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# Case study of Danfoss IT supporting the business units competing in dancing, rugged landscapes

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**Due date:** 2012-01-09

**Institution:** Aalborg University, Denmark

**Line:** Master's in IT Organization

**Study:** Master Project

**Volume:** 126.357 characters (incl. spaces)  
(excl. cover page, table of contents, abstract, illustrations, appendixes, and list of references)

**Confidentiality:** This project is not confidential

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## Abstract

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This project examines the Complexity Science concept of dancing, rugged landscapes as descriptive for modern competitive markets and analyzes how 3 new IS Strategy quests suggested by Venkatraman et al (Venkatraman et al, 2010) in such complex adaptive business systems are expected to be fulfilled in the case study of Danfoss A/S from its recently developed new strategies for both business and IT. It also analyzes how these strategies for Danfoss may be improved by the 7 Guidelines by El Sawy and Pavlou (El Sawy and Pavlou, 2008) and how they will have impact on the Core IS Capabilities (Feeny & Willcocks, 1998) for Danfoss IT, the central IT unit of Danfoss A/S.

My findings were that the IT strategy and IT Perspective goals supported the 3 new IS Strategy quests and were expected to achieve medium to high fulfillment of the quests through 13 IT goals requiring Danfoss IT to develop knowledge, skills, and competences in 17 areas. These goals could be improved by following 5 of the 7 Guidelines, which required development of 5 more areas. The total of 22 areas of knowledge, skills, and competences will have an impact on 6 of the 9 Core IS Capabilities, but will only change the level of business-, technical-, and interpersonal skills required for 2 of the 9 Core IS Capabilities.

## Introduction

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During my master's studies in IT-Strategy we have looked at strategic alignment between the business units and the IT unit as one of the main goals to achieve superior performance using information technology. We also looked at how competitive business advantage could be achieved by exploiting synergies through integration with customers, suppliers and partners.

In the studies of IT-Organization we looked at the role of IT and the use of IT for local improvement and automation, for business process redesign or re-engineering, to help seize and capitalize on emerging opportunities, and as a tool for enabling business transformation. All these efforts could provide higher productivity and better differentiation for the business units.

But at the end of 2010 a research paper by Tanriverdi, Rai, and Venkatraman (Venkatraman et al, 2010) suggests a paradigm shift on how the IT units should help organizations by moving from alignment to supporting the firms co-evolution with the competitive landscape, from integration to supporting dynamic re-configuration, and from sustained competitive advantage to supporting renewal and organizational learning. They argue, that if the market, a firm competes in, becomes a "dancing, rugged, landscape", there is a need for more dynamic and agile capabilities in the IT unit to allow the firm to seize opportunities quickly and to abandon old positions and partnerships

when needed. Therefore, in this situation, the three classic quests in IS strategy research (alignment, integration, and sustained competitive advantage) becomes irrelevant and may even be hurting the business' capabilities.

This has raised my interest into what competences and skills the internal IT unit should develop to have the capabilities to better meet the needs of the business, when it competes in a dancing, rugged landscape.

### **Purpose of this project**

My interest in writing this project has two parts. Firstly, I have seen and participated in several IT projects, where the IT unit at Danfoss A/S has failed to be adequately agile and dynamic in its capabilities to meet the needs of the business. Secondly, the new paradigm suggested by Tanriverdi, Rai, and Venkatraman could explain why this may be so for Danfoss IT. Therefore, I see this project as both a practical problem to be addressed for the benefit of Danfoss IT, but also of academic interest, as it will test the new paradigm on a case study and explore what changes this will mean for the IS capabilities in the case.

The purpose of this project is therefore to analyze and discuss what knowledge, skills, and competences the internal IT Unit at Danfoss should also master in its Core IS Capabilities, if the business is competing in a dancing, rugged landscape, as well as discuss what this could mean for practice and implementation. My theoretical lenses will first be the 7 Guidelines for overcoming turbulent environmental hurdles (El Sawy & Pavlou, 2008) to see how the 3 new quests can be supported better by the IT unit. Second, it will be the Core IS Capability framework (Feeny & Willcocks, 1998) to see how these 9 Core IS Capabilities will be influenced by absorbing new knowledge, skills, and competences for supporting the 3 new quests.

I choose Feeny and Willcocks, as they are well established in the research literature and since their framework looks at important Core IS Capabilities, which should never be outsourced but always kept in-house. El Sawy and Pavlou are chosen, because their 7 Guidelines build on what they call "The Business Capabilities Trifecta", which is very similar to the 3 new quests proposed in the article by Tanriverdi, Rai, and Venkatraman. They have therefore partly answered the research questions proposed by Tanriverdi, Rai, and Venkatraman. Furthermore, Venkatraman et al's article has used El Sawy and Pavlou's article as a reference and inspiration. Also, their guidelines are the best and primary source I was able to find for practical implementation of the 3 new quests, as very few researchers has yet quoted Tanriverdi, Rai, and Venkatraman (see Appendix 1) and it seems that no one has taken up the challenge of providing an answer to their research questions.

My unit of analysis will be the effect of both the new Strategy for IT at Danfoss and the new Danfoss IT Perspective, which I will explore through interviews, analyze through the 3 new IS Strategy quests, enhance with the 7 Guidelines by El Sawy and Pavlou, and synthesize into the Core IS Capabilities using the lens of Feeny and Willcocks.

But before I can start the data collection, analysis, and discussion, I will first describe the problem situation Danfoss is in and show how this situation is relevant for the application of the ideas presented in the article by Tanriverdi, Rai, and Venkatraman. I will also review the Complexity Science that their article draws upon and then review the ideas presented in their article. Finally, I will review the theories of Core IS Capabilities and the 7 Guidelines. This will give me the ability to more precisely formulate my primary research questions afterwards.

## **Methodology**

To analyze, discuss, and draw conclusions to answer the problem chosen above, I will, in the first chapter “Problem Situation”, establish through examples that Danfoss IT has some problems in responding to the needs of the business units. I will also show how Danfoss has these problems in spite of good levels of alignment, integration, and sustained competitive advantage over the years.

In the second chapter “Theory Review” I will first review the Complexity Science, which Tanriverdi, Rai, and Venkatraman build their arguments on in their article. This is done to get a better understanding of the concepts of complexity. Then I will review the article by Tanriverdi, Rai, and Venkatraman, so I can better understand and discuss what requirements the new IS strategy quests they propose will have on the IT unit. Finally, I will review the two theoretical lenses I will use. Therefore, I will review the concepts of the Core IS Capabilities framework (Feeny & Willcocks, 1998) and the 7 Guidelines for turbulent business environments (El Sawy & Pavlou, 2008).

In the third chapter “Reframing the Research Questions” I will now be able show that Danfoss is competing in a complex adaptive business system (CABS). This will verify that the ideas, put forth by the authors in the article, are relevant for the situation, which Danfoss IT finds itself in, as the 3 new quests proposed are only relevant in a dancing, rugged, landscape. To do this, I will draw upon the Science of Economics (Lipsey et al, 1987) and Porter’s Five Forces framework (Porter, 2008). Then I will show how the 7 Guidelines can be linked directly to the 3 new IS strategy quests proposed by Tanriverdi, Rai, and Venkatraman. I will now be able to accurately reframe my primary research questions using terminology and concepts from the theoretical lenses and the article by Tanriverdi, Rai, and Venkatraman.

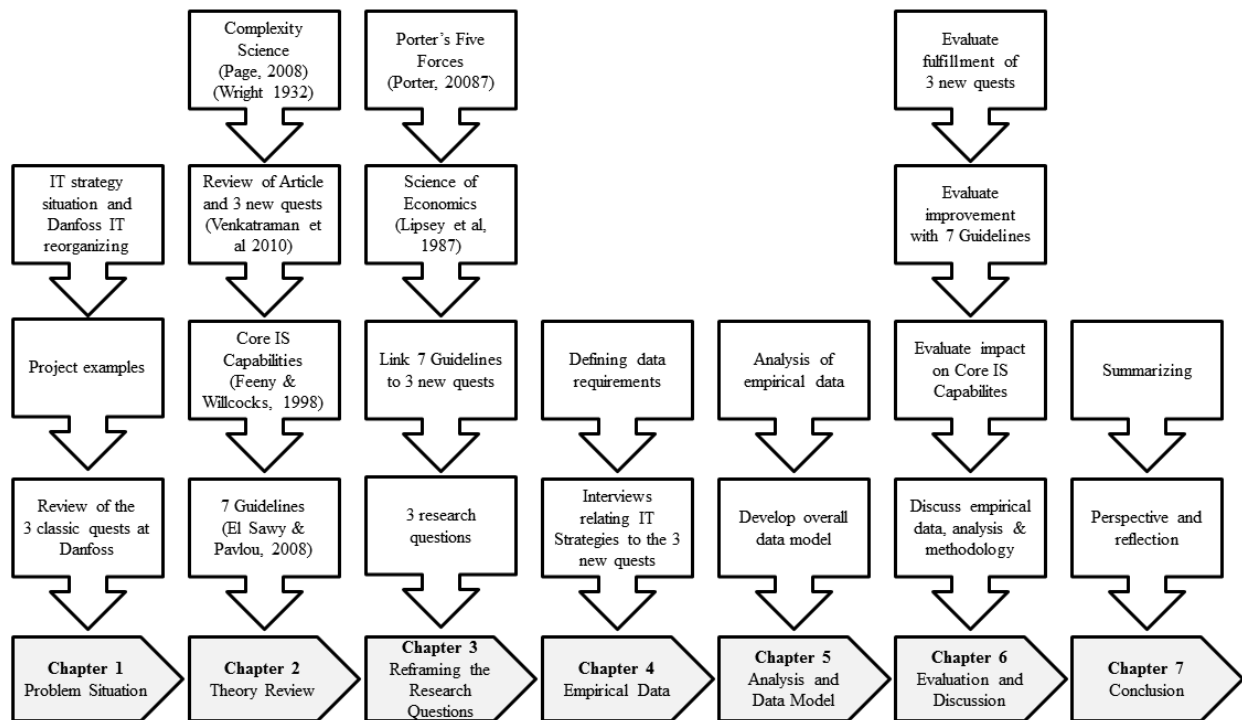
In chapter four “Empirical Data” I will explain how I will collect empirical data at Danfoss for analysis. Since the full description of the “Danfoss Strategy for IT” and the “IT Perspective” at Danfoss is confidential, I must obtain the relevant information about them for this project through interviews to get around this limitation. To conduct these interviews I will have to design the interviews with regards to the theories and the goal of the data collection. I also need to plan how to best collect the data and from whom.

In chapter five “Analysis and Data Model” I will use qualitative methods inspired from Grounded Theory (Corbin & Strauss, 2008) to code, categorize, and synthesize the data into a model, which describes the goals of the IT Strategy and IT Perspective, how they aim to fulfill some or all of the 3 new IS strategy quests, and how they require strengthening of the Core IS Capabilities.

In the sixth chapter “Evaluation and Discussion” I will evaluate the effect of the new IT Strategy and IT Perspective at Danfoss in relation to the 3 new IS Strategy quests and Core IS Capabilities, and how the 7 Guidelines can be utilized. I will now be able to answer the research questions. Finally, I will assess this projects strengths and weaknesses by discussing the quality of the empirical data, the analysis, and the chosen methodology.

In the last chapter “Conclusion” everything is summarized and I will look at the problem from a higher perspective in relation to practice and reflect on writing this project paper.

The research methodology can be seen illustrated in Figure 1 below:



**Figure 1** – Illustration of the research methodology used in this project.

## Scope

This project will focus on the 3 new IS Strategy quests (Venkatraman et al, 2010) and how they impact the Core IS Capabilities (Feeny & Willcocks, 1998) for Danfoss IT.

I will therefore not discuss the differences between and definitions of knowledge, skills, competences, and capabilities, but assume that capabilities will be the top item of the four; at a higher abstraction level than the other items. For a better discussion on this topic, I recommend either an article by Peppard & Ward<sup>1</sup> or a book chapter by McKeen & Smith<sup>2</sup>.

I will also not discuss advanced methods of interviewing when collecting empirical data, but simply assume a general understanding of the differences between the methods of open-, scripted/structured- and semi-structured interviews as well as qualitative vs. quantitative surveys.

When discussing analysis, I will briefly touch on the subject of Grounded Theory, but will recommend the book in my list of reference (Corbin & Strauss, 2008) for a more comprehensive discussion.

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<sup>1</sup> Peppard, Joe & Ward, John, "Beyond strategic information systems: towards an IS capability", Journal of Strategic Information Systems, Vol. 13, Issue 2, July, pp. 167-194, 2004.

<sup>2</sup> McKeen, James D. & Smith, Heather A. "IT Strategy in Action", Pearson Education, New Jersey (USA), International Edition, Chapter 15, pp. 206-216, 2009.

## **1.0 Problem Situation**

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Because of the economic crisis that started in 2008 Danfoss A/S created a new corporate strategy at the end of 2009, which is called “Core and Clear”. This new strategy can in simple terms be explained as being about sticking to core competences and solutions within Climate and Energy, while being clear and transparent about the value delivered to the customers. Danfoss A/S pursues some of its main growth in emerging markets, which to a high degree are from the BRIC countries (Brazil, Russia, India and China).

### **1.1 New IT strategy and IT Perspective**

During the latter half 2010 and the spring of 2011 a new corporate strategy for IT was developed with the help of consultants from Gartner and MIT Sloan CISR. The purpose of the new IT strategy was to re-align how IT was to be used by the business units to improve performance and competitiveness under the new corporate strategy. Rather than Danfoss IT providing an IT strategy for approval, the process took root in the pain-points and strategic directions of the business units, and should cover all IT initiatives, regardless if they were handled by the central or divisional IT.

Danfoss IT has over the summer of 2011 developed a strategy and plan which is called the ”IT Perspective” for how this unit will pursue and aid the shared IT strategy, the Core and Clear corporate strategy, and the individual Perspectives of the business units. It was clear, that the biggest challenges was in delivery of projects and continued business improvements, while operations was generally seen by the business units as solid, but with a need for continual focus on improvements to reduce the cost to serve. This IT Perspective has been approved in late November 2011 by the executive committee and the finance board, which represents the business units.

### **1.2 Reorganizing Danfoss IT**

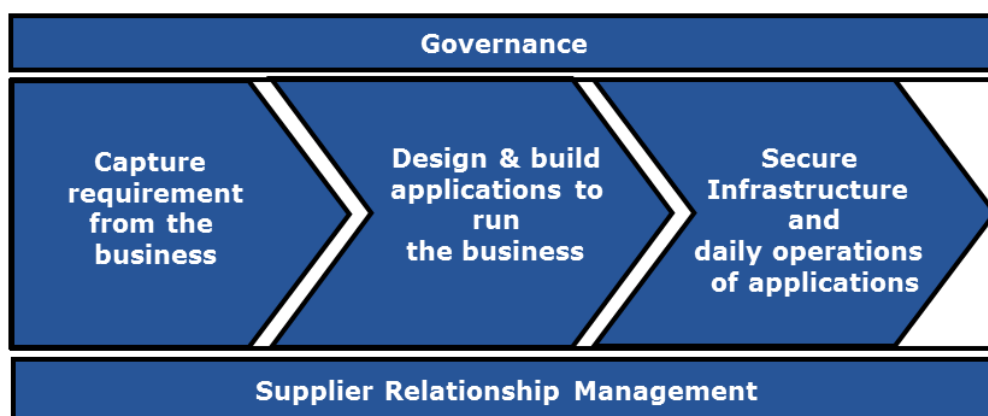
Danfoss IT is the central IT unit of Danfoss A/S with more than 400 employees around the world supporting around 15-17.000 white collar workers and 8-10.000 blue collar workers. Historically, Danfoss IT has been localized and had its main footprint at the Danfoss headquarters in Nordborg, Denmark, but has in the last 10 years reduced staff in Denmark and grown globally, especially by establishing a heavy off-shore presence in China. Up until 2009 Danfoss IT was organized according to technical functions, with 3 main silos – clients and support, business applications and projects, and back-office and infrastructure. During 2005-2007 Danfoss IT implemented ITIL principles to ensure shared support and change processes across the IT organization.



During the economic crisis the senior management team of Danfoss IT chose to reorganize the IT unit in the middle of 2009 into two major parts – “Run” and “Transform” – in order to be more focused on exploiting and exploring individually. This type of organizational setup was also used by other multinational companies, e.g. wind power solution provider Vestas in Denmark by the end of 2009. This seemingly popular organizing trend for IT units has been researched for the past several years by scientist at the MIT Sloan School’s Center for Information Systems Research. Danfoss IT was at that time placed under the Global Service business unit since 2008.

At the end of 2010 the IT unit was moved in under the CFO in the Corporate Functions unit, as it was realized by top management that IT played a very important role for Danfoss business units and was essential in realizing the goals of the Core and Clear strategy. With a new CIO in the beginning of 2011 the central IT unit at Danfoss A/S was reorganized again after less than two years into three main areas with three supporting functions. Figure 2 shows the three main areas and one of the supporting functions:

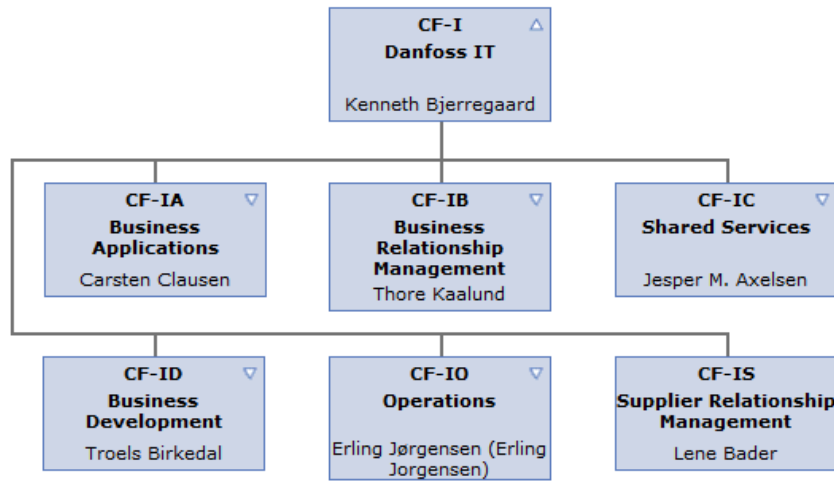
### The New Danfoss IT Operating Model



**Figure 2** – Source: (Danfoss, 2011, slide 12)

The purposes of the 3 main areas are now different from the previous hard separation with more focus on acting somewhat like a value chain, each with its own needs for exploration and exploitation. This need was based on experiences from the hard separation into Run and Transform, where major system upgrades became huge debates about responsibility, as Transform insisted on doing only business innovation and Run insisted on doing only operations and support.

Figure 3 below shows the new organizational sub-units:



**Figure 3** – Source: Organization chart of Danfoss IT from the Danfoss Intranet (Last accessed 2011-11-01)

The details of the Danfoss IT organization and functional organization areas can be seen in Appendix 2, where the IT Unit is placed under the CFO as part of the Corporate Functions (CF) business unit.

The Business Relationship Management (CF-IB) area is responsible for project portfolio management and project management execution. It is also responsible for dialogues with business units, as well as the two administrative areas Global Services (GS) and Corporate Functions (CF).

The Business Applications (CF-IA) area is responsible for implementing continuous business improvements to existing business processes and systems. This area mainly covers SAP, Web, and PLM development. This area also acts as subject matter experts for their area, mostly in projects, hard to solve problems, and task forces.

Operations (CF-IO) handle the day to day operation and support of the infrastructure, application support and technical support. This area covers helpdesk, systems monitoring, network and telephony infrastructure, back office, datacenter, and site services with local on-site technicians.

These are the main process areas where Business Relationship Management is the entry for new systems and services, while Business Applications handles modifications to existing systems and processes. Day to day maintenance and service delivery is handled by Operations using ITIL principles. Previously, IT purchasing was part of the old “Run” organization, but is now a new support function Supplier Relationship Management (CF-IS) for the three main areas. Shared Services (CF-IC) is the financial and performance management support function, while Business Development (CF-ID) handles strategy as well as IT Security and Communication.

### 1.3 Issues are persistent over time

First I want to establish, that there actually are some problems for Danfoss IT in responding to the needs of the business. This I will do by using a few project examples as well as looking at problem task forces and the new corporate strategy for IT.

As a former project manager and technical specialist, I have been involved in many projects, where the IT unit had difficulty in delivering what the business wanted, how the business wanted it, or when the business wanted it. Often there were logical and legit reasons to why this happened, but it had none the less an impact on the business units' ability to fully seize opportunities, drive cost efficiency, or utilize new information technology.

From 2003 to 2005 I was involved in a project called Remote Monitoring Network, which eventually lead to a new service offering from Danfoss<sup>3</sup> called "Retail Care™". One of the big hurdles in this project was that the business unit had contracted a small independent developer in Scotland, who used Open Source platforms for servers, web-services, programming, and databases. This was not the same platform as the one being used by Danfoss IT, where Microsoft products were used, which made it impossible to transfer operations and support on these systems from the contracted developer to the internal IT unit within the narrow timeframe sought by the business unit. Now several years later, the concept, that originally looked to be a very promising new market, has to my knowledge never really taken off on a large scale and has been limited to smaller market segments in Germany and USA.

In 2005 I participated with a Danfoss IT account manager and the manager of the network department in meetings with the CFO for Danfoss Universe<sup>4</sup>. The purpose was to provide IT support and manage the IT operations. However, Danfoss IT was not able to provide smaller design solutions that did not conform to the normally used redundancy designs for high availability, which are more costly. Therefore Danfoss IT was rejected for the task, but we were subsequently used as IT consultants to help the new experience park's CFO evaluate the other offerings from external providers of these IT services.

Since 2008 I have been involved as both a project manager and project contributor in a project to bring virtual communication and collaboration to the business units as a cost effective way to have virtual meetings rather than physical meetings, where the cost of transportation and travel time is high. Only recently in mid-2011 has the solution been successfully rolled out to all employees with

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<sup>3</sup> <http://www.danfoss.com/businessareas/refrigerationandairconditioning/industries/retailcare.htm>

<sup>4</sup> <http://www.danfossuniverse.com/>

several delays, scope changes, and delayed benefit, which was not made available when the solution was most needed during the peak of the economic crisis.

During 2010 and 2011 as a problem task force team leader, I have been involved in several problems, which could be considered cleaning up after previous projects, where things went wrong after the project was finished. Sometimes the scope of the project has been exceeded afterwards, so the design of the initial solution has never been re-evaluated to accommodate the new situation. Other times business driven IT projects had not been handled carefully with involvement of the central IT unit, so technical requirements for a new solution cannot be met by the existing infrastructure and platform.

An example of one of these situations is the implementation of an externally hosted solution for reimbursements called Concur. The Global Service division in Danfoss chose to implement this system in an effort to minimize physical paperwork, where accounting staff were needed to scan receipts and invoices. But as the central IT unit had not been involved, it had not been considered that the client computers were not meeting the specifications required by the vendor with poor performance as a result for the users of the system. This was later determined together with poor work processes and training as the root causes of the problem in a task force.

Another recent example was the business unit Refrigeration and Air-condition (RA) who wanted Danfoss IT to ensure 24/7 operations and support for a system, where engineers shared and developed code to be used in Danfoss products. The system is based on some Windows servers with an IBM application installed and a database server. But Danfoss IT is only capable of supporting the servers and their operating systems 24/7, since a duty roster exists. But since no one are experts in the IBM system chosen by the business unit and there are no duty roster for application support in general, it is not possible for Danfoss IT to support the application from IBM on a 24/7 basis – only the underlying operating system and hardware.

All these examples above are, in my opinion, representative of the challenges that Danfoss IT faces in meeting the needs of the business units. Furthermore, the corporate strategy for IT at Danfoss, which was developed during the spring of 2011, showed that the main concerns or pain points for the business units about Danfoss IT were not the delivery of IT operations and support, but meeting the business needs in project delivery, continued business improvements, and building flexibility in cost to serve with more focus on variable costs, which can better follow the growth and decline in the business revenues. Most of the identified pain-points were based on long lead times, failure to deliver on time and on budget, and a lack of getting full value from projects, as they often are just a “one to one” upgrade of the old system and processes without realizing new benefits.

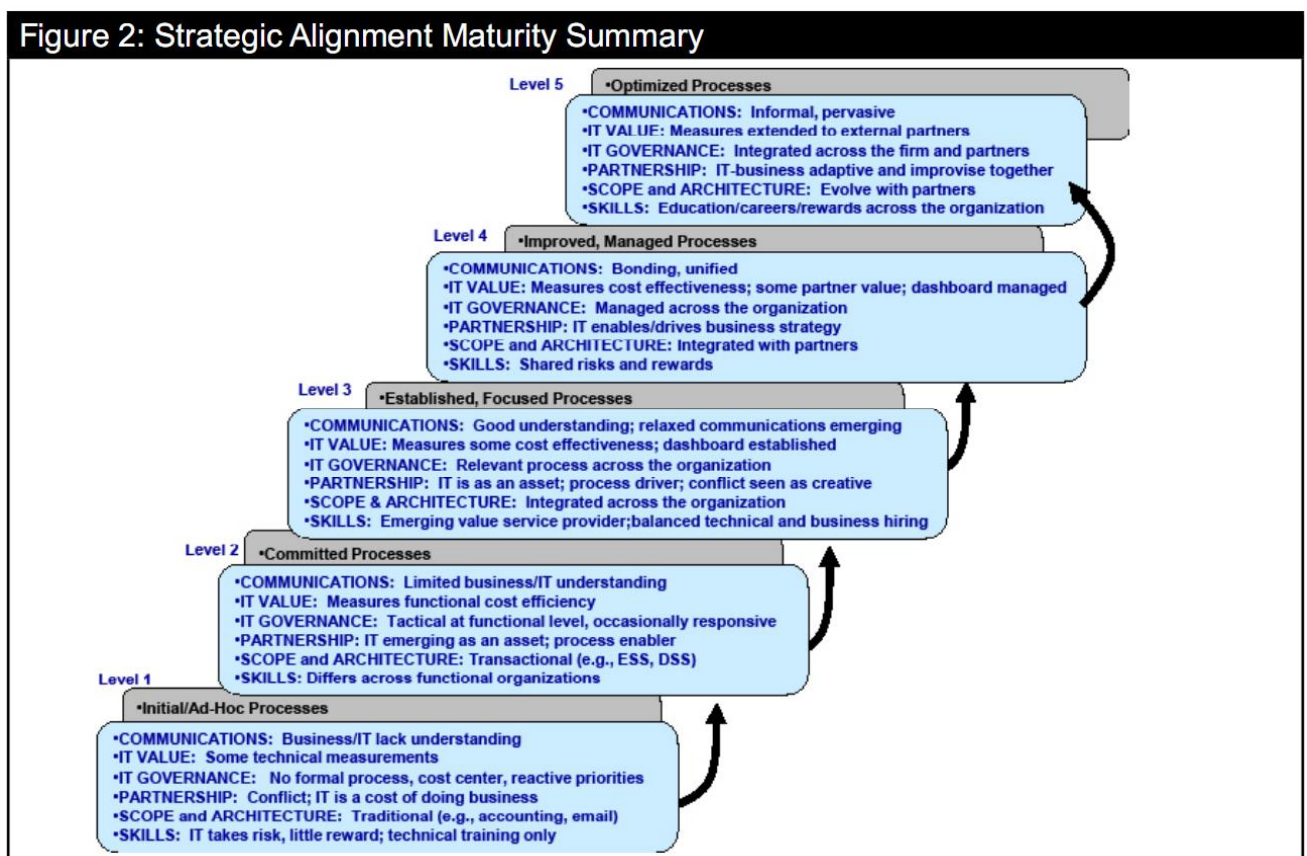
Based on the examples provided and the need for a new corporate strategy for IT, it can be concluded that Danfoss IT generally has some problems in responding effectively to the needs of the business.

## 1.4 The 3 classic IS Strategy quests at Danfoss

In their article (Venkatraman et al, 2010) the authors describe the 3 classic IS Strategy quests and how they are irrelevant in a dancing, rugged landscape. So in the following, I will argue that Danfoss IT has had some problems in responding to the needs of the business in spite of having a relatively high level of alignment, integration, and support of sustained competitive advantage.

### 1.4.1 Strategic alignment

Danfoss IT has for more than 10 years had IT strategies, which have been aligned and approved by the heads of the business units and the executive committee. Sometimes the business changed the competitive strategy and therefore needed the IT unit to align its efforts, while other times the IT unit was given specific goals, e.g. centralizing IT and minimize total cost of ownership in IT.



**Figure 4** – Source: (Luftman, 2007, pp.168, Figure 2)

Using Luftman's five levels of strategic IT alignment maturity (Luftman, 2007, pp. 168), it can be said that Danfoss IT has had a strategic alignment maturity level of 3 since around year 2000 in Figure 4 above, as centralization was begun at that time, account management and Service Level

Agreements (SLAs) were implemented, and IT governance was matured with several boards. One could also argue that Danfoss is getting closer to maturity level 4, as many of the characteristics of this level have started to be fulfilled, e.g. strategic alignment, IT as a value center rather than a cost center, focus applications for enhancing business processes, benchmarking as routine practice, enterprise-wide SLAs, business sponsorship and championing of all IT projects, and integration with strategic partners.

Therefore, I can conclude that Danfoss IT has had a relatively medium to high level of alignment for the past 10 years, yet still have had some problems responding to the needs of the business.

#### **1.4.2 Integration**

At Danfoss there has been a huge implementation of SAP since before 2000, where Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) have been controlled. Later, the SAP system has been expanded to implement Customer Relationship Management (CRM). This huge system as well as other systems, like the one used to handle shipping papers and get them authorized by the Danish department for Toll and Taxation, has been requiring integration with partners, customer and governmental entities.

Therefore an Electronic Data Integration (EDI) function has existed at Danfoss for many years (see department CF-IAI in Appendix 2). Also, in 2007 Danfoss chose to outsource several of its accounting tasks to an external partner Cap Gemini in Poland, which required a complex architecture and infrastructure modifications to allow external employees from Cap Gemini to do their job for Danfoss while keeping the companies separated in accordance to IT security requirements. Furthermore, in the last year Danfoss IT has been partnering with sourcing companies in India to build an Off-Shore Delivery center (OSD) to source scalable resources and competences in a cost efficient way. This will make the IT unit more flexible to the needs of the business, but requires complex integration of infrastructures and system access.

All these new and past initiatives show, that Danfoss has had a high level of integration in many years to achieve process integration, efficiencies, and cost savings. But in spite of this we can still see, that Danfoss IT has had some problems responding to the needs of the business. As highlighted by Tanriverdi, Rai, and Venkatraman, there are enormous costs associated with establishing and close down of several of these integrations. This is not only in project costs, but also in changing or cancelling of contracts and in changing the infrastructure network, servers, and licenses.

### **1.4.3 Sustained Competitive Advantage**

The way Tanriverdi, Rai, and Venkatraman (Venkatraman et al, 2010, pp. 9) defines IT strategy in relation to sustained competitive advantage is internally about managing accumulated knowledge to reuse and exploit in order to stabilize, grow, and defend the firm's advantage. Externally it is about managing and reducing external threats by minimizing uncertainty and engaging in continuous innovation. So from their perspective, the IT strategy is about knowledge management and business intelligence in order to support sustained competitive advantage. In contrast to the authors' argument for renewal in dancing, rugged landscapes, the predictability and stability assumed present in rugged landscapes are the major reasons for the high value of knowledge management, standard operating procedures, and business intelligence in order to sustain competitive advantage.

Danfoss has since 2000 introduced several local and enterprise-wide knowledge management- and business intelligence systems, which have since grown more and more complex, become more advanced, and are being more widely used by workers, planners, and managers. Intranet and Microsoft SharePoint team- and portal sites have exploded in acceptance as tools for sharing information over the more traditional file servers, allowing end users to manage sharing- and access rights to information themselves. Tracking and storing systems for code development, CAD drawings, and technical product documentation have been standard practice for several years. What started as a business warehousing system has since developed into a full blown SAP based business intelligence system with powerful analytical capabilities and reporting features.

So using the perspective on supporting sustained competitive advantage from Venkatraman et al we can see, that Danfoss IT has for the last decade had a high level of support for the business units' sustained competitive advantage, yet still has some problems in meeting the needs of the business.

## 2.0 Theory Review

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Having established that Danfoss IT has some problems responding to the needs of the business in spite of scoring relatively high on the 3 classic IS Strategy quests, I will now review the theories and frameworks I will need to analyze and evaluate the effects from the IT Strategy and IT Perspective.

First I will look at the relevant parts of Complexity Science, which is used in the article by Venkatraman et al. Next, I will review the article by Tanriverdi, Rai, and Venkatraman in order to get a deeper understanding of the article and the demands on the IT unit from the three new quests proposed by the authors. Then I will review the Core IS Capabilities framework by Feeny and Willcocks. Finally, I will review the 7 Guidelines by El Sawy and Pavlou, which I will use to see how Danfoss IT may improve the implementation of the IT strategy and IT Perspective to better fulfill the 3 new IS Strategy quests.

### 2.1 Complexity Science

I need to dig a little deeper than the overview of Complexity Science presented in the article by the authors, as they focused mostly on explaining the dancing, rugged landscape.

#### 2.1.1 Complex Systems

Scott E. Page explains (Page, 2009) that complex systems are characterized by being unpredictable and creating bottom-up emergent phenomena, which can produce novelty but also create large events. Because of the self-organizing in emergence and adaptive behavior from the agents, the complex systems often have a robustness, which allows it to absorb or cope with these large events.

Therefore, complex systems are defined as having and requiring diversity, connectedness, interdependence, and adaptation at moderate but not at extreme levels, since extreme levels would lead to stable equilibriums, chaos, collapses, cycles, or no effects at all (Page, 2009, Lecture 3) as seen in Figure 5. Page explains that these four requirements are related to the agents involved in the complex system.

|              | Diversity       | Connectedness   | Interdependence | Adaptation      |
|--------------|-----------------|-----------------|-----------------|-----------------|
| No/Low       | Nothing happens | Stable/Periodic | Stable          | Nothing happens |
| Moderate     | Complexity      | Complexity      | Complexity      | Complexity      |
| High/Extreme | Chaos/Collapse  | Stable/Periodic | Chaos/Collapse  | Stable          |

**Figure 5** – Effects from different levels of the 4 requirements for complex system, based on (Page, 2009)



By having diversity it means diversity in types of agents and not variation in agents. The agent types must be significantly different to create complexity and thereby interesting results. As an example, if all companies in a market all produce the same products targeted at the same market segment but only have variation in firm-size, we will see limited innovation and therefore no diversity in the products offered. But if some firms were also targeting other market segments, while others had different competitive strategies, e.g. operational excellence vs. customer intimacy vs. product leadership, we will have moderate diversity and therefore complexity.

Connectedness is the amount of other agents a single client is connected to, so low connectedness is when all agents only connects to a few other agents, while full connectedness is when all agents are connected to each other. When agents are connected to several other agents, who again are connected to several other agents, the optimization becomes very complex. Scott E. Page explains that Game Theory focuses on either the best response for a few players or on playing the statistics of the population, while the middle way with moderate level of connectedness in complex systems makes optimization very hard, as every player will play slightly different optimization games because of the differences in whom they are connected to.

Interdependence is about who is impacted by an agents actions. If an agent can do whatever the agent wants without having an effect on any other agent's actions, then there is low interdependence. On the opposite side, we have full interdependence, where every agent's actions are depending on all other agents' actions, which according to Page may lead to chaos, as one agents change will set off a massive change as all other agents also change.

Adaptation is related to amount of learning by the agents, so they can optimize their actions to the environment. With low or no adaptation we will see a stable environment, since there will be no changes in actions, while full adaptation requires everyone to optimize to everyone else's best response. Again we see a stable environment, but this time with what is called a Nash Equilibrium. Only with medium adaptation will the system become complex, where some agents try to optimize their actions and some do not; where some agents react to changes and some do not.

The key difference between a complicated system and a complex system is, according to Page, that the agents involved in the system adapt, so that learning and fast reaction takes place. So systems are complicated because of the interdependencies of our own choices, whereas systems are complex because of the interdependencies between our own actions and the actions of others. It is this adaptation that makes any solution to a complex problem temporary or short term, while solutions to simple systems and complicated systems are long term. This is why the optimal solution in a complex system is said to be moving or dancing.

### 2.1.2 Performance Landscapes

To explain the concept of the dancing, rugged landscape, we need to look at performance landscapes. The concept of performance landscapes was first mentioned in biology research of adaptation and evolution (Wright, 1932), but has been used in many other fields as well. The following builds on how the concept is explained by Page (Page, 2009, Lecture 2).

If we imagine a landscape of a market, then any point or position in the landscape is representative of different strategic solutions. A strategic solution could be a firm's choice to position its product in the market, e.g. with a specific balance between quality and price, as well as a balance between customizability possible and variations offered. This is illustrated in Figure 6:

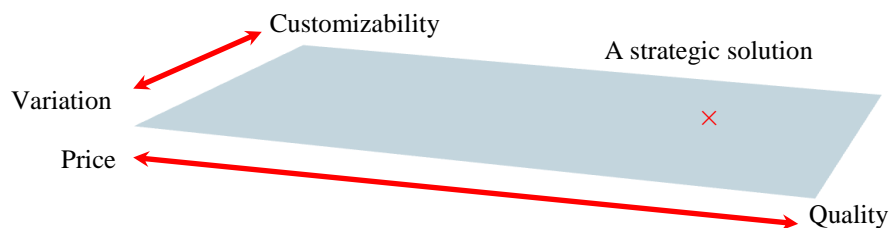


Figure 6 – A performance landscape

We can then consider the elevation of that point as the outcome, performance, or profitability of the point's strategic solution. In the terms of Complexity Science there can be both local and global peaks in the landscape. The peaks are the optimal strategic solutions, as they yield the best or highest outcomes. If possible, the ideal would be to find the global peak, as this is the highest of all the local peaks, but this is not always a possible strategic choice, since there may be barriers to following the ideal strategy. Therefore, agents will often search to find a local peak and improve from there.

### 2.1.3 Simple Landscapes

In a simple landscape, as depicted in Figure 7, there is one clear optimal solution as can be seen marked by the big red circle.

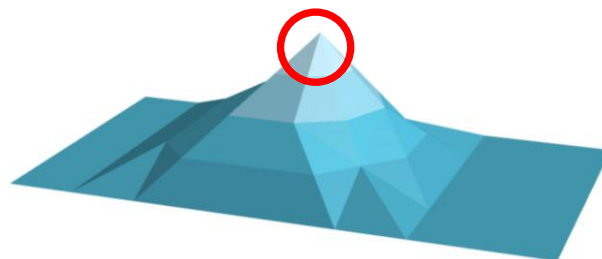


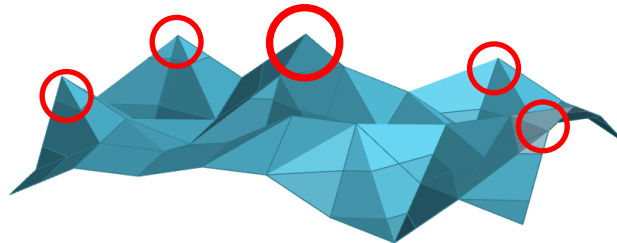
Figure 7 – A simple landscape

This can often be found through trial and error or with the help of mathematics, economic models, or Game Theory. Here we have a situation, where the local peak is also the global peak in the landscape. Even when there is only one optimal solution, it may be hard to find it, but the effort

spent to explore for the ideal or near ideal solution is worth it for the agent before exploitation begins.

#### 2.1.4 Rugged Landscapes

When the system becomes more complicated, we will see a rugged landscape with several peaks and valleys, as can be seen illustrated in Figure 8. Here we have several local peaks as well as the global peak, which are marked in Figure 8 with small red circles and a bigger red circle respectively.

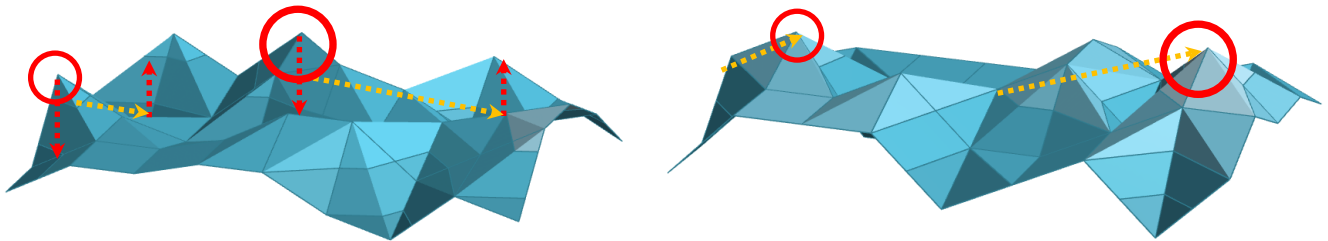


**Figure 8** – A rugged landscape (complicated or difficult)

Again, the use of mathematics, economic models, or game theory can help the agents find the local peaks or even the global peak. It can be difficult to find the global peak, since there can be many dependencies and interactions. But once it has been found, it often takes a long time before the landscape changes, e.g. through industry change. So again it pays off for the agents to put considerable effort into exploration in order to find the better strategies, which will lead to local peaks, before focusing on exploitation. It may not be feasible to wait until the ideal strategy, which leads to the global peak, has been found before exploiting, because of how difficult the solution can be to find. But some effort should continually be put into exploration for the global peak or a better local peak.

#### 2.1.5 Dancing, Rugged Landscapes

When we have a complex system, we still have a rugged landscape, but the landscape is changing frequently. Some valleys become new peaks and old peaks disappear, so the landscape appears to be dancing in often unpredictable ways caused by emergence. In figure 9 below we can see how a local peak has moved and how the global peak has also moved.



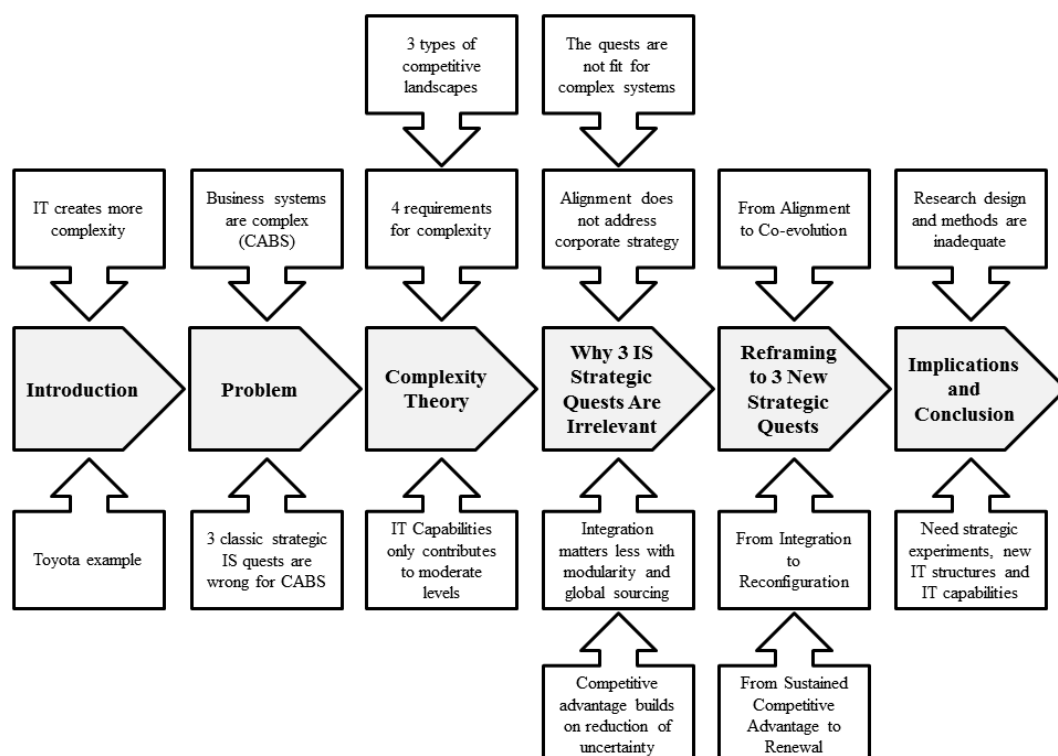
**Figure 9** – A dancing, rugged landscape (complex)

In this situation it is futile to keep looking for the optimal solution, as the landscape will soon change, rendering the solution useless or even harmful. Therefore, local exploration should be quickly followed by exploitation until the landscape changes again, so new exploration is required. There must be either a short cycle or a balance in simultaneously exploring and exploitation. It is clear why adaptation and learning is important to find new local peaks and sensing when old peaks are collapsing.

## 2.2 Article review of Venkatraman et al, 2010

I will now review the article by Tanriverdi, Rai and Venkatraman (Venkatraman et al, 2010). This is done to better understand how their arguments are build and conclusions are drawn. By understanding the impact of these 3 new quests for the business units, I will be better able to understand and, later in this project, to discuss what challenges and demands these will pose for the IT unit.

The flow of the article follows six main steps. This structure can be seen illustrated in Figure 10:



**Figure 10** – Illustration of the flow in the article (Venkatraman et al, 2010).

First there is an introduction followed by a statement of the problem. Then the authors review Complexity Science with the dancing, rugged landscape, which leads to why they think the 3 classic quests in IS Strategy research are faulty or irrelevant in complex adaptive business systems. They then argue how the 3 new strategic quests are more appropriate and encourage further research on these. They finish with the implications for research and practice.

The problem that the authors address is, that business systems are really mostly complex adaptive business systems (CABS), so they argue that the 3 classic quests (alignment, integration, and sustained competitive advantage) in IS Strategy research and practice are irrelevant or may even be limiting for the results of the firms. Therefore, as the resolution, the authors suggests 3 new IS Strategy quests (co-evolution, reconfiguration, and renewal) as the future focus for IS Strategy research and for the firms to pursue with the help from information systems.

The 3 new research questions proposed by the authors asks how the IT unit can enable and support the firm to co-evolve with the complex adaptive business system and therefore requires the capability within the firm to reconfigure and renew. The purpose of the IT Strategy should be to help and support these 3 quests for the firm, so it is neither the IT unit nor the IT Strategy, which should co-evolve with the corporate or competitive strategy.

The authors explain that business systems are complex systems, because they show moderate levels of the four requirements and because IT capabilities also contribute to complexity, but still only keep these requirements at moderate levels. They also explain that alignment and integration are wrong quests in a complex system, as they inhibit adaptation and co-evolution as well as the difficulty in achieving sustained competitive advantage, because of emergence and fast changes.

As the solution, the authors argues why co-evolution, reconfiguration, and renewal is needed for the firm to survive and compete in complex adaptive business systems. They explain that the firm must “[...] match and adapt IT and business capabilities to a rapidly changing external environment” and “[...] also be able to co-evolve with the changing typography”. They also explain how adaptation requires reconfiguration of resources and relationships, when a repositioning decision has been made. Finally, they explain how renewal is required, because “[...] trying to defend the current advantages could inhibit the firm’s co-evolution with CABS” and since “[...] the pursuit of competitive advantages that can be sustained for long periods could be a strategic mistake and a distraction for firms [...]”. Therefore their solution is more likely to solve the problem and better than the previous quests, but they also propose new research by their research questions to validate the solution and to find ways to execute the solution.

In the end of the article the authors first explain how existing research designs and methods are inadequate to research IS Strategy in CABS, as traditional test of a hypothesis makes no sense when the data, relationships, and assumptions change as soon as the data has been collected. So they argue that “Available methods of study are inadequate for *knowing* in CABS” (emphasis added by the authors), so new research designs and the way to study CABS must move towards being more dynamic. They suggest a few techniques and methodologies, that they argue are more relevant for studying CABS.

Then the authors address implications for practice, where they support the simultaneous exploitation and exploration approach with “[...] low-cost strategic experiments to probe into the future, making sense of CABS, and learning about its behaviors”. They also warn that IT capabilities are normally based on static core assumptions and models over long time, but in CABS these may change frequently and “[...] co-evolve with emergent phenomena and changing contexts [...]”. IT structures should not become too deeply embedded to match the environment, but neither should IT structures be without embedding, as structure is needed to coordinate and assemble resources, transactions, and contracts. So they argue that “Complexity Science suggests embedding semi-structures, in which some features are prescribed and determined [...]”. They explain, that these semi-structures will allow co-evolution of the firm with CABS while providing partial order, which will allow the IT capabilities to enable the firm to use exploitation and exploration as best suited for the current situation in CABS; “[...] IT capabilities are needed that increase managerial capacity for making sense of behaviors in CABS and the dancing, rugged, competitive landscape and that enable firms to learn and co-evolve [...]”.

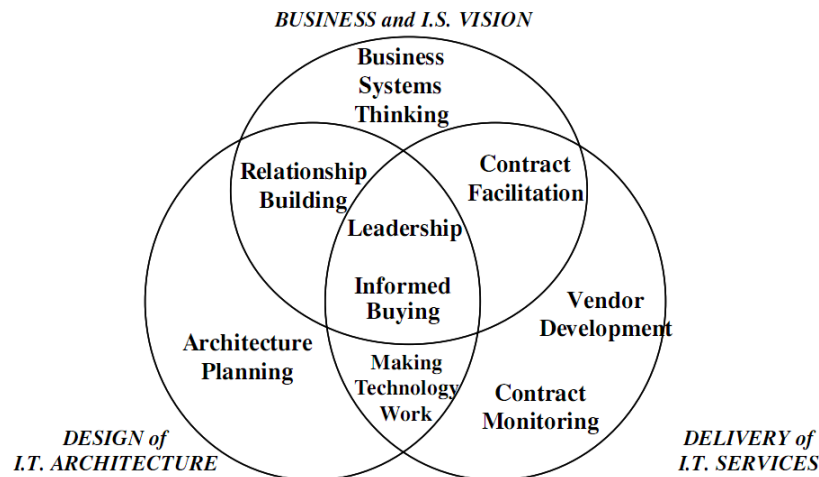
### **2.3 The Core IS Capabilities framework**

Feeny and Willcocks (Feeny & Willcocks, 1998) suggested that 9 core capabilities in information systems must be kept in-house. The article was written at a time, where many companies considered outsourcing parts or all of their IT operations, as it was not considered core to the business, even if it was critical. The logic at the time was that dedicated sourcing partners with wholly dedicated managers could better manage IS/IT activity than the companies themselves.

However, Feeny and Willcocks contested this idea and argued that companies would have “[...] three enduring challenges in the exploitation of IT that a company must successfully address over time”, hence the need for keeping certain Core IS Capabilities in-house.

In their 2006 article, authored with Nancy Olson, they revisited their framework to evaluate its continued relevance and the challenges in practice posed by their framework. They found that their original framework was still valid, but with many lessons learned, especially for implementation.

The 9 Core IS Capabilities are related to the three enduring challenges as seen in Figure 11 below:



**Figure 11** – Source: (Feeny et al, 2006, pp. 29, Figure 1)

The shorthand definitions of the 9 Core IS Capabilities can be seen in Figure 12:

| <b>Core IS Capability:</b>                | <b>Description:</b>  |
|---|--|
| <b>1 IS/IT Governance (Leadership)</b>    | “integrating IT effort with business purpose and activity”   |
| <b>2 Business Systems Thinking</b>        | “ensuring that IT/e-business technologies capabilities are envisioned in every business process”   |
| <b>3 Relationship Building</b>            | “getting the business constructively engaged in IT issues”   |
| <b>4 Designing Technical Architecture</b> | “creating the coherent blueprint for a technical platform which responds to present and future business needs”   |
| <b>5 Making Technology Work</b>           | “rapidly trouble-shoot problems which are being disowned by others across the technical supply chain; and to identify how to address business needs which cannot be properly satisfied by standard technical approaches” |
| <b>6 Informed Buying</b>                  | “analysis of the external market for IT/e-business services; selection of a sourcing strategy to meet business needs and technology issues; leadership of the tendering, contracting, and service management processes”  |
| <b>7 Contract Facilitation</b>            | “ensuring the success of existing contracts for IT services”   |
| <b>8 Contract Monitoring</b>              | “holding suppliers to account against both existing service contracts and the developing performance standards of the services market”   |
| <b>9 Vendor Development</b>               | “identifying the potential added value of IT/e-business service suppliers”   |

**Figure 12** – Source: Adapted from (Feeny et al, 2006, pp. 30)

They explain about the positioning of the 9 Core IS Capabilities in relation to the three enduring challenges (in Figure 11):

*“These spaces are not accidentally arrived at. Three are essentially business, technology or service facing. One is a lynchpin governance position covered by two capabilities [...]. Finally, there are three spaces that represent various interfaces between the three faces. The capabilities that populate these spaces are crucial for facilitating the integration of effort across the ‘faces’”*

*(Feeny et al, 2006, pp. 29-30)*

## 2.4 The 7 Guidelines for turbulent business environments

El Sawy and Pavlou’s article (El Sawy & Pavlov, 2008) presents their research findings of IT-enabled capabilities in turbulent business environments. They find that “[...] there are three types of IT-enabled business capabilities that influence strategic advantage in such turbulent environments [...]”. They explain that “In such environments, enterprises must rapidly innovate, adapt, and reconfigure themselves to match the changing environment [...]”.

Figure 13 below shows these three capabilities, which the authors call the Business Capabilities Trifecta, as these three capabilities together “[...] form a collaborative trio of business capabilities needed to successfully compete in turbulent environments”:

| Figure 1: The Business Capabilities Trifecta |  |
|--|--|
| <b>Operational Capabilities</b>              | The planned ability to effectively execute substantive day-to-day activities, such as manufacturing, logistics, and sales.   |
| <b>Dynamic Capabilities</b>                  | The planned ability to effectively reconfigure existing operational capabilities to match the shift in business environment.   |
| <b>Improvisational Capabilities</b>          | The learned ability to spontaneously reconfigure existing resources in real time to build new operational capabilities that better match novel environmental situations. |

**Figure 13** – Source: (El Sawy & Pavlou, 2008, pp. 140, Figure 1)

El Sawy and Pavlou explain that the Dynamic Capabilities are needed in moderately turbulent environment, while the Improvisational Capabilities are needed in highly turbulent environments. They state that their research does not show the exact tipping point, but they know that “as turbulence increases to very high levels, improvisation capabilities become more influential than dynamic capabilities”. The authors also explain how IT infrastructure capabilities can enable the Business Capabilities Trifecta, since these:

*“[...] are the enterprise’s ability to be aware of what functionalities the IT infrastructure has to offer, to understand when and how to use them, and, when using them, to take advantage of specific IT functionalities and their combinations.”*

*(El Sawy & Pavlou, 2008, pp. 141)*



The authors develop seven guidelines to prepare an enterprise for coping with turbulent environments. They do this by concluding, that IT has recently become part of the integral fabric of the enterprise, emerging reconfigurable IT infrastructures can enhance an enterprise's dynamic and improvisational capabilities, there is a need for simultaneous loose/tight control of infrastructure applications that allows users to quickly reconfigure business variables and data, and there is a need for an IT fusion mindset in both business and in IT staff. These conclusions made it possible for them to develop the 7 Guidelines and related actions steps for how the CIO could address and execute on these. An overview of the 7 Guidelines can be seen in Figure 14 below:

| <b>Hurdle:</b>  | <b>Guideline:</b>   | <b>Action:</b>   |
|---|---|--|
| <b>1 IT Seen Primarily as an Enabler of Operational Capabilities</b>  | "Enterprises should put dynamic and improvisational capabilities in the foreground and relegate operational capabilities to the background."                            | "move away from a mindset where IT is seen primarily as an enabler of operational capabilities"  |
| <b>2 Improvisation Seen as Unacceptable</b>   | "Enterprises should develop improvisational capabilities for highly turbulent environments."  | "assist their enterprises in developing improvisational capabilities for highly turbulent environments"                                |
| <b>3 IT Not Woven Into the Enterprise's Business Fabric</b>   | "Enterprises should consider IT as integral to the business fabric"   | "promote the notion that IT is integral to the business fabric"  |
| <b>4 Limited Availability of IT Infrastructures for Supporting Dynamic and Improvisational Capabilities</b> | "Enterprises need to focus on leveraging the effects of their IT infrastructures on dynamic and improvisational capabilities, rather than on operational capabilities." | "ensure that enterprises can effectively leverage the effects of their IT infrastructures on dynamic and improvisational capabilities" |
| <b>5 Difficulty of Funding Emerging IT Infrastructures for Business Agility</b>                             | "Enterprises should embrace emerging reconfigurable IT infrastructures sooner, rather than later"   | "convince their enterprises of the need to move to reconfigurable IT infrastructures sooner, rather than later"                        |
| <b>6 Resistance to Loose/Tight Coupling</b>   | "The IT department should embed IT processes into the enterprise's business units"  | "convince enterprises of the value of embedding IT processes into business units"  |
| <b>7 The Temptation to Cut Corners</b>  | "Enterprises should implement IT HR policies that foster inner calm and discipline"   | "ensure their enterprises have IT HR policies compatible with turbulent environments"  |

**Figure 14** – Source: Adapted from (El Sawy & Pavlou, 2008, pp. 147-149)

### 3.0 Reframing the Research Questions

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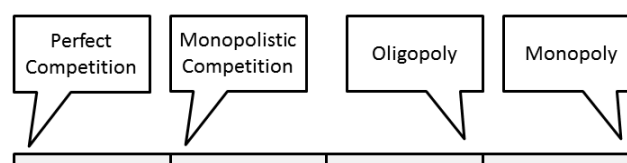
In this chapter I will first establish that Danfoss A/S does compete in dancing, rugged landscapes, which makes the 3 new IS Strategy quests relevant to investigate and pursue in my research questions. Then I will show how the 3 new IS Strategy quests can be linked to the 7 Guidelines and these therefore be considered a possible way to fulfill the 3 new quests until further research has better answered the 3 IS Strategy research questions proposed by Tanriverdi, Rai and Venkatraman in their article. This makes it possible to later evaluate how the path chosen by Danfoss via its strategies might be improved by the 7 Guidelines. Finally, in the end of this chapter, I can use the terminology from the theoretical lenses, from the 3 IS Strategy quests article, and from the Complexity Science to reframe my research questions for this project.

#### 3.1 Determining that Danfoss is competing in dancing, rugged landscapes

Tanriverdi, Rai, and Venkatraman suggest that competitive business systems are indeed complex systems (Venkatraman et al, 2010, pp. 4), but also leave open that not all business systems are complex systems (Venkatraman et al, 2010, pp. 6). Scott E. Page also indicates several times in the first 3 lectures (Page, 2009) that the economic systems, which companies compete in, are complex systems, but also mentions that e.g. a farmers market may not be a complex system.

I can therefore not assume that Danfoss A/S competes in a complex system. So I need to take an analytical look at the competitive markets, which Danfoss competes in, to determine if these can be considered complex business systems. This is a requirement for making the 3 new IS Strategy quests relevant to pursue for Danfoss. To do this, I will use the four requirements of complex systems and see if they, for Danfoss, can be said to be at moderate levels.

The first requirement is moderate diversity among the agents in the system. Drawing from the Science of Economics, e.g. (Lipsey et al, 1987), we know that competition can be defined on a continuum from perfect competition in one end to monopoly at the other end. In between we have monopolistic competition and oligopoly.



**Figure 15** – Source: Adapted from (Lipsey et al, 1987)

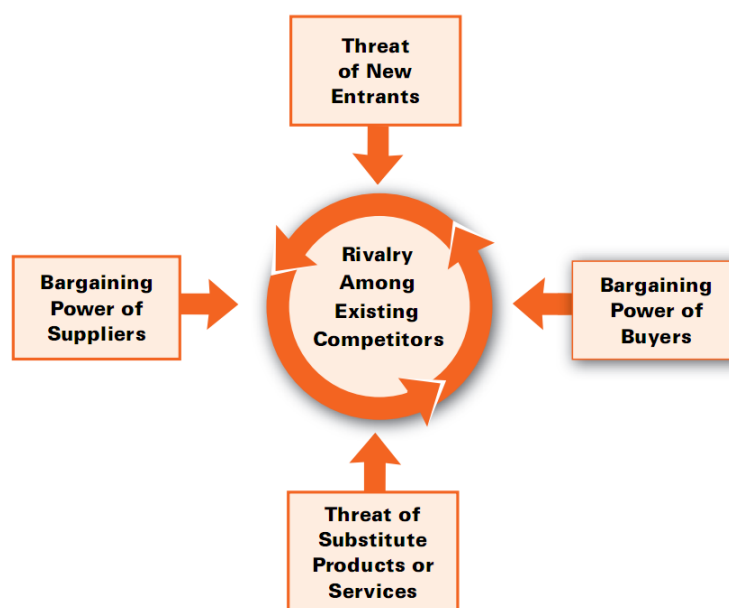
We also know that legislation mostly forbid monopoly and cartels in oligopoly through antitrust policies, as well as perfect competition being rare or nearly impossible, so it can only be said to

almost exist in markets with indistinguishable commodity goods or services. Mostly producers of goods (or providers of services) will seek to avoid the “price taker” situation of commodity in perfect competition and try to differentiate themselves more or less to achieve monopolistic competition, where they will be “price seekers”. Monopoly, when obtained legally, e.g. through patents, will be a “price maker” situation without immediate care for competitors, but such companies still has to consider customer price elasticity and available substitutes, as well as the attractiveness for new competitors to enter the market. Therefore, perfect competition can be said to have too low a level of diversity and monopoly can also be said to have too low a level of diversity, which means these two types of markets are rarely complex systems. Markets with monopolistic competition or oligopoly may on the other hand very well be complex systems. Too high diversity seems impossible to achieve in competition, the consumers or customers will most likely adapt and relevant market segments will emerge.

Danfoss A/S is competing in markets of monopolistic competition or oligopoly, as it is competing in a global market with several competitors. In some markets it can be said to be part of oligopoly competition with only a handful of other major competitors, which is suggested by the current cartel charges against the company, which can be seen in Appendix 3.

The remaining three requirements for a system to be complex are moderate levels of connectedness, interdependence, and adaptation among the agents in the system. Drawing from Michael E. Porter’s Five Forces framework (Porter, 2008) we have a simple generic model of the connectedness, interdependence, and adaptation in a competitive market.

### The Five Forces That Shape Industry Competition



**Figure 16** – Source: (Porter, 2008, pp. 80, Exhibit)

Porter defines 5 areas to be analyzed when developing a competitive strategy – competitors, suppliers, customers, intruders and substitutes, as seen in Figure 16 above.

Using this model to look for connectedness, interdependence, and adaptation, it is clear that Danfoss, as a modern industrial manufacturer of goods with its complicated supply chain, various retailers and many customers, has at least a moderate level of these three requirements internally. If they were too high, Danfoss would never be able to make changes to its choice of suppliers, distributors, or processes, since it would have to be coordinated with every participant in the extended value network. Danfoss is also externally connected to and interdependent with its competitors as well as shared peripheral agents, e.g. suppliers, customers, substitutes, entrants, governments, trade organizations, etc. who can influence the dynamics of the market, as any changes in their actions will influence Danfoss and may require Danfoss to react or adapt. Likewise, the actions of Danfoss may require the competitors and other agents to react, so adaptation also exists. It is also clear (Page, 2009, Lecture 3), that there is not too much connectedness and interdependence, as this would lead to chaos or massive changes all the time. Also, if everyone in the market adapted fully, there would be a stable Nash Equilibrium, where everyone has optimized to the best response of everyone else's best response, which makes changes rare once the market has stabilized. Based on the definition of a complex system with its four requirements, it is clear that most competitive markets are dancing, rugged, competitive landscapes, which was what Venkatraman et al suggested. This is particularly true for monopolistic competition and oligopoly.

Since the Danfoss business units are competing in neither markets that are monopolies nor perfect competitive markets, and because of the moderate level of the connected, interdependent, and adaptive competitive environment in the industrial manufacturer industry, it is reasonable to generally consider these competitive markets as complex systems and also as dancing, rugged landscapes. Therefore the 3 new IS Strategy quests may be relevant to pursue for Danfoss.

### **3.2 A path for improvement, linking the 7 Guidelines to the 3 new IS Strategy quests**

In chapter two I reviewed the 7 Guidelines by El Sawy and Pavlou (El Sawy & Pavlou, 2008). The 3 capabilities for the firm, they describe in their Business Capabilities Trifecta (see Figure 13 on page 23), are closely related to the 3 new IS Strategy quests by Venkatraman et al – we can see a clear link to (or the root of) the 3 new IS Strategy quests.

The Dynamic Capabilities are defined by El Sawy and Pavlou as the planned ability to effectively reconfigure existing Operational Capabilities, while Improvisational Capabilities are defined as the learned ability to spontaneously reconfigure existing resources in real time to build new

Operational Capabilities. Here we see, that the Dynamic Capability matches the Reconfiguration quest suggested by Venkatraman et al. and that the Improvisational Capability matches the Renewal quest.

These two quests are indicated by Venkatraman et al in their proposed research questions to be subordinate to the Co-evolution quest, as they support the firm's dynamic co-evolution with a dancing, rugged landscape. The Co-evolution quest is enabled by the two other quests, while Operational Capabilities seems to be of less concern or out of scope for Venkatraman et al in the context of their research.

We also saw that El Sawy and Pavlou explained the need to go from Dynamic Capabilities to Improvisational Capabilities as the environment becomes more turbulent. This gradual need for change in capability type is not persistent with the 3 new IS Strategy quests, as they are all three needed at the same time to be effective in CABS from the perspective of Venkatraman et al. So we see a significant difference in the concepts from the two groups of authors. However, this difference does not seem to have any effect on how the IT unit should behave to support the business – the 7 Guidelines do not have any gradual implementation.

Having understood how the 7 Guidelines build on a base from the Business Capabilities Trifecta, which is partly also the foundation for the 3 new IS Strategy quests, it will be safe to conclude that the 7 Guidelines are a possible method or path that could be chosen by a firm and which is expected to help fulfill the 3 new IS Strategy quests. This theoretical lens can give me theoretically founded suggestions to improve the path chosen by Danfoss through its IT strategy and IT Perspective, when discussing how Danfoss IT can better support the company, which is competing in a dancing, rugged landscape.

### **3.3 The research questions**

I am now in a position, where I can reframe my primary research questions more accurately using the concepts and terminology from the previous chapters as well as from above in this chapter.

To phrase my research questions, I will look at 3 things.

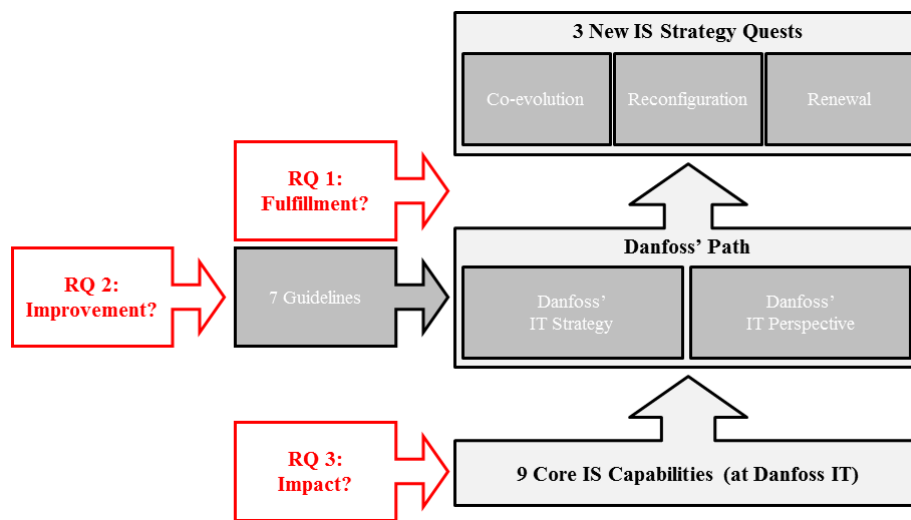
First I will evaluate how well Danfoss' IT strategy and the IT Perspective will lead to fulfillment of the 3 new IS Strategy quests. This I will do by collecting empirical data through interviews and analyzing the interviews. Analyzing the interviews will allow me to create a simple model describing how Danfoss IT has new goals that links to the new IS Strategy quests. Also, the model will allow me to explore which types of knowledge skills, and competences are needed to fulfill these goals and how this will affect the Core IS Capabilities in the different functional areas of the

IT unit. Then I can use the model and the associated challenges Danfoss IT faces to evaluate the effectiveness of the path taken in relation to fulfilling the 3 new IS Strategy quests.

Second, I will evaluate how the 7 Guidelines suggested by El Sawy and Pavlou can be used to improve the path taken by Danfoss IT to better fulfill the 3 new IS Strategy quests and which guidelines are already taken into consideration by Danfoss IT. I will also discuss how they can be implemented in practice at Danfoss.

Finally, I will evaluate what impact the 3 new IS Strategy quests may have on the 9 Core IS Capabilities in Danfoss IT to strengthen them in a dancing, rugged landscape.

Figure 17 below illustrates the way I am going to frame the research question:



**Figure 17** – The research questions illustrated

### 3.3.1 The three primary research questions:

1. How well does the path chosen by Danfoss IT in the IT Strategy and IT Perspective fulfill the 3 new IS Strategy quests proposed by Venkatraman et al?
2. How can the 7 Guidelines by El Sawy and Pavlou improve the path taken for Danfoss IT in fulfillment of the 3 new IS Strategy quests and how could they be implemented?
3. What impact does Danfoss A/S competing in a dancing, rugged landscape have on the Core IS Capabilities in Danfoss IT?

## 4.0 Empirical Data

---

In this chapter I will plan the collection of the empirical data about the strategic path Danfoss IT is planning to be taking in the future. This will be done only through interviews with top level IT managers in positions to design and direct the strategic initiatives for their functional areas, since the IT Strategy for Danfoss and the IT Perspective from Danfoss IT have confidential and sensitive content. Also, I will interview my own manager, who had a central role in developing the IT Strategy and therefore can reveal more details about the goals of the IT strategy in relation to the 3 IS Strategy quests. The purpose of the interviews is only to identify the relevant elements of the IT Strategy and the IT Perspective in relation to the 3 new IS Strategy quests and Core IS Capabilities.

In the following sections I will first describe the requirements for the collection of data to ensure the data collected will be valid to analyze for the goal of this project. Then I will describe how the empirical data are planned to be collected and finish with some post-interview facts about the process.

### 4.1 Data requirements

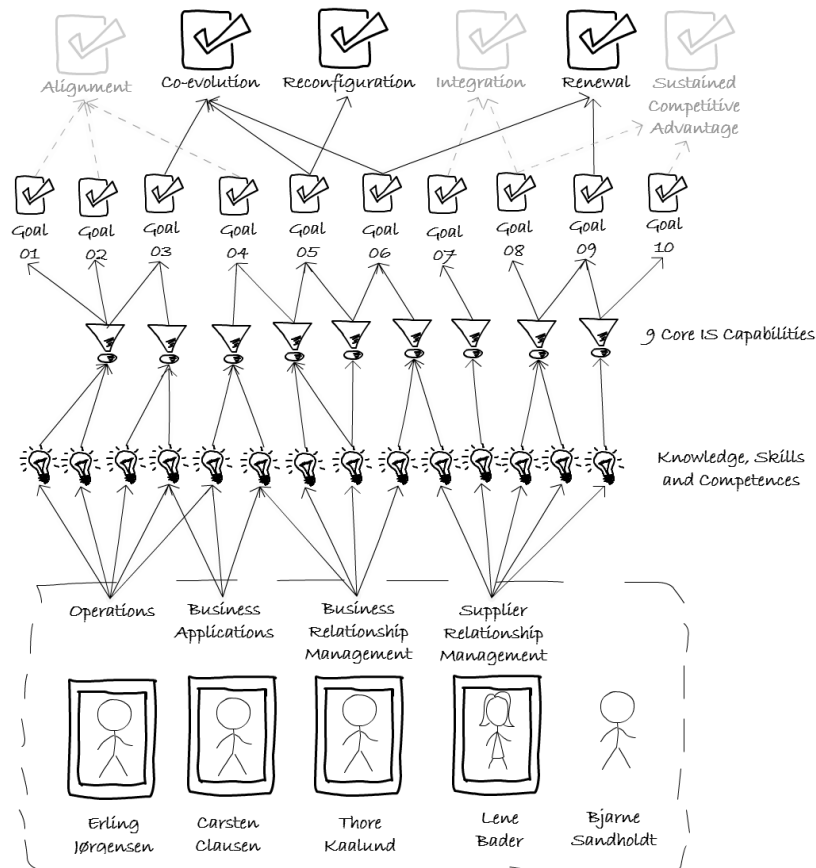
As described in the problem situation there has been developed a new strategy for IT at Danfoss A/S in alignment with the new business strategy from 2009. Also, in a response to the new IT strategy, the central IT unit has been developing the new IT Perspective with the initiatives, goals, and must-win-battles for the IT unit in alignment with the corporate strategy, the strategy for IT, and the Perspectives for the business units.

As stated in earlier, the IT Strategy and IT Perspective are confidential, so I will collect information relevant for this project by doing interviews. In the interviews I want to collect information about the path chosen by Danfoss, so I can understand how and analyze how well this path will fulfill the 3 new IS Strategy quests. Since the IT managers were not aware of these quests when the IT Strategy and IT Perspective were developed, it will be necessary for me to make these managers aware of these quests and allow them to create the links or connections, even if it has been labeled differently within the organization and within the strategies. This is also needed, as they will not want to talk about the IT Strategy and IT Perspective unless they are sure that it can be done safely without revealing potential confidential and sensitive information

Ideally, I would let them explain all facets of the IT Strategy and IT Perspective and make the connections myself. But given the circumstances, I have to structure the interviews, so that the respondents can safely reveal as much as possible in relation to the 3 new quests and the Core IS

Capabilities, while allowing them to avoid revealing sensitive or confidential information. The interviews will therefore be semi-structured interviews with an overview of the theories followed by a few guiding but open-ended questions.

It is my expectation that the interviews will reveal some of the goals in the IT Perspective for each main area. Some of these goals can be linked directly or indirectly to the 3 new IS Strategy quests, while other goals will be linked to the 3 classic quests. Also, I expect the interviews to reveal what new knowledge, skills, and competences, and thereby change in the IS capabilities that will be necessary in each area to enable fulfillment of these goals and quests.



**Figure 18** – Draft model of the assumed relationships between functions, skills, capabilities, goals and quests

Figure 18 above illustrates a draft model of the assumed connections and relationships of how the new or improved knowledge, skills, and competences will strengthen the Core IS Capabilities in the different functional areas, which again will enable each area to pursue different as well as shared goals in the IT Perspective, and hopefully some of these goals can be linked to the 3 new IS Strategy quests, while others links to the 3 classic quests.

## 4.2 Data collection

I will interview the IT managers of the main IT functions. From the Business Relationship Management function I will interview Senior Director Thore Kaalund, from the Business



Applications function I will interview Senior Director Carsten Clausen, and from Operations I will interview Senior Director Erling Jørgensen. In the supporting functions, I will only interview Director Lene Bader from Supplier Relationship Management, since the two other functions are either too new or only focused on administrative tasks not relevant for the 3 new quests, e.g. performance management and financial management. All these managers have participated in developing the IT Perspective by contributing with initiatives, plans, and goals for their areas. I have chosen not to get an interview with the Danfoss CIO, as he has been too busy with getting the IT Perspective approved and since I felt the other IT managers could fully cover what I needed.

To collect data on the IT strategy I will interview Director Bjarne Sandholdt, who is my own manager, as well as Senior Director Erling Jørgensen from Operations. These two managers were both involved in the development of the IT strategy.

Using the assumed structure of cause and effect, which was seen in Figure 18, I will first present the concepts of competing in a dancing, rugged landscape to the respondents and how Venkatraman et al suggest 3 new IS Strategy quests for the business to pursue in CABS. I will then ask the respondents in which ways the IT Strategy and IT Perspective support these 3 quests for their area.

Then I will present the Core IS Capability framework, so I can ask how they see the IT Strategy and IT Perspective require strengthening as well as the addition of new knowledge, skills, and competences to the Core IS Capabilities in their area.

Furthermore, I will ask Erling Jørgensen and Bjarne Sandholdt about the overall IT Strategy and its goals in relation to the 3 quests.

| <b>Respondent:</b> | <b>Manager of:</b> | <b>Length of interview:</b> | <b>Date of interview:</b> |
|--------------------|--------------------|-----------------------------|---------------------------|
| Bjarne Sandholdt   | CF-IOO             | 54:28 min*                  | 2011-12-02                |
| Carsten Clausen    | CF-IA              | 44:07 min                   | 2011-12-06                |
| Erling Jørgensen   | CF-IO              | 26:08 min                   | 2011-12-09                |
| Thore Kaalund      | CF-IB              | 34:31 min                   | 2011-12-14                |
| Lene Sørensen      | CF-IS              | 42:23 min                   | 2011-12-19                |

**Figure 19** – Interview details (\* includes time spent on explaining theories and purpose)

The interview guide's 10 slides can be seen in Appendix 4 at the back of this project. Figure 19 above shows the details about conducting the interviews.

In my first interview I recorded while explaining the purpose of the interview and reviewed the theory from the articles (Venkatraman et al, 2010) (Feeny et al, 2006). But in my second interview I had to first review what the interview would be about before recording, so Carsten Clausen would better be able to act as a filter for potential confidential and sensitive information. I therefore decided to also do this in the rest of the interviews and told the respondents that this would help them better focus their answers towards my needs without worrying about any confidential information outside the scope of my goals for the interview. This is why all subsequent interviews are shorter than the first interview; they were in fact about 10-15 minutes longer.

The interviews have been recorded using Audacity<sup>5</sup> to ensure optimal focus during the interviews rather than on note-taking and they were then saved as MP3 audio files for further analysis.

As these interviews will be highly subjective, there could be a high potential for bias. But since all the managers of the main IT functions have been contributing in developing the IT Perspective for their own areas, they are the primary sources for this insight and since I have confidential access to the IT Perspective documentation as a manager, I can easily verify consistency between the interviews and the presentation presented by IT management for the executive committee and the finance board for approval. Besides, the IT managers have no obvious motivation to mislead or withhold information, as long as it is not confidential because it is related to the competitive and growth strategies of the Danfoss business. I therefore expect them to speak authoritatively and openly about their own areas and future initiatives in relation to the 3 new quests and the need to strengthen Core IS Capabilities in their area.

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<sup>5</sup> <http://audacity.sourceforge.net/>

## 5.0 Analysis and Data Model

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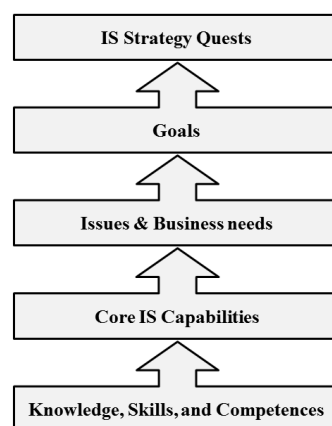
In this chapter I will define how the empirical data will be coded, categorized, and analyzed to create a model of how the Danfoss IT Strategy and the IT Perspective for Danfoss IT are aimed at certain goals that can be linked to the 3 new IS Strategy quests and will require new knowledge, skills, and competences that impact the Core IS Capabilities to deliver these goals and fulfill the new quests.

### 5.1 Data categorization and analysis

To analyze the interviews I need to go through each of them and code the content for later categorization. To do this I will use coding techniques for qualitative research from Corbin and Strauss (Corbin & Strauss, 2008, pp. 198) where I will use open- and axial coding techniques to take blocks of data and extract the meaning to synthesize the blocks into concepts and then relating the concepts to each other. I considered analyzing the interviews using the full methodology of Grounded Theory building, but as my interviews are semi-structured towards a fixed goal with a known cause-effect structure, this methodology for qualitative analysis would not be fitting to use.

So to categorize the coded blocks of data from the interviews, I need to define how to choose a solid categorization scheme. To do this, the categories should be exhaustive, mutually exclusive, and derived from a single classificatory principle (Rogers, 2003, pp. 280). This means that my categories will have to cover all the coded data, ensure that no data can belong to more than one category, and have a simple principle for classification into the right category.

My categorization will build on the structure presented in Figure 18. But the interviews will also contain data about things not covered in that model, so to ensure the categories are exhaustive and mutually exclusive, I may need to add extra categories as needed. The 5 categories I used for the coded data blocks can be seen illustrated in Figure 20 below with their relationships and hierarchy:



**Figure 20** – Categories and hierarchy used for coded data in interviews

The interviews were first analyzed using Mind Mapping to capture the key structure of the conversations as well as to do open- and axial coding. This makes it easier to manage the data, when they have been coded for simplification and common themes, while relationships have been kept. The Mind Map can be seen in Appendix 5, but the details are not visible due to the complexity of data structure and relationships even when coded.

Then the Mind Map was analyzed for each IT function using the categorization and hierarchy to build up models for each area. In my analysis it became clear that the interviews had been much focused on the 3 new IS Strategy quests and Core IS Capabilities, which was my intention. Almost no issues or goals were linked to the classic quests and knowledge, skills, and competences were linked to the 9 Core IS Capabilities. So in coding and analyzing I deliberately focused on making models for each functional area showing the clear effect new knowledge, skills, and competences had on the 9 Core IS Capabilities, which again are expected to achieve specific goals that will solve issues and business needs that are linked to the 3 new quests for Danfoss. The models for each interview can be seen in Appendix 6. The models are not supposed to show precise and accurate links between the different layers, as this would require reworking them with the respondents to verify cause and effect links. They only serve as a base to build a common model for Danfoss IT from, which accurately portrays the layers in the model. This makes sense, since certain knowledge, skill, or competence can have an effect on more than one IS capability, which again can support more than one goal.

### **5.1.1 Interview 1 – Bjarne Sandholdt**

When interviewing Bjarne Sandholdt the focus of the interview was on the IT Strategy and the IT Perspective combined. The goals for Danfoss IT that stood out were: flexibility in cost to serve, faster delivery of IT solutions, building a robust infrastructure, drive rather than support line of business (LOB) innovation using IT, and facilitate the business' process in improving business process management, master data management, and business intelligence (BPM/MDM/BI). These goals link directly or indirectly to all of the 3 new IS Strategy quests. The Core IS Capabilities required to support these goals were: Making Technology Work, Architecture Planning, and Business Systems Thinking. The most important underlying knowledge, skills, and competences for these capabilities are to know how to exploit new technology, see business value from new IT, anticipation of business needs, participation in projects early on, and process redesign knowledge.

### **5.1.2 Interview 2 – Carsten Clausen**

Carsten Clausen, covering the Business Applications (BA) area, explained that the goals for his area were: flexibility in cost to serve, faster delivery of IT solutions, building a robust

infrastructure, drive rather than support line of business (LOB) innovation using IT, and facilitate the business' process in improving BPM/MDM/BI. These are the same goals as Bjarne Sandholdt mentioned and they link to the 3 new quests and require the same Core IS Capabilities as he mentioned. They also have the same underlying knowledge, skills and competences, but one new is added – collaborate with LOB and partners. For the BA area it is also important that enterprise architects and solution architects can work and collaborate with both the business project teams and IT sourcing partners to deliver the best IT solutions for the line of business.

### **5.1.3 Interview 3 – Erling Jørgensen**

The IT Operations (OPS) area has according to Erling Jørgensen mostly the same goals as the BA area, but the need to drive LOB innovation is replaced with the need to enable collaboration in the business via telephony, instant messaging, video conferencing, and virtual meetings/training. The same Core IS Capabilities are required and some of the same underlying knowledge, skills and competences are also needed. For the OPS area the following are needed: know how to exploit new technology, service transition & problem solving, project management competences, anticipation of business needs, see business value from new IT, and process redesign knowledge. Service transition and problem solving are highly related to moving projects into daily operations and support, while project management competences are related to the need for designing and building the robust technical infrastructure needed as foundation for the business application architecture and business collaboration systems.

### **5.1.4 Interview 4 – Thore Kaalund**

In the business relationship management (BRM) area, Thore Kaalund explains that his area has some different goals than the previous areas have. The goals are: improve project management capability, get closer to the business, project portfolio management, making project managers the voice of the LOB, and handle complex build projects. The last goal builds on the premise that IT projects in the past has mostly been about rolling out standard solutions that may have been customized to the organization's needs, e.g. Microsoft Windows, SAP ERP, and SAP CRM. But the future will demand more systems developed with sourced developers from partners meeting very specific and urgent business needs. The Core IS Capabilities are the same as for the previous areas, but Relationship Building is added. The knowledge, skills and competences needed in this area are: project managers with an outside-in view, agile project management competences like Sprints and SCRUM methodologies, advice business of IT solutions, anticipate business needs, business understanding, and see business value from new IT. With these competences the project managers need to change dramatically, as they must better understand the LOB they primarily have projects for. This will minimize the time needed for project clarification and make the project

manager the business representative toward the internal IT organization and move the technical discussions and arguments internally. The future demands more agile project management methodologies to meet the changing needs of the business and project scope creep, but these are competences that will be developed later when all the basics of project management and project portfolio management have been mastered.

### **5.1.5 Interview 5 – Lene Bader**

For Supplier Relationship Management (SRM) the goals for this support function were, as expected, slightly different from the other areas. The goals are: flexibility in cost to serve, faster delivery of IT solutions, challenge managers in make or buy decisions, and building a single shared competence center for IT purchasing & contracts. The Core IS Capabilities required for these goals are Informed Buying, Contract Facilitation, Contract Monitoring, and Vendor Development. Generally speaking, the creation of the new SRM area during the last reorganizing of the IT unit was to build and develop these capabilities. In relation to supporting the goals via these capabilities, Lene Bader sees a need to build knowledge, skills and competences in the following: anticipate emerging LOB needs and trends in IT, objective supplier assessments, make or buy decisions capabilities, systems thinking and compliance mindset, and knowing plans about where the infrastructure and architecture are going. For SRM it is important to be involved when new technologies and systems emerge rather than let the business units each implement their own solutions. Also, when selecting suppliers and solutions it is important to not always go with the best or cheapest product, but also see it as a part of a system landscape requiring inter-operability and compliance as well as evaluating the cost of having too many contracts with different suppliers that needs to be managed.

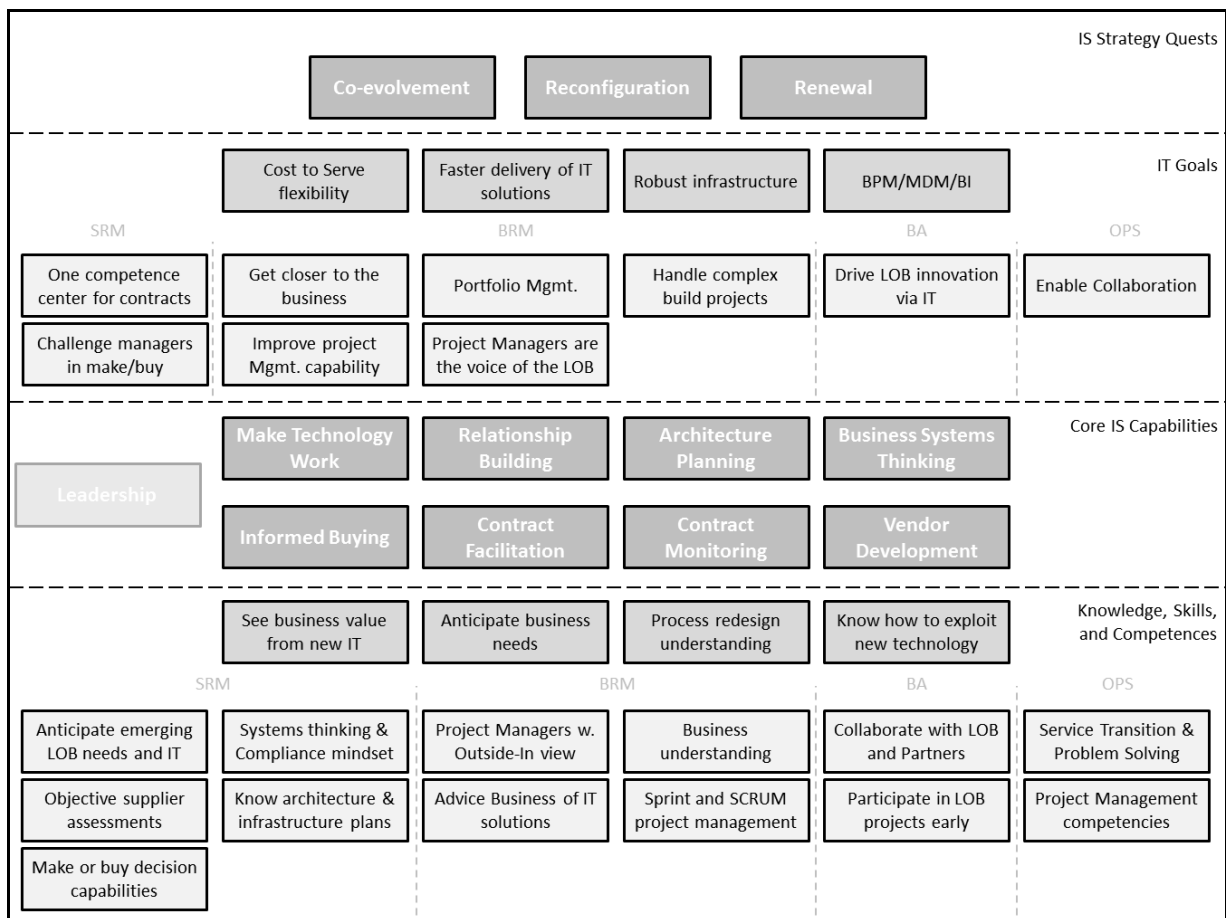
## **5.2 Building the primary data model**

After analyzing the interviews I can now synthesize them all into a combined model for Danfoss IT that is more focused on the 3 new IS Strategy quests and the 9 Core IS Capabilities with details about how Danfoss IT will pursue the quests and how this will have an effect on the capabilities.

The model is illustrated in Figure 21 below and has 4 layers. The top layer is the 3 new IS Strategy quests that is supported by goals from primarily the IT Perspective, which are seen in the second layer of the model. The 4 top row goals are the shared goals for most of the IT functions, primarily the functions in the value chain of delivering IT to the business. Then in the lower rows are 9 goals distributed among the 4 functions, where Business Relationship Management has 5 unique goals and the other functions each have 1 or 2 unique goals individually.

We see in the third layer that 8 of the 9 Core IS Capabilities are affected in order to fulfill these goals, however none of these goals can be achieved without leadership and IT governance to support it. I have therefore added Leadership to the left-hand side of the layer, but faded it to illustrate this point.

In the fourth and lowest layer we see the knowledge, skills, and competences that Danfoss IT sees as needed to be absorbed into the Core IS Capabilities. Four of these are shared across most of the IT functions, while 13 are unique among functions. Again we see that Business Relationship Management has many unique on their own (4), but Supplier Relationship Management has even more (5), while Business Applications and Operations have 2 each.



**Figure 21** – Synthesized model of Danfoss IT’s pursuit of the 3 new IS Strategy quests

As a follow-up on the results from the interviews I have verified them against the IT Perspective where Danfoss IT has 7 strategic Must-Win-Battles, which will be achieved through a specific roadmap of goals for 2012 and a more flexible roadmap of goals for 2013-2015. Comparing these from the IT Perspective with the IT functional area models and the synthesized model for Danfoss IT, which are all based on the interviews, I see clear consistency. Naturally, the models I have developed have less information and goals, since the semi-structured interviews focused only on the 3 new IS Strategy quests and the Core IS Capabilities.

## 6.0 Evaluation and Discussion

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In this chapter I will first evaluate the IT Strategy and IT Perspective for how well they together fulfill the 3 new IS Strategy quests. To do this I must first select my evaluation criteria – choosing which merits that define the degree of fulfillment. Then I can evaluate fulfillment by looking for evidence to support a scoring value and by looking for additional qualifiers or conditions that must exist to enable the successful implementation of the strategies. This will lead me to an overall evaluation of the fulfillment for Danfoss IT. Secondly, I will evaluate in which ways the 7 Guidelines by El Sawy and Pavlou might improve implementation of the strategies for Danfoss IT and how these guidelines may be executed in the Danfoss context. Thirdly, I will evaluate how the plans that Danfoss has chosen through the IT strategy and IT Perspective in combination with the 7 Guidelines will have an impact on the Core IS Capabilities for Danfoss IT. Finally, this project will be evaluated as a whole by discussing the empirical data, the analysis, and the methodology.

### 6.1 Evaluation of fulfillment of the 3 new IS Strategy quests

Evaluating the expected degree or level of fulfillment of the 3 new IS Strategy quests for Danfoss IT from the IT Strategy and the IT Perspective is hard. First, the plans has not been implemented yet as they have only just been approved in December 2011. Second, there is no existing framework to evaluate the new quests as they have only been proposed by Venkatraman et al and no follow-up research has answered their research questions. My perspective will therefore be from a point, where I look at the value driven or enabled for the business from IT in relation to the dancing, rugged landscape, whether this value is to be realized directly or indirectly, and the general ability Danfoss IT has to have influence on the 3 new quests.

#### 6.1.1 Evaluation criteria

To evaluate the expected level of fulfillment I will use two approaches. I first need to look at the overall possibility that Danfoss IT can support the 3 new quests given the role IT has in this specific company. This gives me a context to evaluate all the initiatives that are found in the interviews. Then I will define a measurement scale for fulfillment that I can use to evaluate the value of each initiative on in relation to the 3 new quests and look at the effect from their joint effort.

But first I must realize that my evaluation will be relative. By this I mean that I have no way of knowing how much Danfoss IT could do to fully fulfill the 3 new quests; I don't know all the initiatives that together would define the maximum effort.



With this in mind, I will therefore look at the initiatives chosen by Danfoss and evaluate them as a whole in relation to the context Danfoss IT is in with regards to the role of IT in the company.

So first I will discuss the role Danfoss IT has in relation to the business units. This will be a proxy for the possible impact on the 3 new quests that Danfoss IT can have. To do this I will use a simple scale from 1 to 3, where 1 is low impact, 2 is medium impact, and 3 is high impact.

Then I will evaluate all the initiatives individually by looking at how they realize value in the 3 new quests. This I will do by looking at them to see if they only enable the new quests or if they do more by driving the new quests. Also, for these two levels of fulfillment I will look at the way they realize value – will it only be indirectly or will it be more directly. These evaluations I will score on a scale from 1 to 4 and then look at the average score. This score will be a proxy for the average effort to fulfill the 3 new quests in these initiatives. The effort evaluation matrix for the individual initiatives can be seen in Figure 22 below:

|          |        |       |
|----------|--------|-------|
| Direct   | 2      | 4     |
| Indirect | 1      | 3     |
|          | Enable | Drive |

**Figure 22** – Effort evaluation matrix

To make the final evaluation of the fulfillment I will then compare the score for impact with the score for effort using the following matrix:

|              |   |                           |                            |                            |
|--------------|---|---------------------------|----------------------------|----------------------------|
| Impact Score | 3 | Medium Fulfillment        | Medium to High Fulfillment | High Fulfillment           |
|              | 2 | Low to Medium Fulfillment | Medium Fulfillment         | Medium to High Fulfillment |
|              | 1 | Low Fulfillment           | Low to Medium Fulfillment  | Medium Fulfillment         |
|              |   | 1.0 – 2.0                 | 2.0 – 3.0                  | 3.0 – 4.0                  |
|              |   | Effort Score              |                            |                            |

**Figure 23** – Overall evaluation matrix

In order to anticipate that the score will be relative and that there may be several initiatives, which Danfoss IT could have chosen that are not included, I have decided to push the scale at both extremes, so it is harder to score “High Fulfillment” as well as “Low Fulfillment”.

However, it is important that I do not try to make this into a precise mathematical exercise; after all, the scoring is very subjective. So I will aim for approximate placement on both axes for evaluation.

### **6.1.2 Evaluating impact**

The role Danfoss IT has in relation to the business units in Danfoss and thereby the possibility for impact on the 3 IS Strategy quests can be determined by looking at the areas where Danfoss IT actively supports the business units.

There are several ways that information technology can be integrated in the products, services, and activities of a company and this is also highly different from industry to industry. As an example, if we look at 3 different companies we can see the major differences. Salesforce.com is probably one of the most well-known companies that offer software as a service (SaaS). Clearly, information technology has a big part in the service or product offered by the company to its customers. Amazon is most likely the biggest online retailer, but while information technology clearly is part of the online system for e-commerce, the actual products that the customers receive, e.g. books, CDs, and DVDs, do not use any of the IT from Amazon, but IT is driving the business processes. Ford Motor Company is one of the big industrial car manufactures in the world and has in recent years embedded information technology in its car models, e.g. navigation software, Bluetooth integration with smartphones, etc. But it is unlikely that the IT department handles these IT implementations, I would expect developing engineers to have this responsibility rather than the internal IT unit.

I therefore think that it makes sense to differentiate the areas that Danfoss IT can have impact on between what could be labeled Engineering IT, Manufacturing IT, Business IT, and Administrative IT. Engineering IT would be in the area of products and services. Business IT would be in the area of business processes. Manufacturing IT would be in the area of systems used to produce or manufacture products. Administrative IT would be the area of infrastructure, datacenter, and workplace computing.

Danfoss A/S is an industrial manufacturing company delivering technically advanced mechanical and electrical products and solutions to its customers. But all of the Engineering IT is handled by engineers from the individual business units. However, Danfoss IT handles most of the remaining

IT areas – especially Administrative IT and Business IT. Operational support for Manufacturing IT is also covered in general, except for the Asia and Pacific region. Local divisional IT units do support some parts of both the Business IT and the Manufacturing IT, but all in all Danfoss IT covers most areas.

I therefore estimate the score for impact or degree of influence Danfoss IT can have on the 3 new IS Strategy quests in the Danfoss business units to be “high” since 3 areas out of 4 are heavily influenced by Danfoss IT (= 75%).

### **6.1.3 Evaluating effect**

In the following I will go through each of the goals revealed in the interviews and evaluate them as initiatives that either drive or enable the 3 new IS Strategy quests and do so directly or indirectly.

In the Business Applications area the goal to drive LOB innovation using IT will directly be effort that drives the 3 new quests, because innovation is needed to co-evolve and renew in the dancing, rugged landscape. The shared goal in Danfoss IT of faster delivery of IT solutions will also directly enable the 3 quests, since it affects the speed of reconfiguration and renewal.

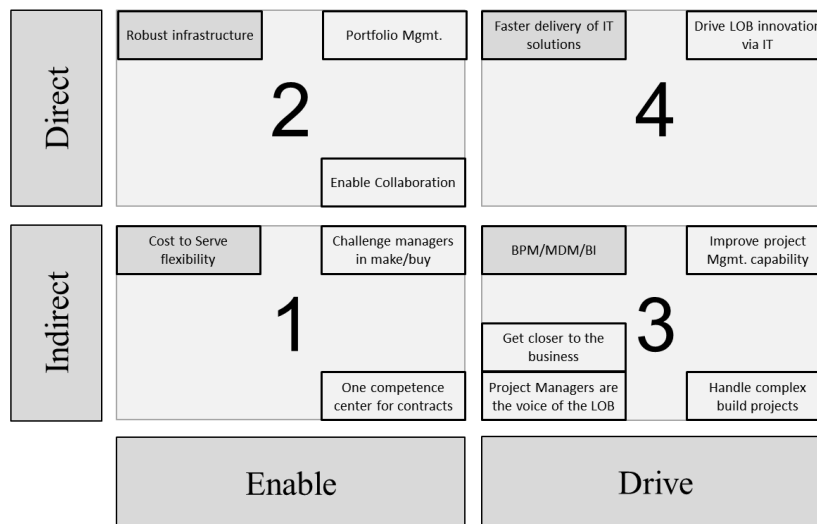
The efforts to facilitate BPM/MDM/BI in Business Applications as well as efforts to handle complex build projects, to improve project management capability, to get closer to the business, and to making project managers the voice of the LOB in the Business Relationship Management area will all drive the 3 new quests, but do so indirectly as it is Danfoss IT that takes initiative to push change to happen. These efforts still need the business units to embrace and utilize the capabilities of the IT unit to go forward with goals in the Corporate Strategy and the business unit Perspectives. It may be argued that these efforts directly enable rather than indirectly drive the 3 new quests, so in my shared evaluation of the goals I will take this into consideration.

When the Operations area build a robust infrastructure and enable collaboration it will directly enable the business to pursue the 3 quests more effectively, because the IT platform is there to build upon and work can happen more efficiently. Better project portfolio management in the Business Relationship Management area will also directly enable the 3 new quests, as it makes it easier and faster to prioritize the project activities within Danfoss IT that influences projects in the business units the most.

The shared Danfoss IT goal of achieving flexibility in cost to serve will indirectly enable the business to pursue primarily the co-evolution quest, since this makes the business less sensitive to market changes when IT costs are variable costs that follows consumption. This means that the business units can better control their spending in recessions and keep sustained competitive

advantage in declining market positions until a new peak in the dancing, rugged landscape has been conquered. One could consider the goals of Supplier Relationship Management to build themselves as the one competence center for IT purchasing & contracts and to challenge managers in make or buy decisions as being sub-goals to the goal of flexibility in cost to serve. These goals therefore indirectly enable the co-evolution quest.

In Figure 24 below I have placed the 13 goals of Danfoss IT in the effort evaluation matrix from Figure 22:



**Figure 24** – Scoring the effect of all the individual initiatives

Calculating the average effect score for Danfoss IT will therefore be between 2.1 and 2.5 because of the uncertainty in classifying some of the goals as mentioned earlier (27 points divided by 13 goals or 32 points divided by 13 goals). There may possibly be more uncertainty due to classification of goals that could be questioned, but assuming they are not all questioned at the same time, the impact seems to be negligible, so the score will be in the 2.0 to 2.5 range.

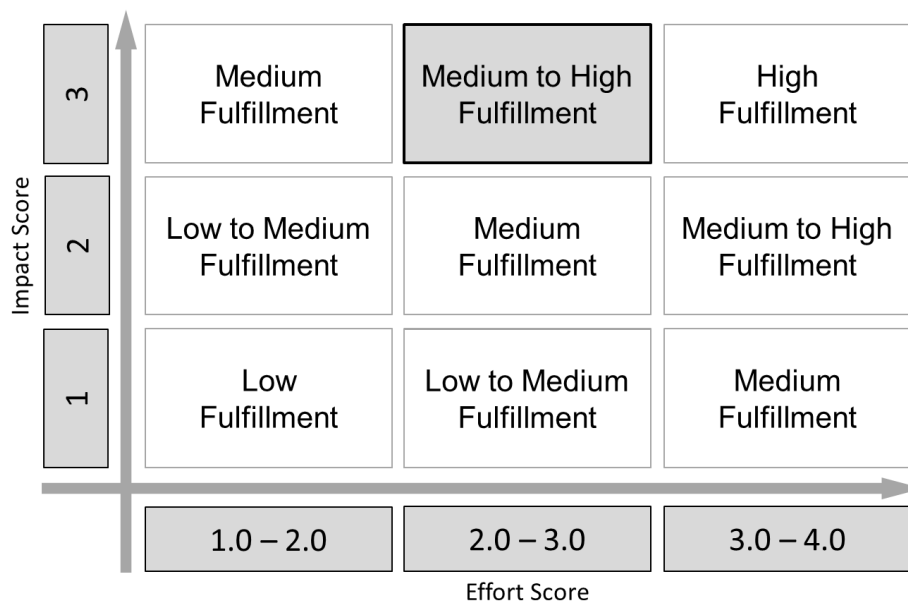
#### 6.1.4 Conditions

For Danfoss IT to realize the value of the 13 goals defined in the IT Perspective requires several things as a prerequisite for success. First, the business units need to build trust in Danfoss IT to allow the project managers to be their voice and to let business and enterprise architects drive LOB innovation. To improve the trustworthiness of Danfoss IT, the general management team (GMT) has begun having quarterly meetings with the CFOs and CIOs of the business units to align expectations and grow mutual understanding. Recently two local divisional IT units from the business have been integrated with Danfoss IT, which shows that Danfoss IT is being trusted to manage IT fully for these business units.

Second, Danfoss IT may need to invest heavily in education for many of the employees over the next years in order to realize the goals of building a robust infrastructure, enable collaboration, and facilitate BPM/MDM/BI. In Business Applications there have already been some educational investments in the spring of 2011 as 12 architects were sent to BPM training at IT Vest. But I think a big hurdle remains to be conquered in enabling Operations to build the capabilities needed. The right employees needs to get the knowledge, skills and competences to see business value from new IT, to anticipate business needs, to understand process redesign and to know how to exploit new technologies. These are knowledge, skills and competences that I think have to be part of everyone's training, since no architect can continually keep this updated for all the technical areas within Operations. Only the specialists in each functional team can understand and stay updated on the technical advances in their areas of expertise to see business value from them and to know how to exploit these advances. To enable continuous improvement and drive cost to serve down, it may be important that everyone in Danfoss IT get a refreshment or even better understanding of process design, which was started in 2009 with the Service Excellence Program that builds on Lean principles.

### 6.1.5 Bottom-line evaluation

I have now evaluated the impact and effect of Danfoss ITs goals in the IT Perspective to fulfill the 3 new IS Strategy quests. With a high impact score due to the possibility for Danfoss IT to have an impact on 3 out of 4 areas, and a medium score in the range from 2.0 to 2.5 for effort from the 13 goals in the IT Perspective, I evaluate the fulfillment to be "medium to high" as can be seen in Figure 25 below:



**Figure 25** – Evaluation of fulfillment of the 3 new IS Strategy quests from the 13 goals in the IT Perspective

So I can now answer my first research question regarding how well the path chosen by Danfoss IT in the IT Strategy and IT Perspective will fulfill the 3 new IS Strategy quests proposed by Venkatraman et al by concluding that the goals in the IT Perspective, which is aligned with the corporate strategy, the Perspectives from the business units, and the IT Strategy, is expected to achieve medium to high fulfillment of the 3 new quests, provided that Danfoss IT builds the knowledge, skills, and competences required through continuous training of the employees and building of trustworthiness.

This is a high result given the fact that the 3 new quests were never consciously included in the IT Perspective and may very well be the result of the business units and executive committee's perception of the markets Danfoss A/S is competing in as being dynamic turbulent markets in the future. Several of the respondents in the interviews saw parallels in the framework of the dancing, rugged landscape and the way Danfoss expects the future of competition to be. It seems that Danfoss IT has also been trying to solve the problem of how to best support the business, when it is competing in complex adaptive business systems and that the IT managers in retrospect can see some overlaps between the IT Perspective goals and the 3 new IS Strategy quests proposed by Venkatraman et al.

## **6.2 Evaluation of improving with the 7 Guidelines**

El Sawy and Pavlou (El Sawy & Pavlou, 2008) suggest 7 Guidelines to how CIOs can help the firms better use both the information systems and the IT units to overcome the challenges of dynamic turbulent markets. In this section I will explore each of the guidelines to see if and how they may be followed by Danfoss IT to help improve or ensure fulfillment of the 3 new IS Strategy quests. I will also deduce what new knowledge, skills and competences may be required to execute the suggested actions at Danfoss IT.

### **6.2.1 Guideline 1**

The first guideline by El Sawy and Pavlou is "To move away from the mindset where IT is primarily seen as an enabler of operational capabilities [...]", so IT is allowed to actively help enabling dynamic and improvisational capabilities in the business. To achieve this they suggest that the CIO must first convey this vision to both business and IT managers. They must see that IT has huge potential to provide advantages in processes that deals with reconfiguration and change. Then the relevant processes should be identified and addressed by tracking emerging IT infrastructures that would enhance dynamic and improvisational capabilities.

This guideline may seem a little outdated for Danfoss A/S, as the business unit have in many years seen the value from using IT to drive both Business IT and Engineering IT, whether delivered by Danfoss IT or not. This guideline enforces the need to strengthen the knowledge, skills and competences in knowing how to exploit new technology, anticipating business needs, seeing business value from new IT, and understanding process redesign – the four identified, which are shared across the functions in Danfoss IT.

### **6.2.2 Guideline 2**

The second guideline is for enterprises to develop improvisational capabilities for highly turbulent environments and for the CIO to assist the enterprise by promoting a culture that accepts and fosters improvisation as well as to “Enhance the enterprise’s ability to sense and interpret the environment with the aid of IT”.

This guideline is very much in line with the goal of facilitating the developing of BPM/MDM/BI, as the BI area has many years been a focus point. The competence discovered in the interviews for this has primarily been to understand process redesign, but I think the concept of improvisational capability may also have value for Danfoss IT. The concept builds according to the authors on the need to “[...] the planned ability to repetitively engage in spontaneous activities effectively [...]”, which for managers, project managers, and project members could be an important competence to possess in order to become more agile and help the business lower time to market. Often it can be the lack of processes or the unforeseen situation that existing processes cannot cope with in an effective manner that causes things may come to a halt. Processes are important, but if they are primarily used to avoid blame rather than to accelerate and standardize workflows, then they can end up as bureaucracy and seen as working against getting things done. Educating the business development facing employees and managers in the authorized breach of processes from improvisational capabilities to ensure faster delivery and experimentation to test potential options could be an important addition to the knowledge, skills, and competences already identified in the interviews. This could be labeled “Process improvisation”.

### **6.2.3 Guideline 3**

For the third guideline the authors talks about the hurdle of “IT not woven into the enterprise’s business fabric” and recommends that the CIO promote the notion that IT is integral to the business fabric by “Consciously work with IT staff members to collectively build a better understanding of the enterprise’s business processes, and consciously work with business users to ensure they are comfortable with using IT applications as an integral part of their work” (El Sawy & Pavlou, 2008, pp. 148). The authors themselves explain that the distinction from seeing IT as

separate and detached and to see it intimately woven into its business fabric is subtle. They elaborate earlier in their article on the subject by telling how the use of IT has gone through different forms and intensity of contextual coupling with business context; from *connection*, first to *immersion*, and finally to *fusion* (El Sawy & Pavlou, 2008, pp. 142). They explain that “Fusion contextual coupling means that IT and the business context become indistinguishable [...]”. The way I understand this, is that when the contextual coupling is fusion then IT is thought of as a necessity in all parts of doing business and everyone involved know by instinct that changing business processes requires changes to the IT systems.

Operations has some initiatives in the IT Perspective regarding training of end users, so they can learn to better utilize and realize value from the IT systems made available for them. Also, the Business Relationship Management area has the goal of increasing business understanding in the project managers and the Business Applications area has had the architects trained in process redesign as well as sees a need for building their competence in collaborating with LOB and partners, which will require a better understanding of the business processes. So for Danfoss IT to improve on this guideline; to implement it better than already planned by the goals above, I see a need to do something drastic to make all IT employees more business savvy; a goal or quest that has been popular among IT managers in several years both inside and outside of Danfoss IT. A way in which this may be approached could be to have business unit managers or divisional business unit CIOs explain to the IT staff of Danfoss IT what the goals of the business unit Perspectives are and how they see the role of Danfoss IT and technology in supporting this. So a new supporting competence could be labeled “Danfoss business savvy”, implying the need to not only understand business in general (many IT employees already have degrees in economics, business, or accounting) but to also stress the importance of understanding business in the context of the business units within Danfoss A/S.

#### **6.2.4 Guidelines 4**

The fourth guideline is for the enterprise to “[...] focus on leveraging the effects of their IT infrastructures on dynamic and improvisational capabilities, rather than on operational capabilities”. To accomplish this, the authors recommend that the CIO get buy-in for reconfigurable infrastructures from the enterprise, “[...] include agility objectives for dealing with transformation and change”, and “[...] devote more attention and resources to deploying such IT infrastructures”.

For Danfoss IT this is very close to the goal of Operations of building a robust infrastructure that is flexible enough to embrace new business demands for applications and systems. But having a focus on agility objectives for reconfiguration may not be part of the IT Perspective goals. It is



suggested by the authors that emergent IT infrastructures promise to enhance an enterprise's dynamic and improvisational capabilities. They mention three such types: Event-driven Architectures, Service-oriented Architectures, and Self-learning Architectures. Operations and Business Applications may possibly benefit from choosing a few architects to monitor these emerging architectures and to bring them into discussions across the IT organization. This competence could be labeled "Monitor emerging architectures".

### **6.2.5 Guideline 5**

As the fifth guideline the authors recommend overcoming the hurdle of getting funding for emergent reconfigurable infrastructures that will allow business agility. They explain that the CIO should convince the enterprise to move towards these new structures sooner, rather than later, by directing the attention, providing proof of concept through test cases that demonstrate payoff from investments, and looking for new reconfigurable architectures.

Since Danfoss IT has approved goals for building a robust and flexible infrastructure, this guideline does not seem applicable for the context Danfoss IT is in. This particular hurdle has already been overcome.

### **6.2.6 Guideline 6**

The sixth guideline is embedding IT processes into the business units in order to overcome the hurdle of resistance to loose/tight coupling. The goal here is to move reconfiguration of IT application infrastructure away from the IT unit and give it to the business users that can better deal with environmental turbulence. This requires flexible IT applications to allow this, while still having tight control to prevent chaos.

I have mentioned this idea to several of the IT managers during the interviews, but they found it hard to implement in the current infrastructure. If end users are allowed to change a business process in SAP and are not aware of the dependencies, then they can damage the process so it stops working. To accommodate the individual needs of all the business units in the past, the SAP based business processes have been tailored and customized heavily to achieve this. They therefore require expert knowledge of both the processes and how they are technically implemented. As Carsten Clausen explained, despite how much SAP tries to sell SAP as a Software-oriented Architecture (SOA), where modules can be built like bricks on top of each other; the reality is that it is not really possible, especially if the architecture implemented has not been planned to work this way from the beginning.

Danfoss is moving more and more towards web-enabled platforms for many systems. This allows them to be sourced from partners, but often also requires the use of standard solutions and limits integration into other systems. This helps total cost of ownership (TCO) when needed and may also provide cost to serve flexibility. But at the same time, Danfoss IT could place more responsibility for reconfiguration in the hands of business users when possible. Also, Danfoss has internally a huge web-enabled SharePoint platform from Microsoft on which end user reconfigurable applications could be built. It is hard to say how Danfoss IT could best execute on this as business unit preferences for system features often trump infrastructure needs, especially when choosing smaller systems for localized use in parts of a business unit only. But I will add another possible competence to support the new reconfiguration quest, which could be labeled “Developing end user reconfigurable solutions”.

### **6.2.7 Guideline 7**

The last hurdle is the temptation to cut corners at the expense of quality and cost. The authors see this as a result of time pressure, which may also increase the risk of burn-out and stress among developers. The guideline to solve this is for the IT unit to “[...] implement IT HR policies that foster inner calm and discipline”. The way the authors recommend the CIO executes on this is to train IT staff “[...] to appreciate the constant pressures associated with turbulent environments and to be comfortable with and resilient to change”, as well as implementing HR policies that promote IT-business partnerships and “[...] reward professionalism and a focus on quality under time pressure”. The authors also recommend project discipline, which maintains inner calm.

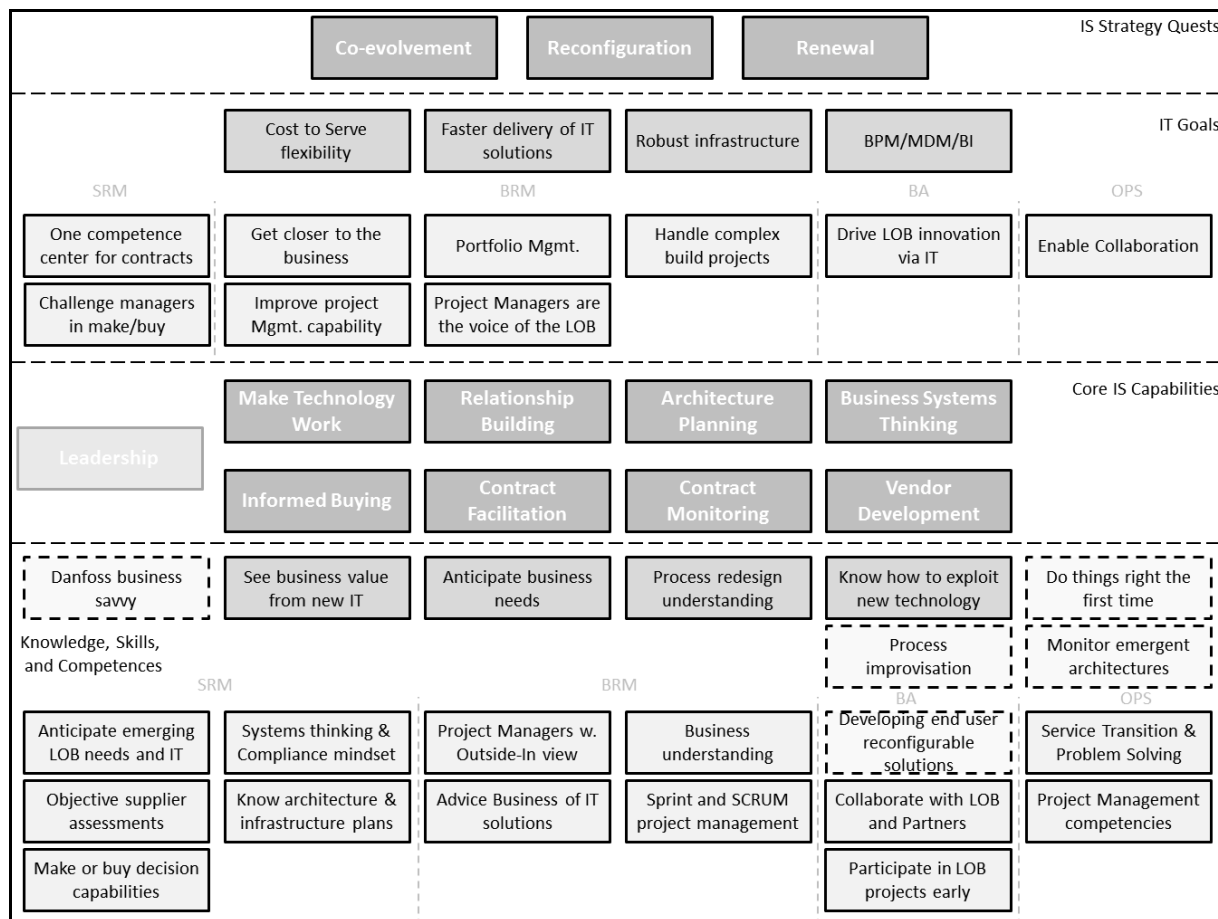
This guideline is easier said than done, as the contradicting goals of timely delivery against quality and cost make practical implementation hard to execute. But the guiding principle the authors try to get across in this dilemma is “slowing down to go faster” which also ensures quality. So adding a possible new competence labeled “Do things right the first time” may be appropriate and more generally applicable, as this also ensures the IT Perspective goal of faster delivery of IT services in general, while minimizing incidents and problems in the ITIL processes.

### **6.2.8 Bottom-line evaluation**

I have now evaluated the potential improvement that Danfoss IT could get from utilizing the 7 Guidelines of El Sawy and Pavlou to enhance the fulfillment of the 3 new IS Strategy quests.

It was my finding that guidelines 2, 3, 4, 6 and 7 could be relevant for the context of Danfoss IT and I have suggested 5 additional areas of knowledge, skills, and competences that could be developed to achieve better execution on fulfilling the 3 new quests. These were “Process

improvisation”, “Danfoss business savvy”, “Monitor emerging architectures”, “Developing end user reconfigurable solutions”, and “Do things right the first time”. It was recommended that all IT staff should become more Danfoss business savvy and build the ability to do things right the first time. Architects in Business Applications and Operations should monitor emerging architectures, and developers in Business Applications should think about developing end user reconfigurable solutions when possible. These findings enable me to update the model from Figure 21 to incorporate these 5 new types of knowledge, skills, and competences as seen in Figure 26 below:



**Figure 26** – Updated model of Danfoss IT’s pursuit of the 3 new IS Strategy quests

I can now answer my second research question regarding how the 7 Guidelines by El Sawy and Pavlou can improve the path taken for Danfoss IT in fulfillment of the 3 new IS Strategy quests and how they could be implemented. I do this by concluding that the knowledge, skills, and competences identified by the IT managers in the interviews may be expanded by adding 5 extra, to a total of 22, in order to help overcome the hurdles of seeing improvisation as unacceptable, of getting IT woven into the enterprise’s business fabric from the IT side, of making IT infrastructures available that supports dynamic and improvisational capabilities, of removing resistance to loose/tight coupling, and of the temptation to cut corners in development.

It must be admitted that some of these 5 new areas of knowledge, skills, and competences may be perceived as slightly speculative and could require long term implementation, since most of them are about behavioral change and not skills that can be easily taught to the employees. None the less, I feel they should be considered by the IT managers and implemented to degree according to the relevant context, as they are in no way harmful to other practices and may also improve other capabilities, which may not be related to the 3 new IS Strategy quests.

### **6.3 Evaluation of impact on the Core IS Capabilities in a dancing, rugged landscape**

This section will evaluate the impact from the knowledge, skills, and competences identified earlier, that were relevant for fulfilling the 3 new IS Strategy quests, on the Core IS Capabilities defined by Feeny and Willcocks for Danfoss IT. To evaluate this impact I will first need to determine which criteria to use and then I will perform the evaluation to make the final conclusion about the overall impact.

#### **6.3.1 Evaluation criteria**

It is impossible to quantitatively or qualitatively measure the impact of future knowledge, skills and competences on the Core IS Capabilities since I have neither measurement of their value nor measurements on the current levels of the capabilities. So my evaluation will focus on how, in the meaning of in which ways, they impact rather than on a value measurement of how much they impact the Core IS Capabilities.

To do this I will first do a rough estimate of which connections can be assumed between the 9 individual Core IS Capabilities and the discovered 22 (17 from interviews + 5 from guidelines) knowledge, skills, and competences. I will do this by first sorting the new knowledge, skills, and competences into 3 categories based on the three faces or three enduring challenges Feeny and Willcocks identified (see Figure 11). This rough categorization will make it easier for me to then link the new knowledge, skills, and competences to the Core IS Capabilities with more confidence, since there are fewer capabilities in each enduring challenge (in each circle of Figure 11).

Then I will examine how the business-, technical-, and interpersonal skills required in the 9 Core IS Capabilities may be changed because of these 22 new knowledge, skills, and competences I have found needed by Danfoss IT, when the business units compete in markets that are dancing, rugged landscapes. This change in skills is based on the use of the “Map of Capabilities and Skills” from Feeny and Willcocks in their first article (Feeny & Willcocks, 1998, pp. 19). The authors have evaluated the levels required in business-, technical-, and interpersonal skills for each

of the 9 Core IS Capabilities as well as the time horizons and motivating values. This map can be seen in Figure 27 below:

Table 1

**Map of Capabilities and Skills**

| Core IS Capability        | Skills     |           |               | Time Horizons  | Motivating Values                    |
|---------------------------|------------|-----------|---------------|----------------|--------------------------------------|
|                           | Business   | Technical | Interpersonal |                |                                      |
| IS/IT Leadership          | High       | Medium    | High          | Future/Present | Strategy<br>Structure<br>Individuals |
| Business Systems Thinking | High       | Medium    | Medium        | Future         | Strategy                             |
| Relationship Building     | Medium     | High      | High          | Present        | Structure<br>Individuals             |
| Architecture Planning     | Low-Medium | High      | Medium        | Future         | Technology                           |
| Making Technology Work    | Low        | High      | Low-Medium    | Present        | Technology                           |
| Informed Buying           | High       | Medium    | High          | Future/Present | Strategy<br>Structure                |
| Contract Facilitation     | Medium     | Medium    | High          | Present        | Structure<br>Individuals             |
| Contract Monitoring       | Medium     | Medium    | Low-Medium    | Future         | Structure                            |
| Vendor Development        | High       | Medium    | Medium-High   | Future         | Strategy<br>Individuals              |

**Figure 27** – Source: (Feeny & Willcocks, 1998, pp. 19, Table 1)

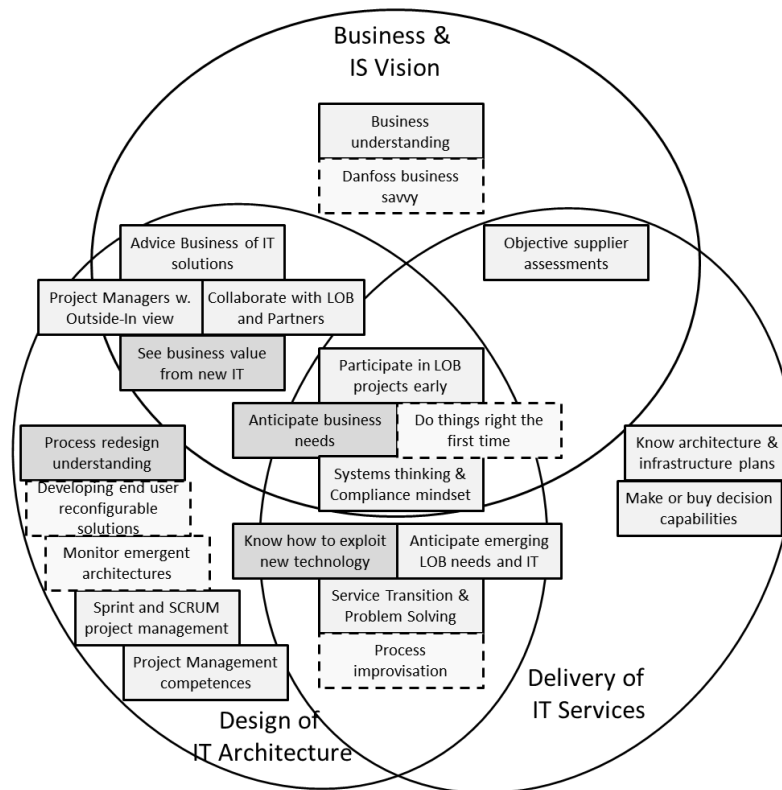
### 6.3.2 Linking the new knowledge, skills, and competences to the 9 Core IS Capabilities

I will first start by categorizing the new knowledge, skills, and competences according to the three enduring challenges presented by Feeny and Willcocks. Some of them will uniquely belong to only one challenge, while others will belong to more than one. My categorization is based on how I subjectively think they belong to the different challenges.

“Business understanding” and “Danfoss business savvy” belong to the Business and IS vision challenge only, while “Know architecture and infrastructure plans” and “Make or buy decision Capabilities” belong to the Delivery of IT services challenge only, and finally “Process redesign understanding”, “Developing end user reconfigurable solutions”, “Monitor emergent architectures”, and “Sprint and SCRUM project management” all belong to only the Design of IT architecture challenge. Belonging to all three challenges we have “Participate in LOB projects early”, “Anticipate business needs”, “Do things right the first time”, and “Systems thinking & Compliance mindset”.

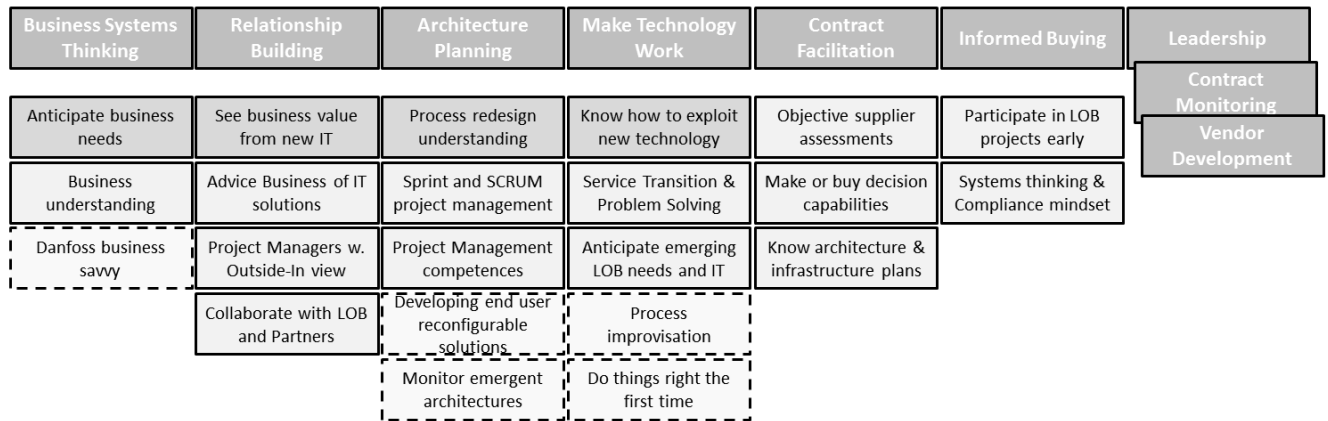
In the face between the Business and IS vision challenge and the Design of IT architecture challenge we have “Advice Business of IT solutions”, “Project Managers with Outside-in view”,

“Collaborate with LOB and Partners”, “See business value from new IT”, and “Project Management competences”. In the face between Design of IT architecture and Delivery of IT services we have “Know how to exploit new technology”, “Anticipate emerging LOB needs and IT”, “Service Transition & Problem Solving”, and “Process improvisation”. Finally we have “Objective supplier assessment” in the face between Delivery of IT services and Business and IS vision.



Now they can be linked to the Core IS Capabilities in each area or intersection, which lead to Figure 29:

Looking at Figure 29 we can see 4 placements stick out as questionable. I have placed them all according to the position from the Venn diagram in Figure 28 and linking them to the Core IS Capabilities in the same positions. By using a little common sense these 4 can be replaced to make better and more believable links between knowledge, skills, and capabilities towards the 9 Core IS Capabilities. This can be seen in Figure 30:



**Figure 30** – Re-linking the new knowledge, skills, and competences to the 9 Core IS Capabilities

We see a bigger impact on the first 5 capabilities in Figure 30 but less or no impact on the remaining 4. This may be expected as the architecture changes to meet the challenges of CABS will have huge impact on contract facilitation and the ability to make technology work. Also, the business need for constant change and transformation in CABS will have huge impact on business systems thinking and relationship building.

### 6.3.3 Changes in skill-level requirements for the 9 Core IS Capabilities

I will now see how the new knowledge, skills, and competences that are linked to 6 of the Core IS Capabilities for Danfoss IT may or may not change the level of business-, technical-, and interpersonal skills required for each of the capabilities, when Danfoss IT has to support the business units competing in dancing, rugged landscapes.

Figure 31 below shows the 6 Core IS Capabilities with their default level required for each in business-, technical-, and interpersonal skills. I have marked the naturally important skills requiring high levels with bold font. Looking at the added knowledge, skills, and competences for Danfoss IT, when supporting the business units in CABS, I see only the need to raise the skill level in two areas from the default levels.

These areas are primarily Architecture Planning, where the addition of the competence of “process redesign understanding” would make sense to require a higher than the default Low-Medium level of skill in business understanding, especially based on the purpose for Business Application to

send staff to this training, where they are to help achieving the goal of facilitating the BPM/MDM/BI redesign. Secondly it is the area Making Technology Work, where the addition of the competence “process improvisation” also may require a higher level of business understanding from Low to Medium or maybe more. Knowing when it is acceptable to deviate from existing processes requires the person to make a judgment call on the business impact from that action.

| Core IS Capability               | Skills:                        |             |               | New knowledge, skills, and competences   |
|----------------------------------|--------------------------------|-------------|---------------|--|
|                                  | Business                       | Technical   | Interpersonal |  |
| <b>Business Systems Thinking</b> | <b>High</b>                    | Medium      | Medium        | Anticipate business needs<br>Business understanding<br>Danfoss business savvy  |
| <b>Relationship Building</b>     | Medium                         | High        | <b>High</b>   | See business value from new IT<br>Advice Business of IT solutions<br>Project Managers w. Outside-In view<br>Collaborate with LOB and Partners  |
| <b>Architecture Planning</b>     | Low-Medium<br>↓<br><b>High</b> | <b>High</b> | Medium        | <b>Process redesign understanding</b><br>Sprint and SCRUM project management<br>Project Management competences<br>Developing end user reconfigurable solutions<br>Monitor emergent architectures |
| <b>Make Technology Work</b>      | Low<br>↓<br><b>Medium</b>      | <b>High</b> | Low-Medium    | Know how to exploit new technology<br>Service Transition & Problem Solving<br>Anticipate emerging LOB needs and IT<br><b>Process improvisation</b><br>Do things right the first time             |
| <b>Contract Facilitation</b>     | Medium                         | Medium      | <b>High</b>   | Objective supplier assessments<br>Make or buy decision capabilities<br>Know architecture & infrastructure plans  |
| <b>Informed Buying</b>           | <b>High</b>                    | Medium      | <b>High</b>   | Participate in LOB projects early<br>Systems thinking & Compliance mindset   |

**Figure 31** – New knowledge, skills, and competences influence on skills of the 9 Core IS Capabilities

So even though we add 22 new areas of knowledge, skills, and competences to the 9 Core IS Capabilities for Danfoss IT, it seems that only two of the capabilities require a change in “skill” level from Low-medium to High and from Low to Medium, which is Architecture Planning, where more business understanding is required when adapting the capabilities to dancing, rugged landscapes and Make Technology Work, where more business understanding is required to improvise process deviation when needed.



### **6.3.4 Bottom-line evaluation**

I have evaluated the impact from Danfoss competing in CABS on the 9 Core IS Capabilities, and can now answer the third research question of what impact Danfoss A/S competing in a dancing, rugged landscape will have on the Core IS Capabilities in Danfoss IT by concluding that 17-22 new areas of knowledge, skills, and capabilities need to be added and developed, depending on whether or not Danfoss IT wishes to follow the 7 Guidelines from El Sawy and Pavlou. I can also conclude that these 22 areas will generally not require change in the level of business-, technology- and interpersonal skills required for the 9 capabilities; only Architecture Planning and Making Technology Work require a higher level of business understanding than before.

## **6.4 Discussion of the empirical data, analysis, and methodology**

In this section I will discuss the data collection, the quality of the empirical data, the analysis and evaluations performed, and the overall methodology of the project.

### **6.4.1 Discussion of the empirical data foundation**

At the end of section 4.2 I indicated the high possibility of bias in the interviews, but I also explained how the respondent were the authoritative sources of information regarding the goals for each functional area of the IT unit with no obvious reasons to withhold information. At the end of section 5.2 I revisited this bias and was able to confirm that the interview data were in alignment with the 7 Must-Win-Battles in the IT Perspective, which I have confidential access to.

Bias in regards to confidentiality aside, there might have been possibilities to improve the empirical foundation for the models and analysis, if I had used the full IT Perspective, as there could be some connections to the 3 new IS quests that the respondents did not see or even acknowledge as being valid. But at the same time I will expect the respondents to speak with more confidence about the underlying motives behind the goals than I could possibly deduce from analyzing the IT Perspective documentation. So, all in all, I do not find that bias or data accuracy are sources of concern for this project.

My planning and collection of empirical data were detailed in chapter 4, where the data quality is highly dependent on my assumed model of cause and effect relationships, which were illustrated in Figure 18. This model guided both my collection of empirical data and my analysis later, so this is a natural area of concern, when discussing the empirical data in a project; have I collected the right data?

However, I feel confident in the general assumptions made due to the simplicity of the model, my previous education in management concepts, and knowledge from relevant articles or books (see the Scope section in the introduction) covering the areas of skills, competences, and capabilities. There was a clear alignment between the data collected and their usefulness in the analysis because of the planning, which has also minimized waste in the process.

If someone else had completed this project, then that person may have chosen a different, but equally valid, approach. One such approach could have been to focus only on the knowledge, skills, and competences needed by the IT employees for the future and then later have analyzed how these would have an effect on or been compatible with the IT unit's ability to support the firm in a changing, rugged landscape. I considered looking at organizational theory for the IT unit in the beginning of this project, but chose to focus on the Core IS Capabilities, as I found them more interesting and more urgently relevant to work with in relation to CABS. But, all in all, I find the empirical foundation to be solid in this project.

#### **6.4.2 Discussion of the analysis and evaluations**

Planning my analysis I explained how I would code and later categorize blocks of data in alignment with my assumed model. I also discussed why these data from semi-structured interviews were better analyzed this way rather than using the Grounded Theory methodology. Also, due to the nature of this project, there were no previous method or process for collecting and measuring fulfillment of the 3 new IS Strategy quests. I could have used other means of collecting the empirical data, e.g. surveys, but using semi-structured qualitative interviews allowed the respondents to contribute more freely and broadly, than surveys would have allowed them to do.

In my evaluations I have been careful to define my criteria and method of measurement. This has assured a degree of objectivity, which would allow other researchers to re-evaluate my empirical data using different criteria and to discuss my findings and conclusions, as differences in results will be linked to the process, criteria, and measurement, rather than subjective argumentation. So I find that the analysis and evaluations are founded in good research discipline.

#### **6.4.3 Discussion of the project's methodology**

There could be many ways to approach this project and several different goals that would be interesting to research. My approach has been to balance the paradigm shift from Venkatraman et al with the practical needs of an IT unit in trying to solve a problem and to give advice on what we should do differently than before.

This project has not been following the more traditional methodology of data collection based on a fixed theoretical lens, a data analysis to understand the practical problem through the theoretical lens, and followed by a discussion and conclusion based on the recommendations found in the theoretical lines.

So I believe this project has dared to move a little outside the traditional comfort zone of known methodologies for projects of this kind and scope, where I have built upon the still open and unanswered research questions of Venkatraman et al by testing their paradigm on a case and linking the effect to a well-known theoretical framework on Core IS Capabilities, which required me to develop the methodology as well as the analysis- and evaluation methods along the way. I spent almost half of the pages in this project to get to where I could accurately reframe the research questions, because of the need to first unravel and explore the problem situation and the concepts related to further analysis.

The only part of this project that I intuitively feel could be perceived a little weak is the Analysis chapter, but I still feel the method used is solid as the resulting models focus on the layers rather than accurate linking of items between layers. The actual linking of knowledge, skills, and competences to the 9 Core IS Capabilities were done in the following chapter with evaluations and discussion, where the methods used were more precisely defined.

## **7.0 Conclusion**

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I will now end this project with a summary of the answers to the 3 research questions and then look at the project from a higher perspective and include some personal reflection on writing this project.

### **7.1 Conclusion summary**

In this project I phrased 3 research questions. First I wanted to answer how well the path chosen by Danfoss IT in the IT Strategy and IT Perspective would fulfill the 3 new IS Strategy quests proposed by Venkatraman et al. My conclusion was that Danfoss IT could expect medium to high fulfillment, provided that Danfoss IT builds the knowledge, skills, and competences required through continuous training of the employees and building of trustworthiness. This is based on the effort from the goals in the strategies and the ability Danfoss IT has to affect the 3 new quests.

Secondly, I wanted to answer how the 7 Guidelines by El Sawy and Pavlou could improve the path taken for Danfoss IT in fulfillment of the 3 new IS Strategy quests and how they could be implemented. To this research question my conclusion was that the 17 required areas of knowledge, skills, and competences identified by the IT managers in the interviews may be expanded by adding 5 extra; bringing it to a total of 22 areas. These 5 extra also had recommendations for implementation.

Thirdly, I wanted to answer what impact Danfoss A/S competing in a dancing, rugged landscape would have on the Core IS Capabilities in Danfoss IT. My conclusion was that 17-22 new areas of knowledge, skills, and capabilities need to be added and developed to 6 of the 9 Core IS Capabilities, depending on whether or not Danfoss IT wishes to follow the 7 Guidelines from El Sawy and Pavlou. I also concluded that these 22 areas will generally not require changes in the level of business-, technology- and interpersonal skills required for the 9 capabilities, as only 2 of them did so in the level of business skill.

### **7.2 Higher perspective and personal reflection**

This project has explored the impact of a company competing in dancing, rugged landscapes on the IT unit in a case and how the IT unit responds to this situation through the goals in the IT strategy (IT Perspective). The paradigm shift with 3 new IS Strategy quests suggested by Venkatraman et al was tested and I found that Danfoss IT is actually trying to accomplish the same things as the 3 new quests. I first verified that Danfoss A/S was competing in complex adaptive

business systems (CABS) and made the point that most companies competing in monopolistic competition or oligopoly would also be doing that.


The consequence of this is that all major companies may have to cope with the challenges of CABS and will depend on the IT units to support them. I think this is an important lesson, because IT units that only support what El Sawy and Pavlou calls the firm's Operational capability, but neglect to support Dynamic- and Improvisational capabilities in dynamic turbulent markets, will not bring more value to the firm than a sourcing partner. Internal IT units must address this challenge or could risk being outsourced.

By analyzing and evaluating the impact CABS had on the knowledge, skills, and competences required in the IT unit, I think there is a shift. I found that many of them focused on business needs and architecture. El Sawy and Pavlou saw the IT infrastructure capabilities as the enablers of the Business Capabilities Trifecta. Naturally the IT unit must have the technical competences to make technology work, but there seem to be needed a much tighter integration of the IT unit in the business to operate successfully in dynamic turbulent markets; what el Sawy and Pavlou calls to have IT woven into the enterprise's business fabric. The future research in this area will be interesting to follow as will the research that takes up the challenge from Venkatraman et al.

My own reflection on writing this project is that it has been interesting to discuss the IT Perspective with the IT managers using the concept of the dancing, rugged landscape from Complexity Science to describe the markets Danfoss A/S competes in. This metaphor immediately opened the conversations to make the goals of the IT Perspective more clear, when discussing topics like time to market, agility in delivery of solutions, sourcing partners, etc. Many of the IT managers immediately saw parallels to the goals of the corporate strategy and the challenges Danfoss A/S is trying to cope with in that.

## Appendixes

### Appendix 1 – “Only 3 articles yet quote the article by Tanriverdi, Rai, and Venkatraman”

[Advanced Scholar Search](#)

☐ Search within articles citing [Tanriverdi: Research Commentary--Reframing the Dominant Quests of Information Systems Strategy...](#)

**Scholar** All  anytime  include citations   [Create email alert](#)

[IT-Enabled Services as Complex Adaptive Service Systems: A Co-Evolutionary View of Service Innovation](#)  
BK Chae... - 2011 - [aisel.aisnet.org](#)  
Abstract The conceptualization of IT-enabled services (IESs) and service innovation are important topics. This research-in-progress attempts to offer a novel perspective on these two topics. Drawn upon complex theory, we conceptualize services (IESs) as complex ...

[A Coevolutionary Journey of Strategic Knowledge Management Alignment: A Chinese Case](#)  
NN Zhang, AY Yu... - 2011 - [aisel.aisnet.org](#)  
Abstract Although knowledge has emerged as the strategic resource of the firm in the increasingly turbulent and dynamic environment, it is underestimated how knowledge management (KM) contributes to sustained competitive advantage of the firm over time. ...

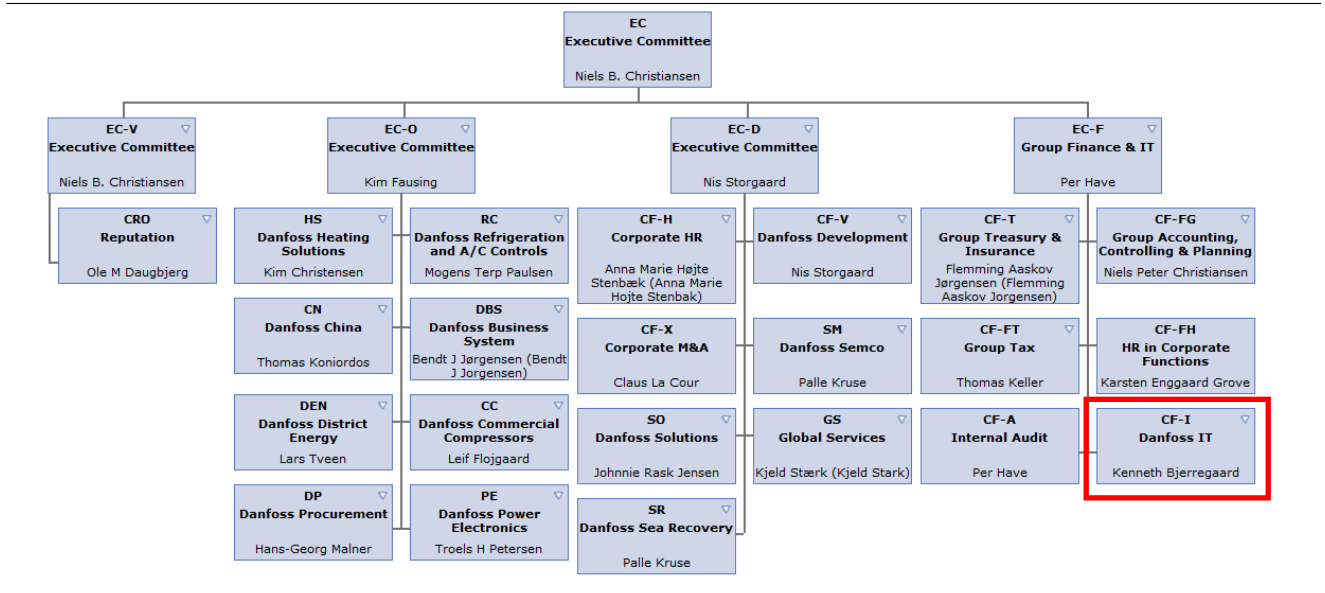
[Same organization, same electronic health records \(EHRs\) system, different use: exploring the linkage between practice member communication patterns and EHR ...](#) [\[PDF\]](#) from [hollylanham.com](#)  
H Jordan Lanham, LK Leykum... - *Journal of the American ...*, 2011 - [jamia.bmj.com](#)  
Objective Despite efforts made by ambulatory care organizations to standardize the use of electronic health records (EHRs), practices often incorporate these systems into their work differently from each other. One potential factor contributing to these differences is within- ...  
[AUB Link \(Services\)](#)

[Create email alert](#)

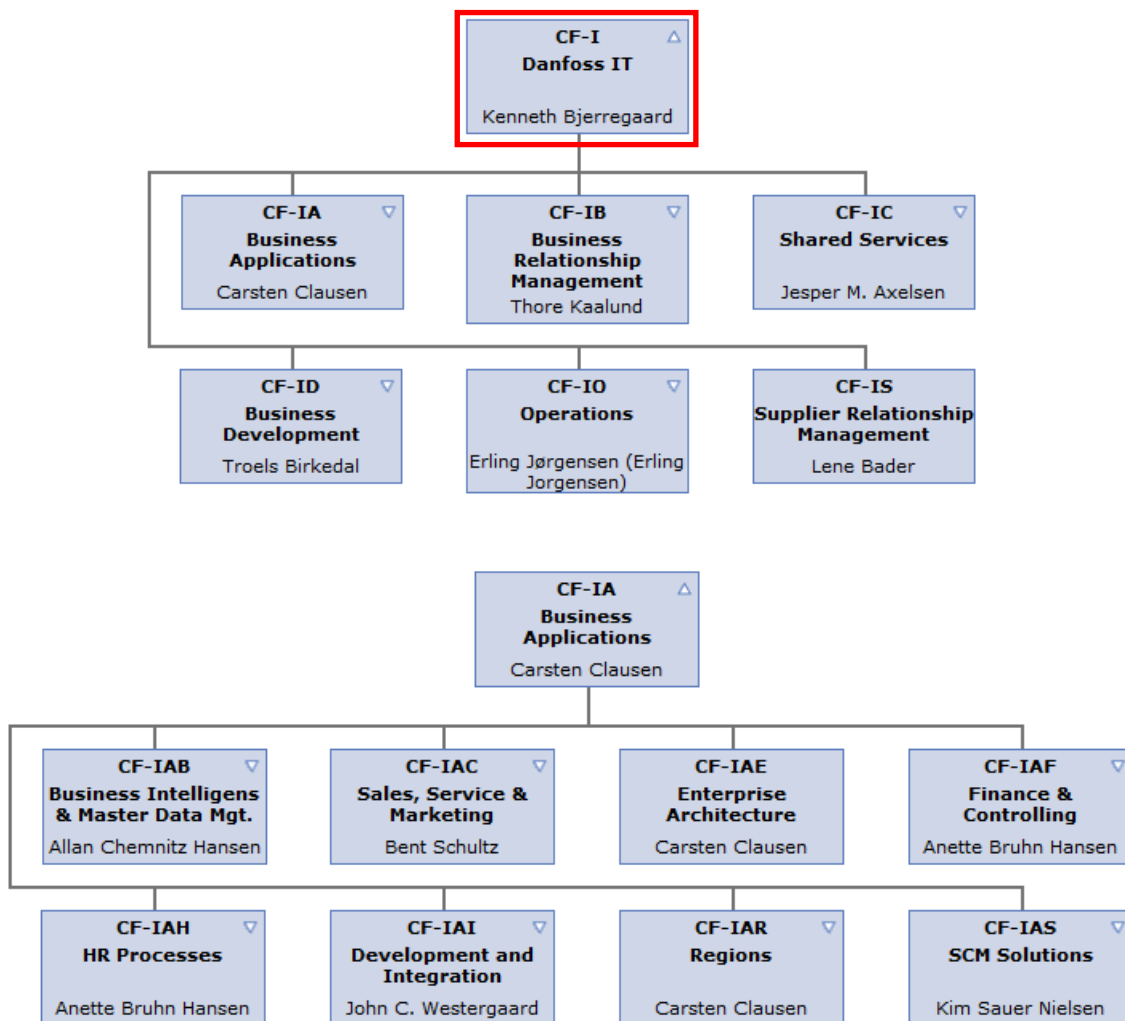
Source: Google Scholar (Last accessed 2012-01-03)

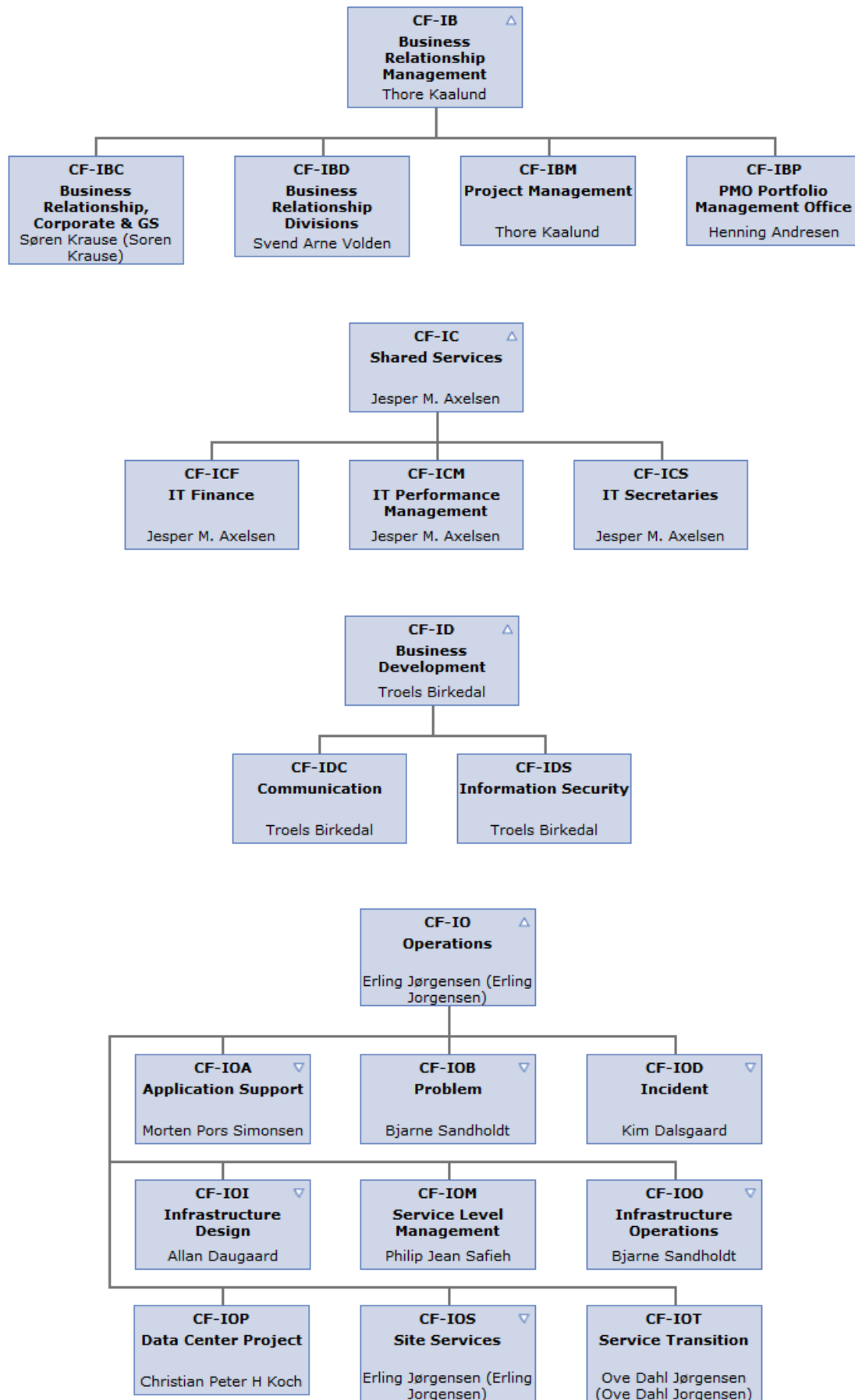
## Appendix 2 – “The Danfoss Organizational Charts, incl. IT Organizational Structure”

### Danfoss Directory - Organization Chart - Business Structure



Business Structure » Danfoss





Source: Danfoss intranet (Last accessed 2011-11-01)



## SIDE 2

TAGE  
OTKJÆR

ERHVERVSREDAKTØR



# Danfoss vil både blæse og have mel i munden

Danfoss bryster sig af social ansvarlighed – men kæmper også mod kunder, man har snydt.

**D**e har sikkert rode orer i ledelsen af den familieejede virksomhed Danfoss.

Teknologiproducenten er nemlig blevet involveret i en verdensomspændende kartelsag om prisaftaler på kompressorer til køleskabe. En sag, som topchef Niels Bjørn Christiansen har kaldt »utrolig, ærgerlig og meget pinagtig«.

Danfoss er i søgelyset i USA, Brasilien, Mexico, Chile, New Zealand og EU. Fordi en ny ledelse hos den brasilianske konkurrent Tecumseh i 2008 alarmerede myndighederne og indrømmede prisaftalerne – for at få lavere straf, forstås.

Siden har amerikanske Whirlpool, japanske Panasonic og italienske ACC indrømmet de ulovlige aftaler. Men hidtil ikke Danfoss – der dog i halvårsregnskabet har måttet afsætte 720 millioner kroner til mulige kommende bøder.

Danfoss' ulyst til at indrømme kan umiddelbart overraske, for EU giver 10 procent rabat på bøden i tilståelsessager. 72 millioner er trods alt også penge. Men ledelsen tøver, fordi en tilståelse vil give de svedne kunder vind i sejlene i

det civile søgsmål, der er på vej i USA.

Danfoss sidder altså og regner på, hvad der er billigst, mens virksomheden med en række dyre advokater gør, hvad den kan for at modarbejde de ramte kunder i USA.

Nu er det ingen udyd at kæmpe for sine ejere. Men det harmonerer ualmindelig ringe med, at Danfoss normalt bryster sig af høje standarder, når det gælder Corporate Social Responsibility (CSR) – at virksomheden har et omfattende socialt ansvar. Danfoss tilsluttede sig i 2002 Global Compact, der er FN's program for social ansvarlighed.

I det lys virker prisaftaler gennem 12 år opsigtsvækkende. Aftalt på møder i lufthavne, indkaldt via mailadresser og telefonnumre uden tilknytning til virksomheder. Hemmeligholdt gennem f.eks. manglende flyoplysninger og aftaler om referatforbud. Men afsløret af Tecumseh.

## Masser af kartelsager

Nu er Danfoss langt fra alene om at være ude i noget snavs. Andre – såsom 200 elinstallatører, Logstor Rør, SAS, Maersk Air, FLSmidth, nogle lokalbanker på Sjælland og Sydhavsoerne, Arla Foods, nogle mobilselskaber, Danske Busvognmænd og to laboratorier – har fået bøder eller indrømmet ulovligheder. Aktuelt undersøges A.P. Møller – Mærsk samt 15 mindre entreprenører for ulovlige priskarteller.

Men det kommer til at klinge hult, når Danfoss 29. september er vært ved en stor CSR-konference, der skal skabe opmærksomhed om en ny fond, CSR-Fonden, som Danfoss er medsponsor for. En fond, der naturligvis skal sætte spot på alt det ansvarlighedsarbejde, mange virksomheder udfører.

En ting er, at Danfoss er blevet taget med fingrene i kagedåsen i form af ulovlige prisaftaler. Selv om uvidenhed i topledelsen hverken er et argument

mod EU's bøder eller fængselsstraffe i USA, må man erkende, at verden er stor, og at medarbejdere kan begå ulovligheder.

Men nu, hvor ulovlighederne er erkendt af konkurrenterne, virker det meget gammelkapitalistisk og meget lidt socialt ansvarligt, at Danfoss udelukkende agerer under hensyn til ejernes økonomiske interesser i valget mellem at erkende ulovlighederne eller ej. Og meget lidt socialt ansvarligt at modarbejde kunder, som har betalt ulovligt høje kartelpriser.

**Det er et fundamentalt valg mellem ordentlighed og penge**

Det er et fundamentalt valg mellem ordentlighed og penge. Når Danfoss både vil blæse og have mel i munden, så ser melet ikke rent ud.

tage.otkjær@pol.dk

Source: Danish daily newspaper "Politikken", Økonomi - section, September, 21st, pp. 2, 2011

## Appendix 4 – “Interview Guide – slideshow for explaining and guiding the interviews”

MAKING MODERN LIVING POSSIBLE

*Danfoss*

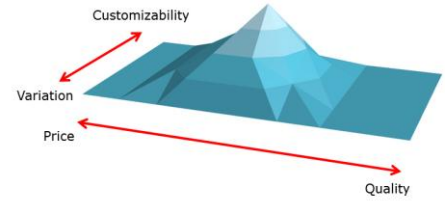
### Master in IT Interview Guide



www.danfoss.com

*Danfoss*

### Simple Competitive Landscape



Customizability

Variation

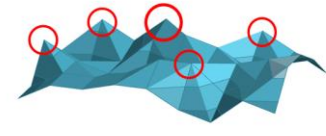
Price

Quality

Department (slide master)      Optional text      Date | 2

*Danfoss*

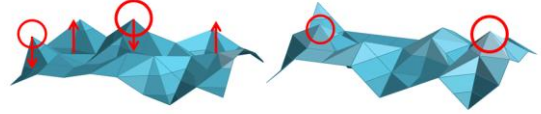
### Rugged Landscape



Department (slide master)      Optional text      Date | 3

*Danfoss*

### Dancing, Rugged Landscape (complex adaptive business systems – CABS)



Department (slide master)      Optional text      Date | 4

*Danfoss*

### 3 Classic Quests of IT Strategy Research

- Alignment
  - **competitive strategy** (how the firm gains an advantage over its rivals within the product-market positions it has chosen)
  - **corporate strategy** (choice of product-markets in which the firm positions itself and competes)
- Integration (IT and process across firm boundaries)
  - Suppliers
  - Partners
  - Customers
- Sustained Competitive Advantage
  - Knowledge management
  - Business intelligence

Department (slide master)      Optional text      Date | 5

*Danfoss*

### 3 New Quests of IT Strategy Research

- **Co-evolution of the firm with the dancing rugged landscape**
  - Identify and exit positions whose profitability is declining
  - Identify and enter positions whose profitability is rising
  - Keep its portfolio of product-markets positioned in profitable peaks
- **Re-configuration**
  - Reconfigure its nexus of global contracts, resources, and transactions
- **Renewal**
  - Stabilize and exploit competitive advantages of the firm for a temporary period
  - Destabilize and unlearn the sources of previous advantages
  - Learn about, create, and stabilize new sources of advantages; and continually repeat this pattern

Department (slide master)      Optional text      Date | 6

## Danfoss' new path: IT Strategy & IT Perspective

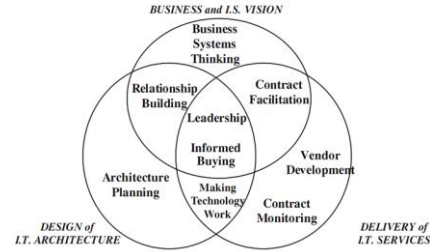
- How and how much do these new initiatives fulfill the 3 new quests for CABS?
  - Co-evolution
  - Reconfiguration
  - Renewal
- What expectations are there to the market in the IT Strategy and IT Perspective?
  - Market changes and competition dynamics (alignment)
  - Partnering and cooperation (integration)
  - Innovation (sustained competitive advantage)

Department (slide master)

Optional text

Date | 7

## Core IS Capabilities



Department (slide master)

Optional text

Date | 8

## Core IS Capabilities

| Core IS Capability:                | Description:  |
|------------------------------------|---|
| 1 IS/IT Governance (Leadership)    | "integrating IT effort with business purpose and activity"  |
| 2 Business Systems Thinking        | "ensuring that IT/e-business technologies capabilities are envisioned in every business process"  |
| 3 Relationship Building            | "getting the business constructively engaged in IT issues"  |
| 4 Designing Technical Architecture | "creating the coherent blueprint for a technical platform which responds to present and future business needs"  |
| 5 Making Technology Work           | "rapidly trouble-shoot problems which are being discerned by others across the technical supply chain, and to identify how to address business needs which cannot be properly satisfied by standard technical approaches" |
| 6 Informed Buying                  | "analysis of the external market for IT/e-business services; selection of a sourcing strategy to meet business needs and technology issues; leadership of the tendering, contracting, and service management processes"   |
| 7 Contract Facilitation            | "ensuring the success of existing contracts for IT services"  |
| 8 Contract Monitoring              | "holding suppliers to account against both existing service contracts and the developing performance standards of the services market"  |
| 9 Vendor Development               | "identifying the potential added value of IT/e-business service suppliers"  |

Department (slide master)

Optional text

Date | 9

## Danfoss' new path: IT Strategy & IT Perspective

- How must these Core IS Capabilities be strengthened as a result of the new IT Strategy and IT Perspective?

Department (slide master)

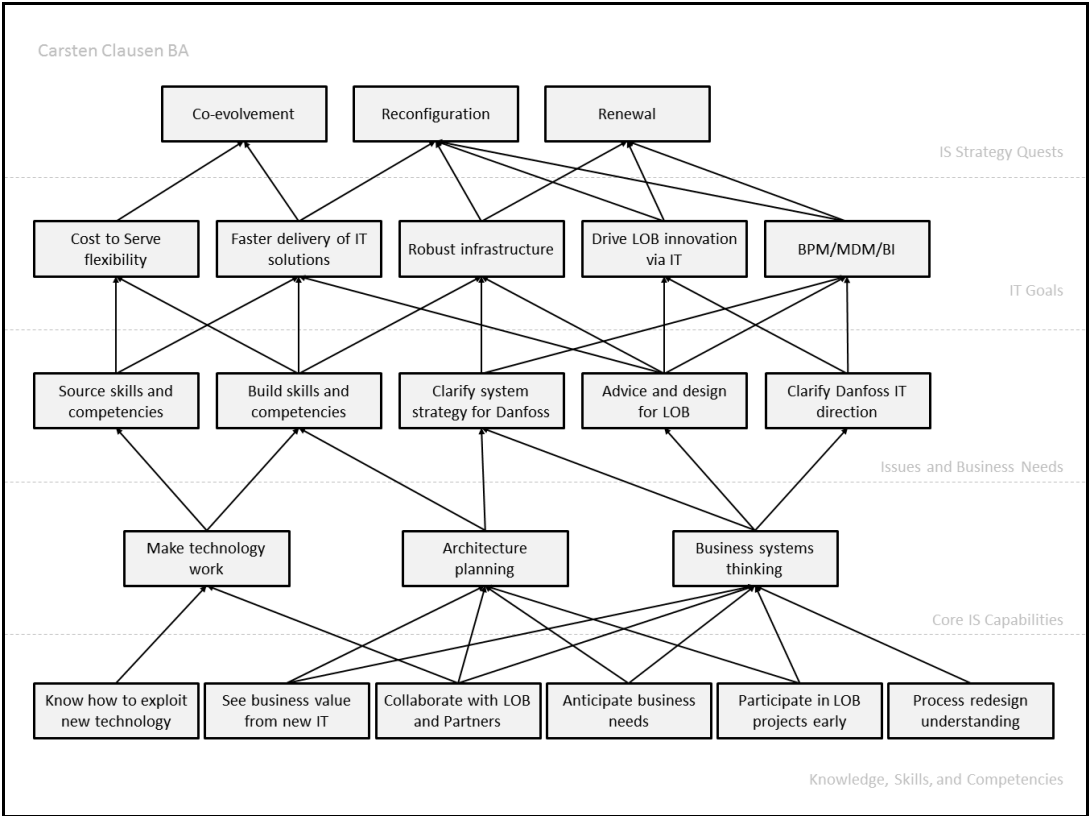
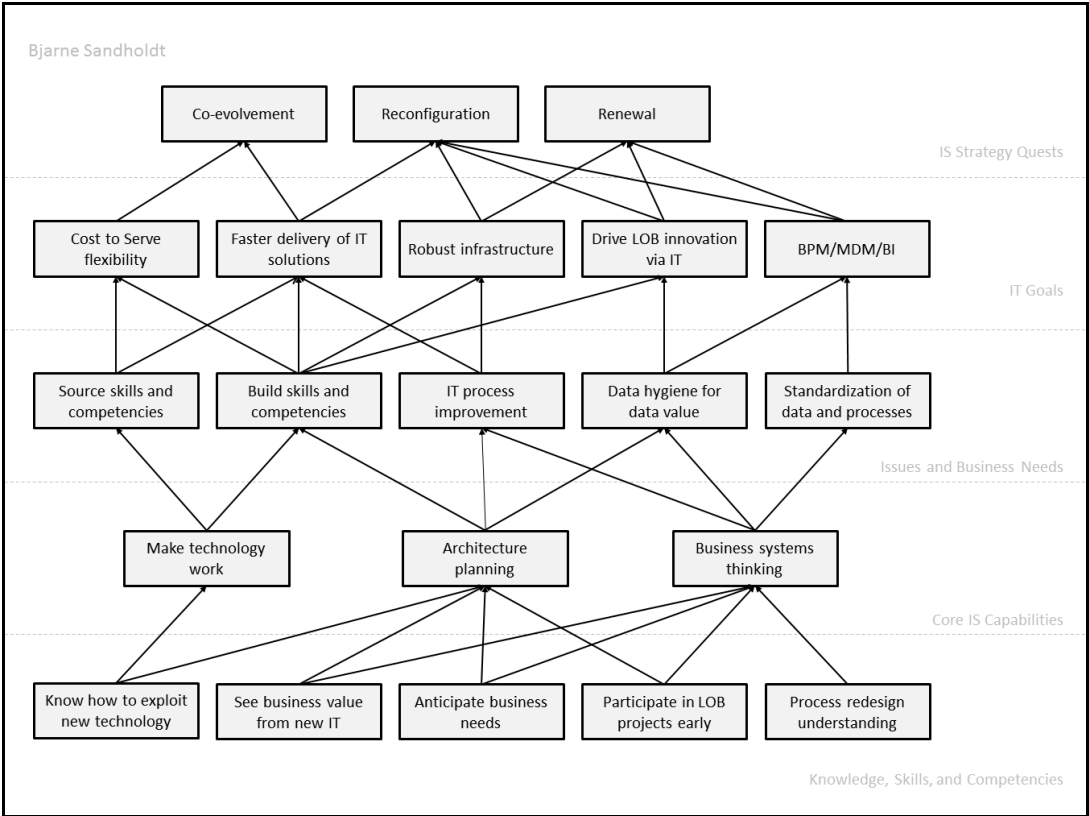
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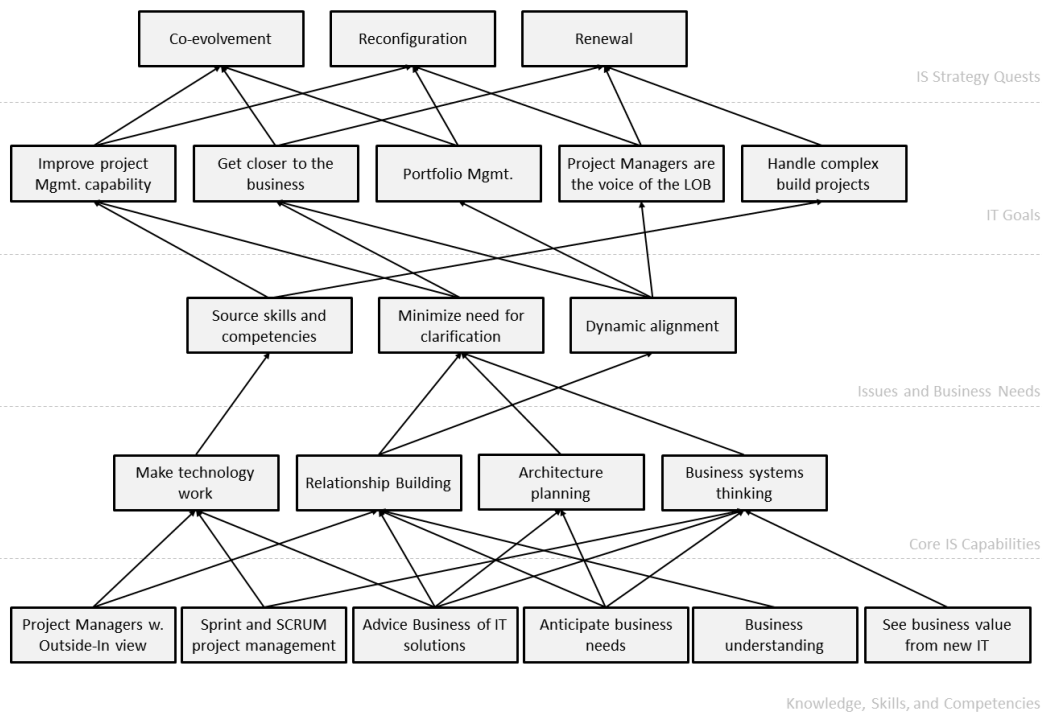
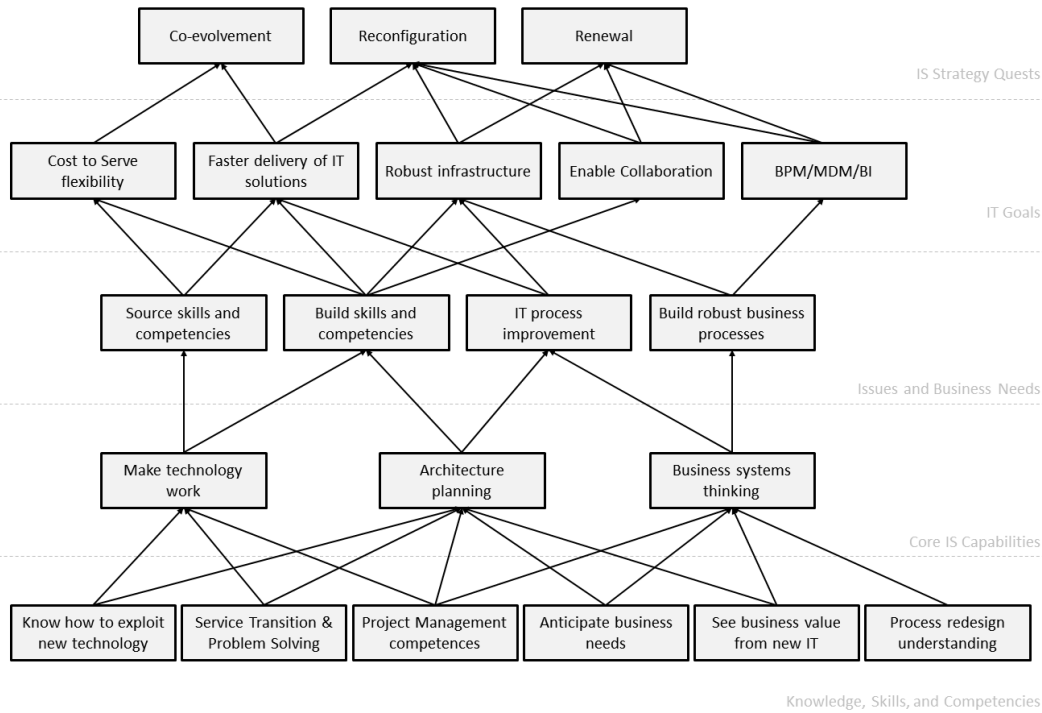
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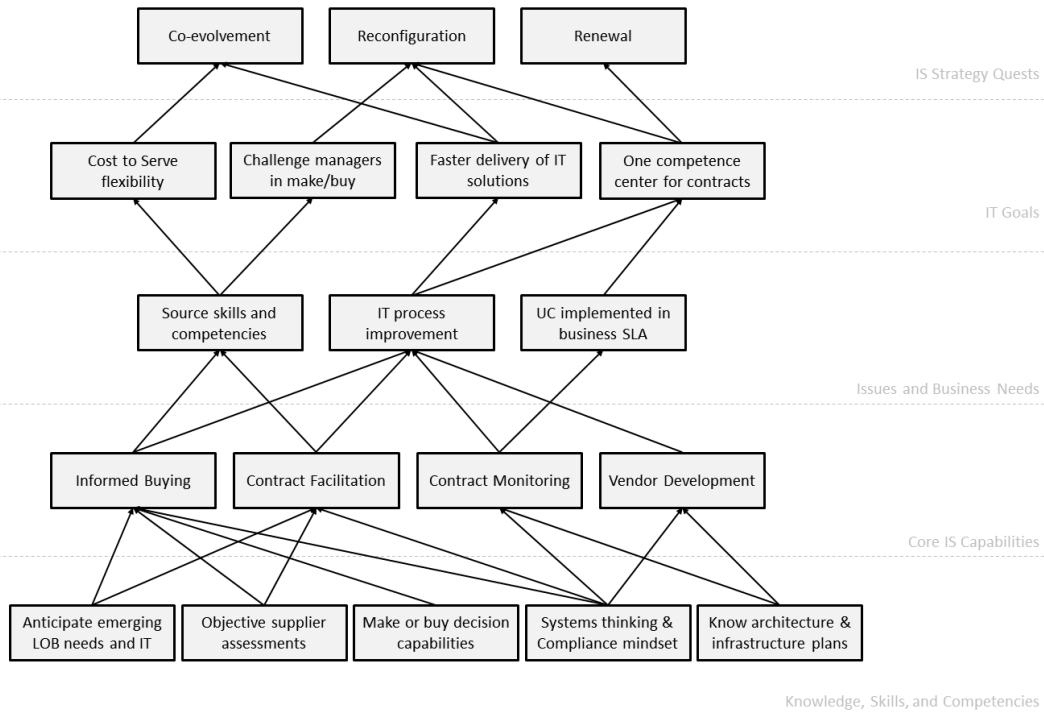
## Appendix 5 – “Mind Map of the 5 interviews – to illustrate data structure complexity”



Appendix 6 – “Data models for each of the respondent’s areas”







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