offers a better explanation of how the vendor's resources,

competences and capabilities move over time constantly under the influence of the managerial and organisational process (Teece et al., 1997).

We call the capabilities that are necessary in each of the stages the dominant capabilities. In contrast to Hunt and Jones (1998), who argued that there are three core capabilities (cost, quality, delivery) supported by subsidiary capabilities necessary for winning the CEM, we propose that there are dominant capabilities, which are not exclusively the cost, quality, and delivery, which have to be constantly present in EMS provider, and that some other capabilities may be emphasised for winning, running, and renewing outsourcing contracts. This is due to the cyclic nature of the vendor's process in outsourcing, and due to the fact that there are two types of customers: new and the existing.

Regarding the competences, not all of them contribute equally to various sets of capabilities. One might argue that an organisation should cut unnecessary competences loose, but they are still necessary for running the business. Without them, the competences that significantly contribute to the capabilities wouldn't be efficient. The core function is not always the most visible function. Competences with the greatest impact on the capabilities are actually embedded within several functions, either on the very corporate level or actually in the EMS process. Therefore, when looking for competences, one has to go beyond functions, as proposed by Hatten and Rosenthal (1999); we must look into processes and on the corporate level.



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**CHAPTER VII**

**CONCLUSION**

## CHAPTER 7

### CONCLUSION

We studied the utilisation of ICT in the outsourcing process through the lenses of a vendor company. The chosen industry was electronic manufacturing service provision, wherein we focused on contract electronic manufacturers.

The central question of vendors' utilisation of ICT across the outsourcing process was explored through the prism of the resource-based view. Since the vendor's competences and capabilities are proven to be important in winning, running and renewing outsourcing contracts, we looked into how ICT impacts competences and capabilities and whether such impact has had further direct or indirect impact on the vendor's performance (measured by win, run, and renew criteria). We explored the impact in the context of the application-creation dimension of technology (Steele, 1989).

Knowing that qualitative research is useful for the research that delves in depth into complexities and processes and has the purpose of investigating little-understood phenomena, identifying or discovering important categories of meaning, and generating hypotheses for further research (Marshall and Rossman, 1999), we embarked on the qualitative research as an adequate method of inquiry. We studied three case companies: one that has been creating some of their ICT applications, and two that are only applying existing ICT applications, where one of those companies has business supportive ICT resources, while the other company's ICT resources are not business process supportive.

The contributions of the dissertation to the existing knowledge can be divided into three groups:

- We developed the “topography of outsourcing”, a model for a deep understanding of the outsourcing phenomenon where special attention is given to the development of the outsourcing process frameworks, both from the outsourcer's and the vendor's perspectives
- We proposed that each of the stages in the vendor's process of outsourcing (win, run, and renew) requires a different portfolio of capabilities
- We developed a model of how ICT impacts the performance through the mediating effect of competences and capabilities

As we have seen, outsourcing shouldn't be considered a simple business practice. Instead, it can be a very complex phenomenon which requires careful consideration throughout its lifecycle. Through the exploration of the outsourcing phenomenon we developed the “topography” of outsourcing which argues that the outsourcing phenomenon consists of six elements (enablers, types, outcomes, process, theories, and the vendor's perspective). Understanding each of the elements and their possible combinations is the only way to understand the outsourcing phenomenon. The emphasis was put on two elements, the outsourcing process and the vendor's perspective in outsourcing.

The second stream of findings is related to the competences and capabilities which were explored through the competences-capabilities-performance triad. We found that each stage of the outsourcing service provision process (win, run, and renew) requires a different portfolio

of capabilities. The findings also suggest that the concept of core function is obsolete and that competences with the greatest impact on capabilities are actually embedded within several functions, or even on the corporate level, or, finally, in the EMS process itself.

Finally, the third group of findings relates to the research framework and ICT's impact on the competences-capabilities-performance triad. We found that ICT can have six roles (capability developer, capability enabler, ICT as a capability, competence developer, competence enabler, and ICT as a competence) when impacting the triad. The direct impact of ICT on the vendor's performance in the EMS industry is when ICT is a capability developer, under the condition that there are strong ICT competences on the corporate level and in the unit that has created the particular capability. Indirect impact of ICT on the performance can be executed when ICT is a capability enabler. ICT can enable a capability directly, or as a developer of the competence that has strong influences on the particular capability. The EMS provider can have ICT competences in certain units or phases, but that is not a prerequisite for the fulfilment of the indirect type of ICT impact on the performance. However, the more ICT competences are present, and in more units, the wider and more versatile the impact of ICT on the performance that can be expected. The findings suggest that in the case of indirect impact the ICT infrastructure, applications, and human capital do not need to be business process supportive. However, direct impact can take place only when the three ICT elements (infrastructure, applications, and human capital) fully support the business process. The creation-application dimension of technology does not have any influence on the roles of ICT. For the most effective impact of ICT on the vendor's performance, the ICT department must fully understand the business process, and ICT competences should be present on the corporate level and in all organisational units.

The research presented in this dissertation has several limitations. There is always a dispute between the qualitative and quantitative methods for the data acquisition and analysis. We think that the qualitative approach helped in the exploration of ICT utilisation, especially in identifying the categories of ICT impact on the competences-capabilities-performance triad. However, a quantitative study would help in verifying these categories, which would increase the validity of the model. Another limitation is that we didn't relate ICT utilisation with the financial data where we could have seen the relationship of the purchase and start of the application of ICT solutions with the financial performance, or the number of contracts won and renewed. Finally, we couldn't have direct access to the vendor's customers (apart from one case company), who would have provided us with a more reliable list of the vendor's capabilities.

The limitations suggest that there is still some work to be done to improve the validity of the proposed model. One of the primary tasks would be to conduct a large scale quantitative research which would embrace the proposed roles of ICT and relate them to the financial performance of the vendor, or to the number of contracts won and renewed in a given period of time. In addition, a longitudinal study would also be useful for capturing the dynamics of ICT influence on the triad, especially in the case when ICT solutions have been created in the company. Finally, we presume that the applicability of the proposed model is not limited to the vendors and the EMS industry and that it can be applied in all types of companies and industries for the evaluation of ICT contribution to the achievement of business goals. However, further work is required to validate that assumption.





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**CHAPTER VIII**

**REFERENCES**

## CHAPTER 8

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**Utilisation of ICT across the Outsourcing Process  
- The Vendor's Perspective -**

**APPENDICES**

## INTERVIEW GUIDE

Talk to

- Top management
- Sales people
- Key Account Managers
- Functional managers
- Management responsible for the activities within the phases
- Project managers

### PHASE 1

#### Section A – Vendor’s process in outsourcing

Task

- Establish the chain of events and draw the sequence of the phases of the vendor’s process and the relationships among the phases
- Identify which phases are the most critical to the success of outsourcing (ask for the interviewees’ opinions).

#### Section B – Competences and Capabilities, Positions and Paths

**Remark to ZP:** Competences should be embedded within functions, while capabilities should be embedded within the process.

Task

- Identify competences (See appendix [COMPETENCES QUESTIONNAIRE](#))
  - Skills and tacit knowledge
  - Technology and explicit knowledge
  - Assets and endowments
  - Collective values and norms
  - Primary and management processes
- Identify capabilities
  - Send an open questionnaire to the selected vendor’s customers asking the following questions:
    1. List three most important of your needs that are being satisfied by VENDOR
    2. List three most important activities that VENDOR is good at
    3. List three reasons for choosing VENDOR among other companies
    4. List three reasons for renewing the contract with VENDOR
  - Call those customers for further clarification where identified capabilities are:

- Identical or similar with identified competences
  - Stemming from the critical phases of the process
  - Related to VENDOR'S ICT
- Ask in VENDOR why did you win the contract and why did you renew the contract
  
- Describe Positions and Paths - Context (document review + interview)
  - Paths
    - Describe historical development of company and of the competences and capabilities identified in previous sections
  - Assets (identify if there are any unique external and internal positions that VENDOR has)
    - Technological
    - Financial
    - Market
    - Institutional
    - Reputational

## PHASE 2

### Section ICT

- Analyze general characteristics of the ICT (document review + interview)
  - Describe elements of the ICT system
- Relationship between ICT and competences
  - Identify how is ICT supporting competences and organizational functions
- Relationship between ICT and phases of the process
  - Identify how ICT supports activities within certain phases of the process
- Relationship between ICT and capabilities
  - Identify ICT's role in supporting capabilities identified by clients, or by VENDOR (embedded within processes)
- Relationship between ICT and winning and renewing outsourcing contracts
  - Did ICT had any direct role in winning and renewing outsourcing contract (compare with the questionnaire sent to clients)
- Relationship between ICT and paths
  - How was ICT developing together with company
- Relationship between ICT and other assets

## COMPETENCES QUESTIONNAIRE

### Skills and tacit knowledge - Know how

What are the unique skills that you have in your organization? What are you good at?  
What are the unique areas of knowledge and skills in your market?  
What value does the client get from these?

### Technology and explicit knowledge – Patents – Manuals - Procedures

What systems and technologies does your company have which allows it to supply its products and services?  
Which of these technologies is critical to getting new or keeping existing client?  
What handbooks and procedures are used within your company?

### Assets and endowments - Installed base of customers - Brand and image - Network of suppliers - Network of talent - Ownership of standards

What are the unique intangible assets of your company (assets that most of your competitors don't have)? Think about things you have inherited from the past which have made the company it is.  
What value do these have in the eyes of your customers?  
How important are they to the success of the company?

### Collective values and norms - Client focus – Reliability - Quality, etc

What are the core values shared throughout your company?  
What norms are derived from these? (How do you measure value?)  
How much of this is noticed by the customer?  
How would you describe the style of management?  
What does management consider its prime objective?

### Primary and management processes - Leadership and control – Communication - Management information

#### Note: Take from Section A – Process

Which primary processes are essential?  
Which management processes (are crucial for the company? (planning, control processes, etc.)

## QUESTIONS TO THE CUSTOMER

Herby I am enclosing the list of question for your preparation

1. Please list three most important of your needs that are being satisfied by VENDOR.
2. Please list three most important activities that VENDOR is good at
3. Please list three reasons for choosing VENDOR among other companies
4. Please list three reasons for having new project with VENDOR

Potential supplier's capabilities that your may identify are following, but not limited to:

Technical competence

Understanding the customer's business

Relationship management

Delivery

Transformation

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Domain expertise

Business management

Behaviour management

Sourcing

Technology exploitation,

Process re-engineering,

Customer development,

Planning and contracting,

Organizational design,

Governance

Programme management