DIGITAL TRANSFORMATION

HOW APIS DRIVE BUSINESS MODEL CHANGE AND INNOVATION

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ABSTRACT

Over the years, information technology has created opportunities to improve and extend businesses and to start conducting business in new ways. With the evolution of IT, all businesses and industries are becoming increasingly digitized. This process, or coevolution, of IT and business coming together is called *digital transformation*. One of the recent trends in this digital transformation is the use of application programmable interfaces (APIs). APIs are standardized digital communication interfaces, used for communication and exchange of information between systems, services and devices (such as computers, smartphones and connected machines). API communication is one of the foundational building blocks in recent disruptive technology trends such as mobile and cloud computing.

The purpose of this study is to gain an understanding of the business impact that is created in digital transformation related to the use of APIs. To investigate this novel area, an exploratory study is performed where a frame of reference with an exploratory framework is created based on established academic literature. The exploratory framework consists of three main parts which cover the research questions, including *Business Drivers, Business Model Change & Innovation* and *Challenges & Limitations* related to API-enabled digital transformation. The framework is used to gather empirical data consisting of two types, interviews (primary data) and contemporary reports (secondary data). Interviews are performed with API-utilizing companies, consulting firms and IT solution providers and contemporary reports are published by consulting and technology research and advisory firms.

Two main business drivers are identified in the study. The first is *Understanding & Satisfying Customer Needs* which is derived from companies experiencing stronger and changing demands for automated, personalized value-adding services. This requires higher degree of integration across channels and organizations. The second driver is *Business Agility*, which derives from higher requirements on adapting to changing environments while maintaining operational efficiency. *Cost Reduction* is also mentioned as a third and secondary driver, as a positive side-effect in combination with the other drivers. The identified impact on business models is that business model innovation is mostly happening in the front-end of business model towards customers. Several examples also exist of purely API-enabled businesses that sell services or manage information exchanges over APIs. The challenges and limitations identified are mostly classic challenges of using IT in businesses and not specific to use of APIs, where the general consensus is that IT and business need to become more integrated, and that strategy and governance for API-initiatives need to be established.
KEYWORDS

TERMINOLOGY
The following are descriptions and definitions of central terms and abbreviations that are used in the thesis.

**Digital Transformation:** The digitalization of business and economy, where information, communication and assets are becoming digitized and connected.

**Application Programming Interface (API):** Standardized machine-readable digital communication interface for a system, application or software component. APIs have a wider interpretation with the origins in software development, though the focus of this thesis is solely on higher-level software communication associated with a business entity or activity. APIs can be designed to have open or restricted access and be exposed both internally and externally of an organization's network.

**API-fication:** The process where businesses make data and functionality in existing systems and applications accessible through APIs and shift into using service-oriented architectures using API-based communication.

**API Economy:** a term coined to describe the growing economic impact of APIs, driven by trends such as cloud, mobile and social computing that all utilize APIs. Through APIs, organizations can reuse, share and monetize on existing assets, improve or extend services and provide new revenue streams.

**Business Network:** The perspective of a business and its environment as a network of roles that exchange tangible or intangible resources. This is also known as value network, strategic network, value web or business ecosystem.
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1 INTRODUCTION

The chapter introduces the reader to digital transformation and the current developments in the trend of API-enabled digital transformation. The intention is to give an overview of the thesis's topic and the background to why this is important for companies to take into account and followed by the purpose of the thesis and the related research questions.

1.1 BACKGROUND

1.1.1 THE COEVOLUTION OF IT AND BUSINESS

Since the first commercial computers were launched in the late sixties, information technology (IT) has come a tremendous way. Over time, businesses have adopted IT to boost productivity, flexibility and improve communication and processing of information. IT have also presented new ways of conducting business and introduced new markets. The process and coevolution where business and IT are coming together is called digital transformation (Capgemini & MIT, 2011). This means that the business is subject to a transformational process in which the business and its environment are becoming increasingly digitized. Gartner (2015) states that:

“Digital transformation consulting particularly helps [business] leaders in efforts to leverage digital technologies that enable the innovation of their entire business or elements of their business and operating models”.

The evolution of how businesses have been thinking about using IT for value creation can be divided into three waves (Cohn et al., 2014). First, businesses focused on automating and reducing cost of operational and management processes. Then the internet introduced new opportunities for entirely new business models, new means for communication and a revolution in delivery of electronic content. Today, assets in businesses are becoming digitized in companies everywhere, and a third wave of IT-enabled innovation is emerging. This currently ongoing development presents new opportunities for companies to expand old businesses or build new ones (Cohn et al., 2014).

1.1.2 THE EXPONENTIAL RISE IN DATA CREATION

In this third wave of IT-enabled innovation, the exponential rise in data creation is one of the fundamental drivers (Cohn et al., 2014). Over the past 20 years there have been statements that information and technology will change how businesses compete, but until now, these predictions have never fully come true. Years of promised technology has taken root and the pace of technology change accelerates has led to the amount of
data generated worldwide is doubling every 18 months (McKinsey, 2012). Still, many companies see IT as a facilitator of business. Other companies are recognizing IT as a driver of business, where technology is driving innovation and improving performance (McKinsey, 2012).

The emerging technology stem from a variety of sources today, increasing usage of mobile devices and smartphones has enabled new channels to engage customers (Hewlett-Packard Labs, 2012; McKinsey, 2012). New levels of automation are possible through embedded sensors and “the Internet of Things”. Scalable and agile business models have been driven by cloud computing or vast stores of data from transactions, interactions through Internet and digitalization of processes (McKinsey, 2012). One effect of the emerging technology is the accelerated need to have flexible software at the core of what organizations do which makes the organization’s core systems and resources accessible universally (Hewlett-Packard Labs, 2012; 3scale, 2014).

1.1.3 API-ENABLED DIGITAL TRANSFORMATION

Businesses have always had a common vision of using IT to create solutions that are flexible and reusable through modularization, and using APIs is one of the more recent trends within this vision. APIs, Application Programming Interfaces, are standardized communication interfaces for software, computer and machine communication. Their use originates from software development where they are used to facilitate interaction between software components, systems or layers in order to increase modularity and reusability of code.

In recent years, much boosted by the popularity of web services and service-oriented architecture (SOA), APIs have become an important tool for higher level communications between services and systems that represent business processes or units. In SOA, standardized communication interfaces between IT services apply this approach of achieving modularity to support a more agile and service oriented business (Bell & Marks, 2006). At the same time, digital transformation of businesses have made IT services more closely linked, sometimes completely reliant, to the facilitation of business processes, activities or units. Because of this, these high-level applications of APIs have become a major enabler for a modular, networked, digital business.

But the use of APIs is not limited to the endeavor for flexible solutions. Features for controlling access to communication interfaces have been developed, allowing companies to securely expose APIs both internally and externally. With this in mind, APIs enable a whole new level of accessibility by providing secure and granular exposure of data, business processes, services and resources, breaking traditional
boundaries between isolated systems. This allows organizations to start creating compelling new business platforms and seamless integrations within and between organizations, a trend which is referred to as API-fication (3scale, 2014). There are many examples of how APIs create business opportunities to generate growth for companies (Iyer & Subramaniam, 2015). And as the internet of things emerges, bringing digitization to all kinds of products and services, the influence of APIs is growing far beyond technology firms. And therefore, all businesses should realize and consider the increasing strategic significance of APIs (Iyer & Subramaniam, 2015).

McKinsey & Co (2015) highlights several recent trends that have increased the strategic importance of APIs. The first one is the tremendous growth of the mobile app market, where APIs play an important role as an important building block for apps. The second trend is the recent successful examples of companies who have embraced APIs and profited very well, such as Salesforce.com and Expedia who generated $1.5 billion (50% of total) and $1.8 billion (38% of total) revenue respectively through their APIs in 2013. The third trend is the emergence of the niche market with providers of software solutions for API management, in which there have been several major acquisitions by large IT companies recently. Some examples include Mashery that was acquired by Intel, Layer 7 that was acquired by CA Technologies and Apiphany that went to Microsoft.

All of these changes that are related to the use APIs are part of the larger trend of digital transformation. This process of APIs acting as an enabler and foundation in digitalization of business, that drives change within and across businesses and industries, is therefore called API-enabled digital transformation. In this transformational process, business models operated by companies will change in both evolutionary and disruptive ways as exemplified above, from incremental business change such as internal process reconfiguration to radical innovation through cross-industry collaborations.

1.1.4 THE NEED TO UNDERSTAND THE IMPACT OF APIS

Given the background that has been presented above, it is evident that APIs have, and will continue to have, great impact on businesses and the way they operate. Though many interesting examples of API-enabled change and innovation exist, most of the examples are exclusive to young and digital companies. The impact on traditional industries which are more or less technology intensive is yet to be explored. Organizations in these industries need to understand how API-enabled digital transformation will affect their business models and what challenges that may lie ahead and they need to use this understanding to prepare themselves for the future.
Ericsson AB, the company for which this study is performed, is a one of the world-leading providers of communications networks, telecom services and support solutions. Being a technology intensive company, Ericsson has been subject to the effects of digital transformation for several years. And the impact of this transformation will continue as Ericsson is shifting its business focus towards software and services focus, when the telecomm products are becoming increasingly virtualized. In an industry which is centered about communication, API-enabled digital transformation will surely impact Ericsson’s reality. Therefore, it is important also for Ericsson to understand the impact of API-enabled digital transformation in order to be able to formulate successful IT and business strategies.

1.2 PURPOSE AND RESEARCH QUESTIONS

Given the background presented above it is evident that it is very important for companies to understand the business impact of digital transformation in general, and more specifically API-enabled transformation. Therefore, this study is aimed to investigate current developments and impact of API-enabled digital transformation in a business perspective, to gain an understanding of future opportunities and challenges.

The purpose of his thesis is to gain an understanding of the business impact of API-enabled digital transformation.

Three research questions have been derived from the purpose. Each question aims to contribute to the purpose in a different way. The first question is about why change will happen, the second is about what kind of change, and the third is about learning how to successfully change given the circumstances. These three questions do not cover all the possible aspects of the impact from API-enabled digital transformation, but provides a solid foundation for fulfilling the purpose.

Research questions:

- Which are the business drivers that relate to API-enabled digital transformation?
- What kind of business model change and innovation does API-enabled digital transformation create?
- What are the challenges and limitations that businesses are facing in API-enabled digital transformation?
1.3 SCOPE

The intended readers of this thesis are postgraduate students in management and IT, university staff and business practitioners interested in the topic, such as chief information officers, chief digital officers, IT or management consultants or business developers. Therefore, it is assumed that the reader has foundational knowledge in management and IT.

To preserve focus on the main topic and to finish the study within the intended time frame of 20 weeks, some limitations of the scope has been done. The focus of the thesis lies on recent and future use of APIs in digital transformation of business applications, and does not cover historic aspects of APIs in software development. The intended area of study is the business-impact relating to the technology trend without performing any detailed investigation in technological aspects. The scope has also been limited by excluding any further exploration of security, legal and regulatory aspects of the topic. This is excluded since it is considered an adjacent area to the challenges of digital transformation that requires a largely different frame of reference and empirical data to be properly researched.

These limitations affect the study in terms of breadth, such as the exclusion of further technological aspects and security, legal and regulatory issues. The intended time frame of 20 weeks limits the depth of the study terms of the amount of literature, empirical data that could be gathered and analyzed.
2 METHODOLOGY

The chapter presents the academic relevance and the authors’ approach for the study and gives an overview of the workflow’s different steps. The chapter finalizes with the method of analysis and a discussion of the study’s validity and reliability.

2.1 RESEARCH APPROACH

Figure 2.1 illustrates the summarized research approach used for this thesis. Argumentation and discussion for each dimension is presented in the corresponding sections presented hereafter.

<table>
<thead>
<tr>
<th>Direction of research</th>
<th>Explorative</th>
<th>Descriptive</th>
<th>Explanative</th>
<th>Predictive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research strategy</td>
<td>Qualitative</td>
<td>Quantitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time scale of study</td>
<td>Specific point in time</td>
<td>Development over time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirical data types</td>
<td>Primary data</td>
<td>Secondary data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific approach</td>
<td>Deductive</td>
<td>Abductive</td>
<td>Inductive</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.1 Research approach summary

2.1.1 DIRECTION OF RESEARCH

The research direction of this study is of an exploratory character, due to the study’s aim to provide basic knowledge and understanding about how API-enabled digital transformation (API-fication) drive business models change and innovation.

This study focuses on understanding the drivers for change and how businesses have adapted to this change, rather than giving definite answers about what the impact will be. Lekvall & Wahlbin (2001) and Patel & Davidsson (2011) explain that an exploratory direction is usually chosen when it is difficult to specify what the actual problem is and what information are needed to solve it. It is frequently seen as pre-study that provide a problem description for further investigation. This is true for this thesis as Ericsson will use it to gain insight and understanding of the situation with API-enable digital transformation to provide decision support and a base for future implementations.

Further on, there are three additional types of research directions according to Lekvall and Wahlbin (2001), these are descriptive, explanatory and predictive and the choice depends on what type of conclusion the authors want to draw from the study, all of which are briefly described below.
Descriptive study is chosen when basic information exists and the authors want to describe a precise subject or a group of subjects rather than focusing on explaining underlying causes.

Explanatory study is conducted when the aim is to both describe and explain underlying causes to a problem. Thus, a deeper knowledge is required to be able to understand cause-effect relationships.

Predictive study build on cause-effect relationship in order to predict the future and these studies are also based on deeper knowledge, similar to an explanatory study.

These additional three types were not considered possible, due to the lack of deeper knowledge of API-enabled digital transformation and therefore neither an explanatory study nor predictive study would be suited. This thesis intends to draw conclusions thus descriptive was not chosen for the direction of research.

2.1.2 RESEARCH STRATEGY

The two most common ways of conducting a research is to use either quantitative or qualitative research strategy according to Lekvall & Wahlbin (2001).

A qualitative research strategy has been chosen for this study due to its purpose to give an understanding of how different parts work together in order to get an overview. The study is focused on soft data such as unstructured interviews and text which are then analyzed with models, frameworks and written arguments which aligns with descriptions of qualitative research strategy by Merriam (1994), Denzin & Lincoln (1998) and Lekvall & Wahlbin (2001). Another reason for a qualitative research strategy is due to the unknowing of what impact API-fication will have on business which, according to Lekvall & Wahlbin (2001) this is more common when the study is more complex or poorly understood events are studied.

Quantitative studies base conclusions on data that can be expressed in numerical form which is later analyzed using statistical methods and the purpose is to seek a deeper understanding of a specific part (Merriam, 1994; Patel & Davidson, 2011; Lundahl & Skärvad, 1999; Lekvall & Wahlbin, 2001).

A qualitative study research is more suited because a quantitative study would mean that this study would measure based on a set of existing parameters and find out how much how much impact they pose. Instead, this study is of an explorative nature which intends to find parameters that matters and act as a pre-study and provide support in future studies.
2.1.3 TIME SCALE OF STUDY

The interest for this study is to explore how API-fication impacts businesses based on the current situation, and not to explore the effect on businesses over a period of time. Thus, the time scale of the study is a specific point in time (Lekvall and Wahlbin, 2001). The reasons for this are the fact that API-fication is a currently emerging trend, and because the intended available time frame for the study was limited to 20 weeks. However, the time perspective of the thesis does try to investigate the role of API-fication as the current stage of the IT development process that has evolved for a long time and will continue do so, most probably to be succeeded by other concepts. To perform a study of change over time would certainly be an interesting approach for future research when API-fication concepts have matured, this would provide a better insight in the actual transformation process rather than the process effects which are investigated in this thesis.

2.1.4 EMPIRICAL DATA TYPES

This thesis uses primary data together with secondary data. The primary data collected through interviews with API-utilizing companies, consultancy firms and IT solution providers to gain a qualitative view and opinion on specific areas. The reasons for why interviews were performed were to receive opinions and arguments that are up to date.

In addition, secondary data was used to get a larger dataset of opinions and views in the subject and to complement and bridge between the literature and the primary data. The secondary data collected consists of publications from Gartner, consultancy firms and IT solution providers.

2.1.5 SCIENTIFIC APPROACH

There are two principally different approaches of reasoning in scientific studies: the deductive and the inductive approaches (Blumberg et al, 2005). A deductive approach implies that conclusions are drawn regarding a case by using generalized principles and established theories to follow and tested by empirical findings of a study (Saunders et al., 2003; Patel & Davidson, 2011; Le Duc, 2007). An inductive approach implies that research can be performed without using established theories. In other words, theories are built using empirical data (Saunders et al., 2003; Patel & Davidson, 2011; Le Duc, 2007). It might be difficult to specify if a study uses one approach or the other, the study can instead be more of a sliding scale where elements from both a deductive and inductive approach, which are common in a third approach called abductive approach where empirical data are gathered based on an observed outcome (Patel & Davidson, 2011; Le Duc, 2007).
This thesis leans towards using a deductive approach because it is based on the creation of an exploration framework in the frame of reference, which is used to gather and investigate empirical material. In other words, the aim is to draw conclusions from empirical data based on the frame of reference. There are also elements of an inductive approach, since few established literature are present and the analysis does not strictly focus on evaluating the framework. With this in mind, the approach could be considered to be abductive. However, the study does not aim to create any new theories based on the empirical findings, why the authors would argue that this study does indeed lean more towards a deductive approach.

2.2 RESEARCH PROCESS

The thesis has followed a modified structure of the workflow presented by Lekvall and Wahlbin (2001) as the Walhbinian-U, see Figure 2.2, and is described further in this section.

![Figure 2.2 The modified Walhbinian-U workflow](image)

The work process was mainly sequential due to the different chapters in the thesis are dependent on previous chapters. However, both the literature-based frame of reference and gathering of empirical data were of an iterative nature. A main reason was to increase the chapters’ quality by critically review if the content helped to answer the purpose and research questions. The aim was to contribute to a more qualitative analysis and result in the end.

The initial problem background was formulated together with the company Ericsson who wanted to understand the impact of API-fication in the upcoming digital transformation. The purpose of the study was determined based on the initial material that was received from Ericsson, in consultation with the thesis supervisors from
Linköping University and Ericsson. Thereafter, a set of research questions were determined to be answered by an analysis framework that was created based on the literature-based frame of reference.

Perspectives from the literature and different empirical sources were compared in order to get an as accurate perception as possible of the subject and associated areas with the analysis framework and resulted in conclusions and discussion. Finally, recommendations have been developed based on the analysis and conclusions.

2.3 LITERATURE MATERIAL

2.3.1 GATHERING OF LITERATURE MATERIAL

The literature study was conducted for the reasons to provide the authors a deeper understanding of the topic and to lay a basis for a literature-based frame of reference and to compose the exploration framework.

The chosen literature areas covered and the purpose for choosing these areas are presented in Table 2.1.

Table 2.1 The chosen literature areas for the study

<table>
<thead>
<tr>
<th>Chosen areas</th>
<th>Purpose for choosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitalization of Business and Value of Information</td>
<td>To understand what literature says about IT in business, understand how IT has changed and affected business in different ways, and how IT affects the value of the exchange of information within and between enterprises.</td>
</tr>
<tr>
<td>Business Process and Business Model</td>
<td>To understand business processes and the building blocks of the business, in order to create an understanding of types of change that IT can create.</td>
</tr>
<tr>
<td>Service Oriented Architecture</td>
<td>Create understanding of modularity, service orientation, communication and integration, which are properties that are carried by the API technology</td>
</tr>
<tr>
<td>IT and Organizational Change</td>
<td>To understand challenges and limitations occurred by IT and organizational change</td>
</tr>
</tbody>
</table>
Linköping University library’s search engine UniSearch was mainly used to gather academic sources for the literature study, such as academic books and articles. The gathering of literature was done initially and the key words used in order to search for literature related to the areas in Table 2.1 was the following: IT Strategy, API, Business Model, Business Process, Sourcing, Enterprise Architecture, API Economy, Business Ecosystem, Service Oriented Architecture, IT Organizational change, Digitalization of business, Data leveraging.

When gathering material for Service Oriented Architecture, the literature was very technical focused and less business oriented at first. To avoid this minor problem we searched in a category towards management. The gathered material was skimmed through by reading the abstract and conclusion section and afterwards determined if it was relevant to the study. The authors rated the material with a three-point scale where the highest rating had the highest relevance to the purpose and research questions. The relevant material was then labeled and divided into literature subjects that the authors read through entirely for a primary relevance check and then began to compose the literature-based frame of reference. The primary relevance check was to ensure that the material was published by academic institutions to ensure a higher quality since material publication from academic institutions is reviewed before publishing. Some of the filtered out material might have been used as empirical material instead.

Figure 2.3 is an overview of the gathering of the Literature-based Frame of Reference.

![Image](image_url)
The creation of the frame of reference was written through an iterative process to ensure that relevant material was included. Each literature area was started by searching for relevant material, as mentioned before. Thereafter the primary relevance checked academic material which was related to the area was processed by synthesizing the material. The same process occurred for each area and the entire chapter was work through in the purpose of improve the quality of the chapter based on the supervisors and opponents comments from the seminars. The combination of newer and older literature has given the authors a good understanding, overview and confidence about the different areas of the topic.

2.3.2 LITERATURE MATERIAL SOURCE CRITICISM

There are several possible strengths and weaknesses in the gathered frame of reference material that need to be considered in terms of source quality. On the positive side, sources of varying age have been used, which provides a balance between modern and traditional perspectives which can contribute to a more rightful view. However, API-enabled digital transformation is still a novel area that is not yet established in academic research. This makes the process of finding sources difficult and focus have been partially shifted to the underlying concepts of API-enabled digital transformation that are well-explored in academia, such as partnerships, information integration, IT impact on business, and service-oriented architecture (SOA).

A too limited number of authors represented within academic areas can negatively impact the frame of reference through a single-sided perspective or subjectivism. To prevent this, one or a few main sources are combined with complementing sources in each area. Important perspective in the academic material might have been missed due to missed keyword in the selection of keywords. This is likely since the thesis contains a variety of academic areas some of which are novel. To mitigate this effect, quite a lot of time was deliberately spent on keyword development and the gathering of academic material.
EMPIRICAL MATERIAL

The empirical material gathered for the study consists of three types of sources, *Contemporary Reports, Interviews* and *Examples of API-Enabled Digital Transformation*. The type of material gathered for each source is further described in the following sections.

The empirical data gathered was based on the exploration framework created from the literature data gathered and focuses on three major areas, *Business Drivers, Business Model Change and Innovation, and Challenges & Limitations*.

The different sources are meant to be input data for the analysis and the different types of sources were used in the aim of receiving the views and opinions from parties that is involved in the API-enabled digital transformation. The range of views and opinion are intended to provide an as accurate perception as possible of business impact from API-enabled digital transformation.

The following Figure 2.4 is an overview of the gathering of Empirical Material.

2.3.3 CONTEMPORARY REPORTS

The material collected consist majority of reports from Gartner and large consulting firms, such as McKinsey, Accenture, Capgemini, PwC, Ernst & Young, and HCL Technologies. These reports were selected due to their subject on Digital Transformation, Digital Enterprise, API-fication and API-economy which contain relevant material for the exploration framework. Reports consisted of various types; these reports consisted of interviews and surveys conducted by consultancy firms. In other reports, projects carried out by the consulting firms were presented. Moreover, the majority of the reports consisted of the consultancy firms’ own opinion and view of the subjects.

![Figure 2.4 Overview of the gathering of Empirical Material](image-url)
2.3.4 EXAMPLES OF API-ENABLED DIGITAL TRANSFORMATION

The purpose of this section is to provide an insight and to illustrate digital transformation initiatives involving APIs and even complete API-enabled business models. The information of the example companies was collected from the company websites, consultancy articles, reports and books. The examples were evaluated by the authors based on whether they were illustrative of API-enabled digital transformation.

2.3.5 INTERVIEWS

Three types of companies have been selected to carry out the interviews on. First type is *IT Solution Provider* to Ericsson, which offers tools, services, software, systems and platform solutions to companies. The contact information to the solution providers account managers was given by Ericsson and the interviewee was chosen by the solution provider.

The second type is *API-utilizing Company*, and consists of a range of enterprises selected by the authors and were based on how big of an influence digital transformation have been on the enterprise or to their industry.

The third type is *Consulting Firm*, which consists of large consulting firms that offers Digital Transformation consulting services and were chosen by the authors.

All companies and individuals were contacted by e-mail or telephone and the authors requested to get in contact with individuals that have both an operational and IT perspective of business which were considered most relevant to interview. Organizational titles that were considered relevant to the authors based on these premises and the positions that the authors reach out for were primarily CIO, Consultant, and Head of IT with a focus on business. The final selections of companies were those who had the opportunity to set up an interview with the authors. A summary of respondents can be viewed in section 4.3 *Interviews*.

An interview guide was prepared in beforehand for semi structured interview. The guide consists of a list of subjects and questions based on the exploration framework and the purpose is to allow more flexibility during the interview and allow the interviewee to further develop the answers. Denscombe (2009) and Kvale (1997) argues that semi structured interviews are appropriate when looking for opinions, experiences and privileged information from people in key positions. The interview guide was useful during the interviews, although most of the questions were answered through a discussion on a broader topic.
The authors were both present on all the interviews; one asked questions and the other took notes. All of the interviews were performed semi-structured and face-to-face at the respondents' office except for one which was performed over the telephone and the duration was about an hour.

In the beginning of the interview, the respondent was oriented by the authors about the topic and purpose of the interview. Time to ask clarifying questions was given before the start of the interview. Kvale (1997) states that setting the interview is important, and the action made by the authors contributed the setting.

All respondents answered based on their position with the exception of personal views which they were clear to point out that it was their own opinion and not the company's official opinion. The conversation was also recorded if the respondent gave the permission. The recording of the conversation did not affect the performance of the interview from the perspective of the authors; it contributed to that both could focus more on the interview since the recording entailed less focus on taking notes during the interview.

The perception was that did not make any difference for the respondent either. This may be a result of the authors being clear with that a summary of the conversation would be sent to the respondent for review within a week. The interview was transcribed by the authors in close connection to the interview occasion and the corrections received were corrections of facts which the authors solved immediately.

2.3.6 EMPIRICAL MATERIAL SOURCE CRITICISM

The gathering of empirical material has also its strength and weaknesses that need to be taken into account from the aspect of source quality. There were no major problems in order to get in contact and collect information from different kinds of sources. However, there were a couple of cases where the most senior IT executive of API-utilizing companies referred the authors to one of their relevant team members. This may have led to that the authors did not receive the most comprehensive business perception from those companies since most of the senior IT executives had a better insight into the company's operations and how the company aspire to use IT in business. But overall, there were not any big differences between the respondents.

Furthermore, IT solution providers and consultancy firms may have a higher degree of opportunism and glorification on the concepts of APIs which leads to a more visionary perception of the transformation. Moreover, all the empirical material gathered has been interpreted by the authors, and in the interviews the interviewees may interpret
the questions asked differently. The answers received were both company and personal opinion, and the respondents were clear when it was their personal opinion. The personal opinions were filtered out due to it was not really related to the main questions.

2.4 HOW ANALYSIS WAS CONDUCTED

The analysis is divided into three sections structured after the explorative framework, see Figure 2.5. The aim of the analysis is to gain insight of how different sources aligns or differs to each other in order to procure an as accurate perception as possible and a better understanding of the impact API-enabled digital transformation.

In each section, empirical data from interviews with API-utilizing companies, consulting firms and IT solution providers was first compared with theories and predictions in the literature-based frame of reference. Comparison was made searching for confirmation or contradiction with the literature, or if the empirical data points to other issues not included in the frame of reference.

To improve the analysis further, each section was complemented with a second analysis step. In this, the contemporary reports were taken into consideration to possibly extend the frame of reference with results from studies performed by consulting and research firms on the topic. These contemporary reports also provided a larger and broader input of data.
2.5 ETHICS

The report has been conducted in accordance with the Swedish Research Council's Ethical Principles for humanities and social science research. Principles of fundamental individual protection requirement can be concretized into four general main requirements of the research; these requirements are referred to as information requirement, the requirement of consent, confidentiality obligations and utilization requirement. Each requirement is specified then further in a number of rules (Vetenskapsrådet, 2002).

2.5.1 INFORMATION REQUIREMENT

The information requirement has been followed by informing all interview respondents about the purpose of the study, their role in the study and that their participation is voluntary and therefore has the right to withdraw their participation at any time. This was performed both when booking the meeting and before the interview began.

2.5.2 THE REQUIREMENT OF CONSENT

We obtained consent from the respondent before any interview occasion in order to meet the requirement of consent, since the respondent was going to make an active effort. It has also been informed that the respondent may request to be deleted and the opportunity of withdrawal, a common form of withdrawal is to be confidential, which means that the data remains but possibilities of identification are eliminated (Vetenskapsrådet, 2002).

2.5.3 CONFIDENTIALITY OBLIGATIONS

The interview questions did not focus on any areas that included ethically sensitive issues and therefore did not require actions to comply with confidentiality obligations. In addition, this study does not contain any information that is classified as ethically sensitive information and information classified as ethically sensitive vary from community to community. The point being, information that may be perceived as unpleasant or offensive to those affected and their successors may be regarded as ethically sensitive, such cases should confidentiality be established (Vetenskapsrådet, 2002). No action was taken regarding to this since the thesis topic was estimated not to incur any notable risk of dealing with ethically sensitive information.

2.5.4 UTILIZATION REQUIREMENT

The rules of utilization requirements states that information and data on individuals that are collected for research purposes, which includes personal information, may not be disclosed to third parties (Vetenskapsrådet, 2002). Respondents has therefore been
informed about that all empirical material collected is intended to be used for the study and not for commercial or non-scientific purposes. However, theses from Swedish universities are public documents and must be publicly accessible by anyone who may ask for it. But the raw empirical data gathered from interviews are not included in the study and thus fulfills the utilization requirement.

2.6 METHODOLOGY DISCUSSION

2.6.1 VALIDITY

The purpose of validity is to see if the study actually measures what it is supposed to measure (or investigate) and if it includes any subjectivity (Lekvall & Wahlbin, 2001). Many perspectives or dimensions of validity exist; two common ones are internal and external validity. Internal validity deals with how well the results are consistent with reality. External validity refers to how well the results from the study can be applied to other situations (Merriam, 1994). Validity of an qualitative study are in general higher compared to a quantitative study, since in a qualitative study the authors may have the opportunity to perform deeper interviews that may explain complex situations better than simplified questions in a survey (Eisenhardt & Graebner, 2007; Lekvall & Wahlbin, 2001). However, if respondents choses to be confidential it can reduce validity to the reader since the person's relevance and significance to this study will not be as clear. However, the person's relevance and significance to the thesis remains the same because the individual is not confidential to the author.

With regards to external validity, the frame of reference and the findings in this study can surely be applied in other situations, especially in large enterprises, as the frame of reference and analysis framework are not industry specific. Furthermore, the frame of reference is based on several independent and comparable sources which can be considered consistent with reality and thus contribute to a high validity.

All interviews have been written out in close connection to the interview occasions which also contributes to an increased validity according to Le Duc (2007). In addition, the interviews gave more than one perspective on the matter by asking several respondents the same question. The reason is that the persons interviewed at different companies were familiar of how API-enabled digital transformation has impacted their business and industry and thus could contribute with their knowledge on the subject.
Furthermore, the study reach a higher level of validity if theoretical concepts have been triangulated (Kvale, 1997), and according to Le Duc (2007) a set of secondary sources may also contribute to strengthen the report's validity. As mention before in this chapter, this master’s thesis has used multiple types of sources in the purpose of triangulation to achieve an accurate perception of business model change and innovation – as mentioned in section 0.
Empirical Material. When respondents and theory are inline or not, the authors has discussed and analyzed the underlying factors in order to explain the differences or similarities. This study has also been written by two authors which Lincoln & Guba (1986) states will contribute to triangulation and increase validity due to more viewpoints are obtain. Thus, the authors would argue that this thesis have a relatively high validity in its entirety.

2.6.2 RELIABILITY

The meaning of reliability is to which degree the results of the study would be consistent if repeatedly tested, which means that high reliability is achieved by minimizing inaccuracies and biased stances (Lekvall & Wahlbin, 2001; Merriam, 1994; Yin, 2008). According to Lekvall & Wahlbin (2001), the reliability of a qualitative case study is often lesser. In this study, the reasons for this may be the uncertainty of the topic and the possibility of low reliability from interviews exists, which probably affects the reliability negatively. However, the authors perceive that the topic and concepts have been clear since the concepts and terms were described and exemplified at all interviews. It resulted in low variation in the interpretations among the interviewees and terminology used was consistent.

Considering the maturity of API-fication and low degree of implementation in Swedish companies it will have a negative effect on reliability due the constant evolution of technology. But the authors of this thesis argue that the effort made in the study has contributed to an acceptable reliability. Furthermore, the findings can be argued to be of a general nature, which makes easier to identify the level of consistency of future research in this field.
3 LITERATURE-BASED FRAME OF REFERENCE

In this chapter we present ideas and models from established academic literature that can be related to API-enabled digital transformation. This provides a foundational understanding and the literature is used to create an exploratory framework used for gathering and analysis of empirical data to investigate the research questions.

3.1 DIGITALIZATION OF BUSINESS AND VALUE OF INFORMATION

This section introduces digital transformation and discusses how information technology increasingly affects how information flow within and between businesses, and look into the associated business value and drivers. Even though APIs and digital interfaces are not explicitly mentioned in the following text, please note that they are foundational technologies that further enhance the integration, network and information concepts discussed.

3.1.1 THE INCREASING RATE OF DIGITALIZATION

Espada et al. (2011) present that more and more physical objects are becoming available in digital format that have a specific purpose, comprise a series of data and can perform actions. In addition, Gershenfeld & Vasseur (2014) mean that devices and products that surrounds us is starting to go online due to the impressive growth of the internet in the past two decades.

The multitude of diverse objects in combination with virtually endless ways of connecting objects, businesses, and consumers together bring great challenges for managers; the challenge is to standardize the interfaces which they can connect to each other and networks such as the internet (Leminen et al., 2012).

Evans (2011) argues that more than 99% of the physical objects that may one day join the network are still not connected, and estimates show that there are presently 10 billion connected devices and by 2020 there will be 50 billion connected devices (IBSG, 2011). Westerlund, Leminen & Rajahonka (2014) clarify that while these estimates are rough, they point to an exponential growth in the number of objects connected to the internet.

The devices and products range from mobile devices to general household products, such as toothbrushes and refrigerators, and will be embedded with capabilities for example sensing or communication through the use of different technologies (Evans, 2011; Oriwoh et al., 2013; Gomez et al., 2013). In addition, the devices and products are
becoming more interconnected for various purposes, including identification, communication, sensing, and data collection (Oriwoh et al., 2013).

3.1.2 HOW BUSINESSES CAN LEVERAGE DATA

One of the common purposes of implementing APIs is in order to make data accessible, and there are various drivers for internal data access within organizations. Barton & Court (2012) emphasize data-based analytics as a strategic issue for two reasons: new business models have and will continue to derive from ability to exploit data, and data-driven strategies will become an increasingly important point of competitive differentiation. To successfully achieve this Barton & Court (2012) argue that data for analytics should be sourced creatively from different systems origins to provide broad views, and that legacy IT structures need to be challenged as they may prevent integration of siloed information.

Cohn et al. (2014) present how data can be leveraged to create value for customers and opportunities business growth. They state that IT transformation of business so far can be divided in three waves. First, through automation and reduction of cost of operational and management processes. Second, as the internet created opportunities to build new business models. The third and currently ongoing wave is IT-enabled innovation. This is powered by three drivers: The explosion in digital data and data tools, the improved capacity to integrate, analyze and exploit structured data, and lastly the emergence of business in the cloud. As transactions are moved from physical space to becoming virtual, increasingly complex processes can be handled by standard software and turned into service offerings through low-cost, high-powered cloud computing.

Cohn et al. (2014) present five patterns of how IT can facilitate the hunt for new business value, which may apply independently or in combinations:

- **Using data that physical objects now generate (or could generate)** to improve a product or service or create new business value. For example, using physical sensors for smart metering of energy usage.
- **Digitalizing physical assets.** For example, introduction of digital magazines. Mobile technologies further fuel this trend. Distribution costs are drastically reduced, more customer choices are introduced and tailored services become increasingly important.
• **Combining data within and across industries.** Big data and new IT standards that allow enhanced data integration make it possible to coordinate information across industries or sectors in new ways. Walmart and Dell are examples of companies who have successfully integrated data across their supply chains, while most other supply networks are relatively uncoordinated. And in Germany, a firm is integrating information across the health care industry to increase efficiency by facilitating information exchange between insurers and health care institutions.

• **Trading data.** Businesses may have data that is valuable to other businesses. The ability to combine disparate data sets allows companies to develop new offerings for adjacent businesses. The recent partnership between mobile network operator Vodafone and satellite navigation devices and services company TomTom is one example of such a case. Vodafone can gather information about traffic jams which is valuable to TomTom who purchases the information to improve their navigation products.

• **Codifying capability.** Means that a company takes a process in which it is best-in-class and sells it to other companies using cloud computing. For example, IBM developed an automated solution for travel booking and expense reporting processes which later was turned into a service offering and sold to other organizations.

The changes from data being leveraged that was observed by Cohn et al. (2014) vary from incremental, simple enhancements to game-changing, disruptive changes which may require new business models or even a new business units to support them. Cohn et al. (2014) also suggest that some changes can emerge into of platform-based businesses, in which a core technology is surrounded by complementary products and services, typically provided by other companies.

3.1.3 **IT-BASED INTER-ORGANIZATIONAL VALUE CREATION**

Jarvenpaa & Ives (1994) was early to present thought-provoking ideas of how networked business and the value of information would increase. They predict that the permanent nodes of a network organization will increasingly focus on knowledge and service activities, rather than manufacturing or production activities as these will become brokered as easily substituted commodities. Furthermore, Jarvenpaa & Ives (1994) argue that network organizations increasingly will differentiate themselves not on how they manage physical material or product flows, but on how they manage intellectual and service processes.
Guo et al. (2014) agree on the developments predicted by Jarvenpaa & Ives, and expect that businesses will continue to assess their unique drivers of advantage in digital settings as they further modularize their business processes and rely on plug-and-play capabilities for richly linking internal and external digital assets in the business network. For example, many new startups are examples of this relying on linkages through APIs and web services (Guo et al., 2014).

Konsynski & McFarlan (1990) was early to offer more concrete thoughts on inter-organizational opportunities with information technology with what they call *information partnerships*. IT empowers businesses to compete by introducing new ways for them to cooperate, and according to Konsynski & McFarlan (1990) one of the most intriguing ways is the information partnerships, in which businesses share customer data. Information partnership is an opportunity to joining forces without merging, for example how American Airlines allied with Citibank in an arrangement where air mileage credit is awarded to credit card users, thus boosting loyalty with cross-marketing.

Diverse companies can offer novel incentives and services or participate in joint marketing programs through information partnerships (Konsynski & McFarlan, 1990). Furthermore, they can gain advantage in new channels of distribution or introduce operational efficiencies and revenue enhancements. Partnerships also introduce opportunities for scale and cross-selling. They can make small companies look, feel and act big, and they can make big companies look small and close. Partnerships provide a new basis for differentiation while they let companies share financial and technical risk when investing in hardware, software as well as management and organizational learning.

Konsynski & McFarlan (1990) present four kinds of information partnerships:

- **Joint marketing partnerships** where businesses make use of digital linkages to establish combined marketing programs e.g. in the airline industry. In marketing partnerships, participant companies gain access to new customers and territories and to economies of scale through cost sharing and combined offerings may simplify the customer's life.

- **Intra-industry partnerships** are formed among small or mid-size companies who see an opportunity or need to pool resources, in order to collect capital and skills required to create new technology infrastructure for an entire industry. For example the ATM banking network.
• **Customer-supplier partnerships** are set up by suppliers in order to service customers. A third party might step in to form the partnership if both customers and suppliers are too fragmented.

• **IT vendor-driven partnerships** where technology vendors introduce new technology in a market to provide a platform for uninitiated industry participants to offer novel customer services. For example online retailing.

Konsynski & McFarlan (1990) present the following set of success factors for information partnerships:

• Shared vision within senior management
• Reciprocal skills in information technology, competence is essential.
• Concrete plans for and early success. Businesses should plan introduction of the system so that people across participating organizations can experience positive results early, to establish a sense of accomplishment and commitment.
• Persistence in the Development of Usable information. Information has to be sent in a way that is useful to others without compromising confidentiality of company secrets. Information has to be packaged for all partners by all partners.
• Coordination on business policy. Partnering means more than sharing data and applications that involve a considerable degree of integration across company lines requires business systems and processes of partnering companies to be aligned.
• Appropriate business architecture. Partnering companies have established the structures and guidelines that ensure fairness and profit. Rules that constitute equal treatment under the system must be agreed upon. The deal need to be structured so that partners contribute what they can really afford to and so that they will profit from the system in proportion to what they put in.

Konsynski & McFarlan (1990) emphasize that partnership is a strategy, and that partnerships can be forged both offensively and defensively. Managers need to ask themselves: What lines of business to provide exclusively and how to leveraging them through partnering? What adjunct services that will drive products to new markets? Where can profitability offer joint purchasing incentives without confusing or eroding the existing customer base?

Bharadwaj et al. (2013) present their view on current developments in IT-based inter-organizational value creation, where digital platforms are enabling cross-boundary industry disruptions and inducing new forms of business strategies. In an increasingly digitally intensive world, firms operate even more in business networks. Digital
platforms also enable firms to break traditional industry boundaries and operate in new niches that were earlier defined only through those digital resources. There are several new sources of value creation and value capture as the digital business context brings new opportunities to create value from information. Many new business models based on information exchange have emerged, for example multi-sided business models where businesses give away certain products in one layer to capture value in a different layer. The extension of multi-sided business models is value creation and value capture through complex and dynamic coordination across multiple companies (Bharadwaj et al., 2013).

Katsamakas (2014) presents further thoughts on how digital platforms relate to competition. According to Katsamakas (2014), a defining feature of digital transformation is that networks of firms, instead of individual firms, are competing with each other. These business networks consist of interdependent firms coordinating closely to deliver value to consumers in the form of products or services. An example of a business network (also known as value network, strategic network, value web or business ecosystem) is Cisco and its partners (Katsamakas, 2014). A business network often consists of a value network leader (or platform leader or keystone) firm, acting as business network orchestrator, and a number of partners of the network leader. Katsamakas (2014) argues that increasing importance of networks in the economy shifts the focus of competition from the level of individual firms to the level of network. Furthermore, the increased interdependence and connectedness of modern world makes business networks, rather than individual firms, the essential value creators (Katsamakas, 2014). Because of these developments, it is important to understand the network strategy of leader firms and the way IT affects how business networks compete and impact industry structures. Businesses should carefully consider whether to share key partners with competing networks since it affects the investment incentives of all firms in the network (Katsamakas, 2014). This decision is also closely linked to the use of IT to reduce the investment costs. How much firms invest in IT to reduce network costs (cost of sharing information, co-designing products, collaboratively forecasting demand etc.) affects network design decisions, including what is the most profitable way to compete with competing networks.

Grover & Kohli (2012) also state that contemporary business environments increasingly involve IT investments being made by multiple companies in cooperative, platform-based and relational arrangements where the objective is to co-create value. Grover & Kohli (2012) categorize this shared value into four layers: relationship-specific assets that create new opportunities for value creation, focus on identifying complementary resources and capabilities among partners such that they are a source of value,
knowledge sharing routines between companies for decision making and strategies for co-creating new or better products, and finally governance control structure that reduce transaction costs and incentive new value co-creation. Governance is typically done through contracts and formal agreements, though social and informal controls can also play a major role since they usually carry less cost (Grover & Kohli, 2012). The governance layer can be seen as the layer that integrates the three other layers, and assumes even greater significance when several firms collaborate in a loosely coupled cooperative arrangement. A summary of the layers by Grover & Kohli (2012) is presented in Table 3.1, where the investments are examples of actions that companies take.

Table 3.1 Co-creation of IT-based value in multi-firm environments

<table>
<thead>
<tr>
<th>Investments</th>
<th>Enablers</th>
<th>Value co-creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Layer</td>
<td>Inter-organizational IT (software and hardware)</td>
<td>- Incentives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- General IT and organizational infrastructure</td>
</tr>
<tr>
<td>Complementary Capability Layer</td>
<td>IT functionality (e.g. software, skills) or capability (e.g. real-time product availability) that synergistically complements partner resources</td>
<td>- Experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Partner information</td>
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<tr>
<td></td>
<td></td>
<td>- General IT and organizational infrastructure</td>
</tr>
<tr>
<td>Knowledge Sharing Layer</td>
<td>Sharing of knowledge repositories and use of analytical software</td>
<td>- Absorptive capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Incentives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- General IT and organizational infrastructure</td>
</tr>
<tr>
<td>Governance Layer</td>
<td>Inter-organizational systems that facilitate brokerage and integration effects</td>
<td>- Informal contracts (trust)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Alignment of transactions with governance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- General IT and organizational infrastructure</td>
</tr>
</tbody>
</table>
3.1.4 DISCUSSION

The literature presented in this chapter reflects various aspects that provide an understanding of possible business drivers for API-enabled digital transformation. The increasing rate of creation and increased use of data and information in businesses is an important driver as APIs can facilitate transfers, control and management of this data. Cohn et al. (2014) argue that data-driven strategies will become more important and that businesses will increasingly use data to create value for customers and generate opportunities for business growth. They also argue that data should be sourced creatively from different areas of the organization, something that APIs could enable by overcoming isolated system barriers.

Several authors, Jarvenpaa & Ives (1994), Guo et al. (2014) and Bharadwaj et al. (2013), discuss how businesses are becoming more networked and modular, with increasing fragmentation and sourcing. Lower cost and standardized integration for business components is an important driver here, and Bharadwaj et al. (2013) mention new businesses focusing solely on managing transactions of information. In recent years outsourcing industries have seen tremendous growth which reflects this increasing modularization of businesses.

Konsynski & McFarlan's (1990) theories about information partnerships, published 25 years ago, do indeed suffer somewhat from the time past. Many of the information partnerships that Konsynski & McFarlan discuss have today become standardized services instead of tailored partnerships, such as payment services and logistics services. Though most of Konsynski & McFarlan (1990) drivers for information partnerships are still valid, sharing risk and cost of investment in technology is probably less important today because of lower hardware costs and standardized solutions. Also, partnerships are shifting from Konsynski & McFarlan's (1990) one-to-one integrations to the collaboration, coopetition and platform integrations described by Grover & Kohli (2012).
3.2 BUSINESS MODELS

To be able to understand how the digital transformation impacts businesses, the business model has been chosen as the framework for describing companies in this thesis. The business model term is frequently used and has many definitions. Osterwalder & Pigneur's (2010) business model canvas has been selected as the main source providing a complete framework covering the complete organization, both externally and internally. This section defines and describes business models and presents how business models can be analyzed and designed. This is complemented with common criticism of the business model framework and literature about how business models are shifting towards a business network perspective under the influence of IT.

3.2.1 THE DEFINITION AND BUILDING BLOCKS OF BUSINESS MODELS

Osterwalder & Pigneur (2010) define a business model as "The rationale of how an organization creates, delivers and captures value" and can be compared to a blueprint for a strategy to be implemented through organizational structures, business processes and systems. In addition, Sako (2012) points out that business models are in the center of innovation in distinctive ways. Opportunities for new business models are generated with new technologies, and suitable business models are needed to be able to translate technical success into commercial success (Sako, 2012).

Osterwalder & Pigneur (2010) recommend using the Business Model Canvas to guide the business perspective firstly and then align the business with applications and technology perspective. Hunter & McDonald (2007) assert that the Business Model Canvas is a powerful tool that helps grasp how a business works without diving deeply in operational details. This tool is also recommended for Chief Information Officers (CIOs) by Hunter & McDonald (2007) for aligning IT and key business processes.

The Business Model Canvas is a tool for describing, analyzing and designing business models by using nine building blocks to describe the logic of a business model. The blocks cover the four main areas of business: customers, offer, infrastructure and financial viability (Osterwalder & Pigneur, 2010), see Figure 3.1.
1 Customer Segments
Customers is the heart of any business model, a company can't survive for long without profitable customers. Companies may group customers into distinct segments where they share common needs, behaviors or other attributes in order to better satisfy customers. Thereafter, organizations need to take a conscious decision about which segments to target and which to ignore. Once this is fulfilled, a business model based on a strong understanding of specific customer needs can be designed.

2 Value Proposition
The Value Proposition is an aggregation or a bundle of products and/or services that the company offers to customers and is the reason why customers turn to one company over another. Each value proposition shall provide the requirements of a specific customer segment by solving the segments problem or satisfy its need.

3 Channels
A company's point of contact with customer's takes place through its communication, distribution and sales channels. The channels are intended to serve several functions such as: raise awareness of the company's products and services among customers, helping customers evaluate a company's value proposition, allowing customers to purchase specific products and services, delivering a value proposition to customers, and providing post-purchase customer support. The interface of the channels plays an important role in customer experience.

4 Customer Relationships
The type of relationship that a company wants to establish with each customer segment should be clarified and can range from personal to automate. Drivers of a customer relationship may be the following: customer acquisition, customer retention, and boosting sales.
5 Revenue Streams
If customers are the heart of a business model then revenue streams are its arteries. If a company knows the value each customer segment truly are willing to pay then the firm can successfully generate one or more revenue streams from each customer segment. Each revenue stream may consist of different pricing mechanisms, such as fixed list prices, bargaining, auctioning, market dependent, volume dependent, or yield management.

Revenue Streams can be of two types and a business model can include them both. One type is Transaction revenues which is payments from one-time customer payments. The other is Recurring revenues which is ongoing payments to either deliver a value proposition to customers or provide post-purchase customer support.

6 Key Resources
Key Resources is the most important asset required and is necessary in every business model and can be physical, financial, intellectual, or human. They allow a company to create and offer a value proposition, reach markets, maintain relationships with customer segments, and earn revenues. To decide which key resources that are needed depends on the type of the business model and they can be owned or leased by the company or acquired from key partners.

7 Key Activities
Key Activities are the most important actions to make a business model to work and a company to operate successfully. A business model requires a number of key activities and may differ depending on the type of the business model. Like key resources, they are required to create and offer a value proposition, reach markets, maintain customer relationships, and earn revenues.

8 Key Partnerships
Partnerships are becoming a cornerstone of many business models and companies forge partnerships for reasons such as: to optimize their business models, reduce risk, or acquire resources.

Partnerships can be divided into four different types:

1. Strategic alliances between non-competitors
2. Coopetition: strategic partnerships between competitors
3. Joint ventures to develop new businesses
4. Buyer-supplier relationships to assure reliable supplies
9 Cost Structure

The Cost Structure describes the most important costs incurred to operate a business model. Cost from creating and delivering value, maintaining customer relationships, and generating revenue can relatively easily be calculated after defining key resources, key activities, and key partnerships.

3.2.2 IT & THE SHIFT TO BUSINESS NETWORKS

Keen & Williams (2013) who argue that digital business is marked by innovation through interface between to customers, partners, and suppliers. The use of interfaces facilitate asset-blending investment can reduce the capital cost and the risks of fixed, in-house capabilities by variable cost sourcing (Keen & Williams, 2013).

The emerging technology of a network of interconnected objects impacts how business models are designed (Westerlund et al., 2014; Bharadwaj et al., 2013). Westerlund et al. (2014) explain that the approach to understand a business model of a business network is looking at the value for all actors in business network and therefore suggests shifting the focus on value creation and value capture in business models from the company level to a larger business network level. Many business models that use this approach tends to bias toward the vendor and lack the drivers for shared value for an entire system which is one of the important components (Westerlund et al., 2014).

Allee (2000) adds to this theory and argues that economic value in business network is generated through changing forms of processes and complex exchanges between companies, suppliers, strategic partners, community, customer and users. These value exchanges usually are mapped as a flow diagram which shows goods, services, and revenue streams, as well as knowledge flows, and creation of value. The dynamics visible through the perspective of value network is relevant even when describing business models at a company level (Allee, 2000).

3.2.3 VALUE DESIGN & BUSINESS MODEL CANVAS CRITICISM

Westerlund et al. (2014) argue that Osterwalder & Pigneur (2010) only focus on the architecture of the business model and that it only provides "an exploded view showing the parts of an engine". Traditional concept of business model which is associated with a single organization can be replace with the term Value Design which is better suited for a business network since it is defined at a business network level, according to Westerlund et al. (2014) and Guo et al. (2014).
Westerlund et al. (2014) argue that a business model should not be broken down into a number of unconnected components as in the Business Model Canvas. The goal of value design is to establish a foundation for a business model tool that considers business network and focuses on the actions of value flow instead of the parts. The concept of the design is to illustrate how value for the participants in the business network is purposely created and captured. Moreover, Westerlund et al. (2014) explain that different value designs can be categorized, examined and compared in the same way as different types of business model. The key value pillars of Value Design are shown in Figure 3.2.

According to Westerlund et al. (2014), the key pillars of Value Design are better suited for designing a business network based on the following motivations. Value drivers comprise individual and shared motivations of participants in the business network to fulfill a need, such as generating value, realizing innovation, or to make money. Examples of shared value drivers that participants may share include sustainability and improved customer experience. Value nodes are nodes consisting of various actors, activities or (automated) processes that are linked together with other nodes to create value. The business network is a composite of value nodes and can be grouped within organization or networks of organizations, or even groups of networks. Value exchanges are done by different means in the forms of resources, knowledge and information. Exchanges occur between and within the business network value nodes and can be illustrated through value flows. Value Extract is a subset of all value exchanges including only the value that is meaningful from a commercial point of view (that has direct or indirect monetary value). The Value Extract shows the relevant nodes and exchanges and is useful in defining an organization’s core value and underlying aspects.
3.2.4 DISCUSSION

Both the business model canvas and value design are good models for gaining a better understanding of how the use of APIs relate to different parts an organization, and how these parts may be affected by the use of APIs. The business model canvas provides more of an architectural perspective while the value design complements the canvas with emphasizing a network perspective of the organization, which is becoming more important when business is becoming more networked, modular and integrated.

Certain building blocks of the canvas are related directly to APIs while others are influencing blocks indirectly. Products, information and knowledge are becoming digitized and gain higher priority as key resources in companies. APIs allow organizations to source key resources and facilitate key partnerships, enabled through a platform where companies easily can integrate and share information with each other.

The information and knowledge provided through APIs contributes to companies in terms of increased flexibility, which is achieved by combining and creating new interfaces that can easily be used and repurposed internally and externally. Interfaces can be used to create new channels, enhance existing channels and combine channels to better reach customers in a more personal or automated ways, allowing organizations to improve value propositions based on customer needs. Stronger customer relationships can be with the aid of having systems and resources accessible universally. APIs can also affect the cost structure positively through simpler creation, reuse and combination of interfaces for integrations within and between companies. This is a key benefit in digitalization of business processes because of simplified aggregation and transfer of data. More discussion about how APIs relate to key activities can be found in chapter 3.3 about Business Processes.

Given the choice of business models and value design frameworks, Porter’s value chain model could have been an alternative for understanding business. Porter’s value chain also describes how certain input generates an output and how value is created through a chain of transactions between units inside and outside of the business. The important difference lies in the network perspective, where the value chain is linear, the value design model opens up for more complex relationships and bi-directional value exchange which is more suited for this study when investigating how APIs enable integrations for networks, platforms and collaboration.
3.3 BUSINESS PROCESSES

The need to have a business network perspective of an organizations business model will consequently affect the business processes configurations. An organizations business model is fulfilled by its business processes. This section describes business processes and presents the importance of Business Process Management and how technology drives changes in business processes.

A business process can be described as a complete, dynamically coordinated set of activities or logically related tasks that must be performed to fulfill strategic goals (Zairi, 1997) and are typically cross the borders of organizational units (Anttila & Jussila, 2013). All business activities, work and value adding interactions and transaction internally within an organization as well as between an organization and its stakeholder are done through processes. Thus, the performance of the business processes has the greatest strategic and operational importance in affecting the organizations result, competitiveness and sustained success (Anttila & Jussila, 2013). Information and knowledge sharing between employees and stakeholders is essential for organization to achieve high performance business processes (Anttila & Jussila, 2011).

3.3.1 BUSINESS PROCESS MANAGEMENT

The business processes of organizations create high demands to establish Business Process Management (BPM) which consists of methods, tools and technologies. The aim of BPM is to analyze and continually improve fundamental activities of an organizations operations and to manage business processes with internal and external reach more efficiently, effectively and adaptably (van der Aalst, ter Hofstede, & Weske, 2003; Benner & Tushman, 2003; Lockamy & McCormack, 2004; Lambert, Garcia-Dastugue, & Croxton, 2005; Zairi, 1997; Anttila & Jussila, 2013).

Strnadl (2006) contributes to this opinion and states that BPM has evolved over time into focusing more on utilizing the strategic value of computer and software IT. Before the emerging of IT, the traditional way of managing information and knowledge in business processes was through business documents (Anttila & Jussila, 2013). IT has later on been developed into dynamic, flexible and interactive information and knowledge systems which give possibilities to generate new methods to help organizations to remain current and achieve an advantage to their competitors. This change has given advantage for leveraging collaborative group work within business processes today. IT is therefore considered widely important for improving business processes (Davenport, 1993; Margherita and Petti, 2010) and the global networking reinforces its importance thus many business processes utilizes advanced information
systems (Anttila & Jussila, 2013). In addition, W.P Wong (2013) explains that to improve performance throughout the organization is by integrating management and IT entities closely through business processes. Moreover, while some roles are focused on improving business processes with IT, business executives can focus on creating and innovating the business models and processes so that they take advantage of the emerging opportunities in the market (W.P Wong, 2013).

Examples of BPM methods, tools and technologies that have been commonly used by organizations in the past are illustrated in Table 3.2 (Zairi, 1997; van der Aalst, ter Hofstede, & Weske, 2003; Brown et al., 2000).

Table 3.2 Examples of common BPM methods, tools and technologies

<table>
<thead>
<tr>
<th>Methods</th>
<th>Tools and Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean</td>
<td>Balanced Scorecard</td>
</tr>
<tr>
<td>Six-Sigma</td>
<td>Product life cycle analysis</td>
</tr>
<tr>
<td>Total Quality Management (TQM)</td>
<td>SWOT-analysis</td>
</tr>
<tr>
<td>Business Process Reengineering (BPR)</td>
<td>Service-oriented Architecture (SOA) applications</td>
</tr>
</tbody>
</table>

Business process reengineering (BPR) is maybe the most IT-centric of the business process management methods and was very popular during the 1990s, when as many as 60% of the Fortune 500 companies claimed to have initiated or planned to initiate BPR efforts (Hamscher, 1994). BPR aimed to achieve dramatic improvements in performance in measures such as cost, quality, service and speed, within an organization by focusing on fundamental rethinking and radical redesign of business processes and workflow using IT (Hammer and Champy, 1993). Technology and IT has also been used in BPR to facilitate integration of separate functional activities into complete cross-functional processes (Altinkemer, Ozcelik & Ozdemi, 2011).

Today's businesses face a rapidly changing business environment and high consumer expectation, thus the design and implementation of business processes are extremely important in attaining the required business performance and flexibility (Altinkemer, Ozcelik & Ozdemi, 2011). A greater need for inter-organizational processes has given
BPR the role of a strategic tool for organizations (Abdolvand, Albadvi & Ferdowsi, 2008). Furthermore, Fadel & Tanniru (2005) and Lin, Yang & Pai (2002) share this view and argue that reengineering is necessary to facilitate processes across the organizational boundaries and to integrate operations in back- and front-office.

3.3.2 BUSINESS PROCESS CRITICISM

Common weaknesses in business processes include redundant and inconsistent data, which occurs when information carrying medium changes during the business process which often causes manual effort for data entering (Algermissen et al., 2005; Berente et al., 2009; Davenport, 1993; Hammer and Champy, 1993). Another weakness is information deficits; the information that is missing hinders business processes to execute (Berente et al., 2009). To obtain the information an investigation or enquiry is necessary which may involve third parties. This can interrupt the business process and binds resources for an uncertain amount of time and further coordination with third parties might be necessary (Bhasin & Parrey, 2013).

3.3.3 DISCUSSION

Business processes are aimed to fulfill company's business models and strategic goals, which can be considered the representation or implementation of key activities in the business model canvas. A company's agility can be increased by using APIs since they can enable improvements in a company's business processes.

By increasing exposure and simplifying sharing of information and knowledge internally and complement with valuable data for companies' value propositions from external sources, APIs can contribute to more effective business processes and business process management that respond more quickly to faster changing business environments. Moreover, the common weaknesses of redundant data, inconsistent data, and information deficits in business processes can be mitigated by use of APIs when data can be accessed directly from data source in a structured and standardized way. The business process (management) benefits from using APIs are further exemplified in SOA, which is described and discussed in the next section.
3.4 SERVICE-ORIENTED ARCHITECTURE

With the thesis core business concepts of business processes and business models covered, it is time to approach the concept of Service Oriented Architecture (SOA). Service oriented architecture is an interesting area to discuss since it provides an understanding of how IT can align to the business. And most importantly, since Service Oriented Architecture relies on standardized communication interfaces, it is a good way to understand the potential impact of APIs within organizations.

3.4.1 INTRODUCTION TO SERVICE-ORIENTED ARCHITECTURE

Bell & Marks (2006) present SOA as a concept covering information technology, business operations and organization, and defines SOA as follows:

“SOA is a conceptual business architecture where business functionality, or application logic, is made available to SOA users, or consumers, as shared, reusable services on an IT network. “Services” in an SOA are modules of business or application functionality with exposed interfaces, and are invoked by messages.” (Bell & Marks, 2006)

Note in the definition above that services communicate through exposed interfaces, which refers a standardized IT-based communication – which could be an API. Also, note that services can be considered independent because of their modularity and interfaced communication. Services in SOA, according to Bell & Marks (2006) definition, are reusable modular units of business capabilities, processes or technical functions that are consumed by internal or external customers. These services are a unit of business or business process activity, and services can together componentize a complete business process.

Bell & Marks (2006) point out that SOA is not a product, solution or technology and it is not a quick fix for IT complexity or a generic solution for every other IT issue. Bell & Marks (2006) define a set off essential ingredients of a successful service-oriented architecture:

1) A conceptual SOA vision, the idea or approach of how IT can be designed, planned and delivered as modular business services to seize business benefits.

2) Services, which include any possible service within an organization. With services comes a service design model that assures reusability, interoperability and integration across business processes and technology platforms.
3) **Enabling technology**, which supports the realization of the SOA. The technology is implemented to allow your services to operate in support of the enterprise's business objectives and to enable further development of the IT architecture and include legacy systems in the SOA.

4) **SOA governance and policies**, which are used to realize the conceptual architecture through communication to stakeholders in the organization. The SOA governance model defines governance processes, organizational roles and responsibilities, standards and policies threat must be adhered to for the SOA.

5) **Metrics**, which are used to measure results that are achieved. For example, usage metrics, policy conformance metrics, development metrics, business and return on investment metrics and process metrics.

6) **Organizational and behavioral model**, which are used to support the organizational transformation that is required in order to successfully migrate to SOA.

### 3.4.2 BUSINESS DRIVERS FOR SERVICE-ORIENTED ARCHITECTURE

Bell & Marks (2006) present several business benefits (or drivers) for SOA through less focus on integration and more focus on service-enabling. IT and process integration has traditionally been driven by business requirements from things such as mergers and acquisition activities, corporate reorganization or restructuring, application or system consolidation, data integration or data warehousing and new business strategies. The integration has traditionally been point-to-point custom integration or proprietary middleware solutions, both of carry significant maintenance burdens and risk of breaking. With SOA and the service approach for IT and process integration these cons are mitigated and the solution becomes more flexible and reusable.

According to Bell & Marks (2006), SOA provides indirect opportunities to gain competitive advantage through increased customer satisfaction, business agility, faster time to market, ease of partnering, IT cost reduction, and increased IT productivity. Since services are mapped closer to business needs, the link between business and IT becomes more distinct and provides better alignment of business and IT. Bell & Marks (2006) emphasize increased *agility* as a central benefit and goal for implementing SOA, consisting of several dimensions. Through looser coupling between business services and the specific application technologies supporting the processes, it becomes easier to make changes in business processes or application technology without causing unwanted chain reactions on the opposite side. Agility also means that it becomes easier to reconfigure, improve and create new processes and process linkages to create
more value in the company. Speed is increased as changes can be implemented faster through shorter development time. Flexibility is increased too, with a greater range of response and range of options for competitive responses.

The agility becomes the focal point when facilitating flexing of business and IT architectures in response to changes, illustrated in Figure 3.3. The agility then becomes a strategic business capability and, Bell & Marks (2006) conclude, the service-oriented architecture becomes a business-oriented architecture.

![Diagram of Corporate Strategy, Business Model, Business Architecture, IT Architecture - SOA]

**Figure 3.3 Flexing between IT and Business Architecture (Bell & Marks, 2006)**

Lawler & Howell-Barber (2008) put further emphasis the relationship between SOA, BPM and a service-oriented business, illustrated in Figure 3.4. According Lawler & Howell-Barber, BPM can be considered the base for the business architecture and convergence with SOA and BPM brings benefits from combining services as processes. Lawler & Howler-Barber (2008) also present survey results regarding the benefits of SOA, where the top-ranked benefits include flexibility, speed and modularity, followed by better integration with business partners and lower costs.
3.4.3 LESSONS LEARNED ABOUT SERVICE-ORIENTED ARCHITECTURE

The lessons learned from the SOA-movement are relevant to understand some of the challenges that may exist in API-enabled digital transformation. Bell and Marks (2006) present some important lessons learned. First, SOA implementation is preferably performed as a long, continuous and iterative process with incremental steps. Organizational, cultural and behavioral issues are more important than technical issues in order to succeed. Also, SOA must not be subject to technological reductionism, as often emphasized in IT and information systems literature: there is no technological silver bullet which magically solves business challenges by itself. And finally, by using business modeling prior an SOA initiative two important things are assured: it will be a true business initiative (rather than a technology initiative) and that clear business results are targeted.

Lawler & Howell-Barber (2008) presents additional important issues. Close collaboration between IT and business departments contribute to faster SOA deployment. Enterprise governance of services can ensure effective and economical reusability of services. Early focus on service standards in SOA projects can help in the foundation of SOA solutions and strategy. Early service orientation training for both technical and business staff is critical for SOA strategy success.
3.4.4 DISCUSSION

The similarities between the use of APIs and Service-Oriented Architecture are many, and the literature about SOA provides good insight into the evolution of IT architecture which APIs now are part of. The SOA literature also provides an understanding of how APIs relate to Business Process (Management) and key activities in the Business Model Canvas, and that API services could represent nodes in a Value Design network. APIs could be seen as a broader and looser concept than SOA, and organizations should be able to combine the both. The author's personal perception is that while few successful examples of pure SOA implementations exist, many of the concepts in SOA are widely adopted in practice and APIs could prove to be a worthy successor, offering more lightweight and flexible solutions while achieving the same goals.

3.5 IT & ORGANIZATIONAL CHANGE

The digital transformation affects the entire organization and this section introduces the strategic importance of digital strategy in organizations, difficulties in adopting information technology followed by a presentation of mediation strategies for embracing new technology in industries. Finally the organizational analysis framework called Leavitt's Diamond is presented focusing on the relationship between Technology, Tasks, People and Organizational Structure.

3.5.1 BUSINESS STRATEGY NEED TO INVOLVE IT

The steadily growing number of interconnections among products, processes and services has formed the infrastructure of business to become increasingly digitized. IT is becoming more integrated into a businesses practice due to great advances in computing, networking and interaction and the perception of technology has shifted the view of IT beyond merely as functional resources but rather as significant drivers of strategic change (Sandberg, 2014). In Addition, Bharadwaj et al. (2013) argue that IT strategy should be transformed from typically being a functional level strategy supporting the business strategy, to reflect a fusion between IT strategy and business strategy.

3.5.2 DIFFICULTIES IN ADOPTING CHANGES IN INFORMATION TECHNOLOGY

Although many firms invest heavily in IT they struggle to capitalize on the massive amounts of data they possess and realize the changes that are envisioned. Reasons for this include that companies still have conventional approaches to designing and implementing IT, which focus on building and deploying technology on time, to plan and within budget (Leonardi, 2013; Marchand & Peppard, 2013). Marchand & Peppard
(2013) argue that IT projects should instead focus on understanding how people create and use information. Moreover, it is not enough just getting people to use new technology to achieve organizational change, the way people use technology must be changed as well (Leonardi, 2013).

3.5.3 THREE MEDIATION STRATEGIES

The number of existing technologies and software capabilities far exceed what any company could ever possibly adopt. Moreover, newer technologies are currently being developed for future use. Andal-Ancion, Cartwright & Yip (2003) argue that the availability of new technology is not a problem, however, the problems is instead which technologies to choose and for what purpose.

Depending on the industry, companies will be offered different potential to use new technologies to transform their business through three types of mediation strategies. The following 10 drivers are used to determine the type of mediation approach that is most likely to succeed in a particular industry.

1. **Electronic deliverability** – How much of a product or service that can be delivered electronically.
2. **Information intensity** – Almost all products and services contain information, though the amount varies. New technology, for instance the Internet, has enabled companies to leverage the information content that is inherent in their products and services.
3. **Customizability** – Companies can tailor, with new technology, an overall offering to specific needs and preferences of individual customers compared to one-size-fits-all products in the past.
4. **Aggregation effects** – There are differences in how products and services can be aggregated, but new technology creates possibilities to offer customers bundled services that satisfy their needs through combined offers.
5. **Search cost** - New technologies (such as the Internet) have lowered the search cost for finding products or services that people want, regardless of their location or time zone. They have also increased openness in transactions when suppliers and customer can easily compare prices, product features and service attributes online.
6. **Real-time interface** – Real-time interfaces are essential for companies and customers who handle important information that changes suddenly and unpredictably and also for those who does not want to be limited transacting business during normal office hours. Although real-time updates are of less value when the pertinent information rarely changes.
7. **Contracting risk** – Is the degree of complexity when placing an order. The contracting risk for customers depends on the product and services and the media it is offered through.

8. **Network effects** - Utilization of products or services increases radically with the number of customers.

9. **Standardization benefits** – Companies have been enabled by new technology to synchronize and standardize processes, increasing convenience for customers and efficiency in business-to-business transactions.

10. **Missing competence** – activities that are missing internally by an organization, but that are crucial to an overall product or service offering.

Andal-Ancion, Cartwright & Yip (2003) mean that determining the best mediation is just the initial step of a long journey. Later on, companies must execute that strategy by implementing extensive changes in their organizations together with the business restructuring that are necessary. The three strategies, **Classic Disintermediation**, **Remediation and Network-Based Mediation** are illustrated in Figure 3.5 and further explained below.

![Figure 3.5 The three mediation strategies (Andal-Ancion, Cartwright & Yip, 2003)](image)

**Classic Disintermediation**
The aim of the strategy is to use new technology to eliminate any middleman that is seen as an obstacle for a faster and more efficient transaction. The main drivers for Classic Disintermediation are the ones that pertain to the inherent characteristics of a product or service, and electronic deliverability is a major factor together with Information intensity. For example, new technology such as sophisticated websites can perform a lot of the functionality that was earlier managed by intermediaries distributing products or services with high information intensity.
Remediation
The aim of the strategy is to use new technology to strengthen existing and new relationships between suppliers/producers, distributors and customers. The two main drivers are Aggregation effects and High contracting risk. If combining products or services are beneficial for companies, both drivers encourage companies to use new technology to work closer with their middlemen partners and build stronger, ongoing and more secure relationships.

Network-Based Mediation
The aim of the strategy is for new and established players to use new technology to build a network of strategic alliances and partnerships in complex relationships. Main drivers of Networked-Based Mediation are the ones pertain to a company's interaction with its partners and competitor; especially Network effects and Standardization benefits are important drivers for industry players to work more closely together.

3.5.4 CHANGE AND ORGANIZATIONAL INTERDEPENDENCE
Changes occur seldom in isolation, instead Leavitt (1965) sees Technology, Tasks (Services/Operations), People and Organizational structure function as four codependent variables. The variables represent the points of the Leavitt's Diamond, see Figure 3.6. A change in any of the corners of the diamond impacts some or all of the others. In other words, a changed task will unavoidably affect the structure in which they work, the people involved in the task and the technology that they use.

![Figure 3.6 Leavitt's Diamond](image)

Smith, Norton & Ellis (1992) state that experience shows that management tends to look at change factors in isolation and the reaction to interrelating variables occurs after the event. If so, problem will occur if the interrelating variables are not managed at critical times of change. Leavitt (1965) argues that changes could presumably be consciously intended or occur unforeseen and in efforts to only change on or two of the variables often have costly outcomes.
Moreover, it is not satisfactory to manage change reactively nor to attempt handle flat structured the same as multilayered structure. One must take into account, the impact of changes in services or technology has on people and the structure in which they work, in both short and long term. Leavitt’s Diamond is therefore an essential tool to keep in mind while valuing structure as one of the key resources of management (Smith, Norton & Ellis, 1992).

3.5.5 DISCUSSION

In this section, relevant literature on common problems and challenges in adoption of information technology in organizations is presented. The section provides a solid foundation for the exploration of challenges and problems in API-enabled digital transformation. Some of the ideas in this section have already been expressed throughout the frame of reference, such as the general need to integrate IT and the business in companies, both strategy and organization, which is mentioned even by Konsynski & McFarlan (1990) on information partnerships in section 3.1.3. The importance of putting effort into changing culture, processes and methods when IT is introduced is also frequently emphasized.

The Three Mediation Strategies make a very interesting addition to the literature about businesses becoming increasingly networked, modular and integrated (in section 3.1.3). The drivers presented by Andal-Ancion, Cartwright & Yip (2003) would probably also relate to the rate of which industries become digitized and networked. Since APIs change the prerequisites for integrations and information exchange, they directly influence the dynamics of power for any intermediaries in industries.

Leavitt’s diamond is a valuable general tool to be used when gathering empirical data and performing the analysis. The literature covered through this chapter show much evidence of the relationships between People, Structure, Tasks and Technology. Two good examples include Leonardi (2013) about the need to change culture and ways of working together with introduction of IT, and Bell & Marks (2006) who argue that IT should be structured as services (SOA) which align to processes and activities (which in turn support other components in the business model).
3.6 EXPLORATION FRAMEWORK

The exploration framework describes how the literature presented in the frame of reference relates to the purpose and research questions. This is used to create an exploration framework that forms a basis and structure for gathering empirical data and analysis of this data.

3.6.1 OVERVIEW AND APPLICATION OF THE FRAMEWORK

Figure 3.7 illustrates the main relationships between research questions which together aim to fulfill the purpose. API-enabled digital transformation is seen as an overarching process, in which technology is creating opportunities with associated Business Drivers (research question 1). When businesses pursue these opportunities, it will lead to both incremental and radical changes in existing business models and creation of completely or partially new business models (Business Model Change and Innovation, research question 2).

These two processes can be considered to represent the initiation and the implementation of phases of API-enabled digital transformation. These two top arrow blocks represent the linear relationship, though in reality the processes are probably iterative and overlapping in most businesses. In parallel with the initiation and implementation, challenges and limitations that hinder the processes of API-enabled digitalization are present, illustrated by the bottom box (Challenges & Limitations, research question 3).

![Exploration framework with main areas and relationships](image)

Each area in the exploration framework expanded by connecting associated parts of the literature in the frame of reference. The expanded exploration framework forms a break-down structure with topics and theories that is used when gathering empirical data through interviews (primary data) and contemporary reports (secondary data). The connection between the main areas and the literature is presented in the following three sections.
The expanded analysis framework is also used to create an interview guide, following the same structure with the addition of with contextualizing examples and questions that help the interviewees understand and dive into the topic.

3.6.2 BUSINESS DRIVERS

In order to understand and investigate the business drivers in API-enabled digital transformation a wide variety of literature is used. In section 3.1 Digitalization of Business and Value of Information, several types of business drivers in IT developments are discussed that can be related to the use of APIs. Areas included in the exploration framework include how businesses can leverage data through APIs, and how IT enable or enhance information partnerships, sourcing, inter-organizational value creation, business networks and business platforms. How APIs relate to the use of service-oriented architecture and service-oriented thinking in business IT is also included to understand benefits of internal use in relation to business processes.

The information sought for when gathering empirical data is based on the underlying factors that have driven important IT-related changes in the industry, and traditional business drivers for IT. If there is stronger network focus and companies have established partnerships, coopetition or collaboration to improve competitiveness, sourcing of resources, products and services or achieve other things. Furthermore, has the view of information has changed and do companies try to leverage data to create or improve their products and services.

3.6.3 BUSINESS MODEL CHANGE & INNOVATION

To understand the impact of API-enabled digital transformation Business Model Canvas is the central theory and analysis perspective. As discussed in section 3.2.4 about Business Models, the canvas components that are more related to API-enabled digital transformation include: Value Proposition, Channels, Customer Relationships, Key Resources, Key Activities, Key Partnerships, and Cost Structure. The literature from other authors in section 0 about how digitalization affects business models is also used as a complement the canvas. Since the use of APIs has strong connections to service orientation and process management, Business Processes (Management) and Service-Oriented Architecture theory is also included in the exploration framework to provide a more operational insight in the business.

The empirical data about business model change and innovation that was searched for included whether companies’ business models have changed in terms of integrations, modularization and IT-related changes based on the related building blocks of business model canvas. The empirical data searched for also include examples of companies that
have illustrated business model innovation and companies’ visions on future IT-related business model innovation in their industries.

Moreover, empirical data on how business processes have changed due to new technologies that promote integration and standardization. Impacts from changes have also been investigated in cases where no major changes in companies’ business models have happened. This is relevant since business processes can be seen as the Key Activities canvas block which indirectly affects other blocks of the business model. Companies’ current and past perspectives on becoming more integrated internally and externally and are also gathered, where the development can be related to challenges and limitations.

3.6.4 CHALLENGES & LIMITATIONS

In the third area of the exploration framework, Challenges & Limitations in API-enabled digital transformation are investigated. Section 3.5 IT & Organizational Change provides essential tools for this. The literature about challenges and problems in strategic and operational adoption of IT is included and investigated in relation to APIs. The Three Mediation Strategies are also included and related to the literature about APIs, business networks and inter-organizational value creation in section 3.1.3. Leavitt’s Diamond fulfills the role of a multi-purpose framework to extend other literature, for example how leveraging data requires changes for people and tasks. Challenges and limitations are also connected to literature about change in Business Models, Value Design and Business Processes.

Empirical data is gathered about the challenges and limitations that companies see in business becoming more integrated and networked because of API-enabled digital transformation, together with important lessons learned from developments and projects so far. Furthermore, empirical data on how IT has impacted companies’ way of working is gathered from both a strategic and organizational perspective based on Leavitt’s Diamond.
4 EMPIRICAL DATA

In this chapter, the gathered empirical data is presented. The chapter consists of three main parts. The first part contains a list with real-world examples of API-enabled digital transformation with varying types of change, ranging from incremental process digitalization to radical API-enabled business models. The second and third parts cover the exploration framework analysis framework based on sources that should provide complementary perspectives. The second part consists of secondary empirical data from contemporary reports about digital transformation and APIs, published by well-established consulting and research firms. The third part contains primary empirical data from interviews with consulting firms, IT solution providers and API-utilizing companies.

4.1 EXAMPLES OF API-ENABLED DIGITAL TRANSFORMATION

This section presents a collection of examples of companies that have performed interesting digital transformation initiatives involving use of APIs, or even deployed completely API-enabled business models. These real-world examples are included to provide context for theory and other empirical data through, and does not cover all of the possibilities or types of initiatives that are possible. The following examples are based on public information from company websites and the interviews that were performed.

4.1.1 API MANAGEMENT SOLUTION PROVIDERS

Over the last 10 years, a whole industry has formed around API management. In August 2014, the research company Forrester published a study with evaluation of the 11 most significant API management solution providers. Those providers are mentioned here for reference:

- CA TECHNOLOGIES
- AKANA (formerly SOA Software)
- APIGEE
- MASHERY (now Intel Services)
- MULESOFT
- TIBCO SOFTWARE
- WSO2
- AXWAY
- IBM API MANAGEMENT
- 3SCALE
- INFORMATICA
4.1.2 CUSTOMER EXPERIENCE & VALUE ADDING SERVICES

Companies across various industries are doing digital transformation initiatives to improve or extend the customer experience by enhancing products or services.

NIKE has created an API-enabled ecosystem around its fitness wearable electronic devices and sports community. Nike’s API can be integrated into other hardware makers’ devices. Nike has also launched the Fuel Lab which is a software incubator in the purpose of helping hardware makers to integrate its fitness measurement system, Nike Fuel, into their devices.

GENERAL MOTORS has provided a set of APIs that give third-party developers access to vehicle related features in order to develop more innovative and user friendly in-car applications and remote mobile applications for customers to enjoy. An example is the smart phone-app Telogis Fleet which allows companies to manage their fleet vehicles.

EBAY, the online auctioning giant, has created comprehensive APIs for their merchants. Through these, merchants can retrieve information about items, submit items for listing, manage biddings, and many other things. This allows merchants to automate selling and bidding processes, improving the experience for both sellers and buyers.

MBANK is a polish bank that has created more digital touch points with their customer by establishing partnerships with various companies in combination with segmenting their customers. The bank sends notifications to a customer’s smart phone with discount offers to stores based on customer data and location data. The service is enabled by cross industry-collaboration APIs and the purpose for the service is to add value in the customer’s daily life.

4.1.3 INTERNAL PROCESSES

API-enabled digital transformation can have significant impact on internal processes and there are several interesting examples of companies that have successfully achieved efficiency and quality improvements. APIs can be used to support a SOA strategy or to build customized user interfaces and workflows on legacy systems.

SALESFORCE.COM is the well-known leader of cloud-based CRM. Salesforce has further established their strength by building a developer community with extensive documentation online, offering a wide array of APIs for customers to integrate, administrate and control their engagements in the cloud.
AMAZON.COM is a widespread example in this area. In 2003, the company decided that all of its infrastructure services should be accessed internally through an API. This reorganization of software assets made the assets much more accessible to the company's programmers and later these internal services could easily be used externally when launching Amazon Web Services.

“All teams will henceforth expose their data and functionality through service interfaces. [...] Anyone who doesn't do this will be fired.”
– Amazon.com CEO Jeff Bezoz in the company-wide policy from 2003

COCA-COLA ENTERPRISES is a good example who has been using its internal APIs since 2012. Their API program has allowed Coca-Cola to build several internal apps, including an Olympic ordering app that helped it keep the Olympics well stocked with Coca-Cola products.

4.1.4 BUYING AND SELLING DATA
Companies can buy data over APIs from other organizations to improve processes, products or services; or they can identify data that is valuable for other organizations sell it over APIs.

VERIZON offers a service called PrecisionID to stakeholders in marketing and is used for a more effective advertising. By segmenting Verizon customers into demographic, interest and geographic, the PrecisionID provides data through APIs for marketing and addressable advertising solutions that reaches audiences more accurate, and more effective than other solutions in the mobile advertising space.

FACTUAL is company running an open data platform and community. They provide a marketplace of evolving data on thousands of topics, for example restaurants, hotels, and doctors. Factual's platform store over 65 million local businesses and points of interest in 50 countries, accessible via download or APIs. Companies that use Factual are those who need to consume data sets about local place information, entertainment and information such as Bing, Facebook Places, Yelp and Groupon.
4.1.5 API-ENABLED BUSINESS MODELS

There are several examples of companies whose business models rely heavily on the use of APIs to be successful.

EXPEDIA AFFILIATE NETWORK (EAN) writes on their website that they are the world's fastest-growing private label travel affiliate network and one of the world's leading online travel companies. EAN works with over 7,500 partners in 33 countries to turn their web traffic into hotel bookings and 90% of EAN's business now utilizes APIs. EAN also offers third party APIs and has been taken up from over 5000 developers worldwide. Their hotel booking platform has generated more than $4 billion in revenue from its huge global network. Websites that are connected to Expedia through APIs are for instance Hotels.com, HomeAdvisors.com, Hotwire.com and Egencia.se

TWILIO operates an interesting business model; selling business communication services (SMS, MMS, Voice, Video and more) through their cloud API. Twilio basically offers an outsourcing solution for telecom hardware and communication systems, allowing customer businesses to stop thinking about the technology and focus on creating applications and services that run on Twilo's platform.

GOOGLE MAPS is one of the most widely used embedded APIs on various third-party sites and applications. Google Maps are free to use for end users. Although the API is also free up to a certain number of users, Google does charge for usage above this level in order to recover the costs of serving the increased traffic loads.

SPOTIFY uses APIs to improve their reach through an API-centric content business model. Spotify serves data (music) from central server locations and rely on APIs to deliver both the metadata and the stream to a variety of freely downloadable clients on many platforms. This way, Spotify can take advantage of extended reach through large mobile platforms (android, iOS), a web interface and other devices.

4.2 CONTEMPORARY REPORTS

This section aims to act as a complement to the frame of reference and the interviews with secondary empirical data. It consists of the contemporary reports about digital transformation and the use of APIs in businesses, published by consulting firms and research institutes. Several reports consist of studies based on large amounts of interviews or surveys while other reports are less based on data and presents opinions, views and lessons learned from projects carried out by the consultancy firms. The empirical data in this section represent a larger amount of data though it will be affected by being public documents, some of which also serves as marketing materials.
The empirical data is presented in three parts, one for each exploration framework area with separation between API-related digital transformation material and specific API material.

4.2.1 BUSINESS DRIVERS

Business Drivers for Digital Transformation

In 2011, Capgemini Consulting & MIT Center for Digital Business published a comprehensive report called *Digital Transformation: A Roadmap for Billion-Dollar Organizations*. The report presented results from a survey of 157 business and IT executives in 50 large traditional companies, located in North America, Europe and Asia, about how these companies manage and benefit from digital transformation.

In the report, Capgemini & MIT (2011) conclude that digital transformation in companies is driven by pressure from customers, employees and competitors. Some companies also mention globalization and M&A activities as drivers for increased digital transformation. The report also concludes that while many companies had made significant investments and efforts in implementing ERP, CRM, or other technology-enabled changes, they had only obtained basic levels of value from these investments. Much more value could be obtained by continuing this effort, by envisioning new capabilities and process changes to reap larger returns from foundational investments. Capgemini & MIT (2011) created a breakdown of digital transformation in three categories: *Customer Experience, Operational Process* and *Business Model*, see Figure 4.1. While the report is not specific about APIs, many of the blocks can be considered enabled or enhanced by APIs (these are highlighted by the authors in Figure 4.1).
In 2011, EY published the report *The Digitization of Everything*. It confirms the main driving trends of digital transformation as the need to achieve collaborative and cross-channel engagement with customers, suppliers, and employees together with social media. EY states that expectations that are being formed in the B2C world are transferring to the B2B world and increasingly suppliers and partners will look for ways to engage digitally with each other. Therefore, organizations should work to integrate procurement into their supplier relationships to reduce manual processes and improve invoice tracking, and develop portals for real-time collaborative forecasting with suppliers to better manage inventory.

According to Hewlett-Packard Labs’ paper *The Future of Enterprise IT in the Cloud*, from 2012, managing a hybrid portfolio that includes both internally developed and externally acquired services will be one of enterprise IT major challenges. Furthermore, the effective collaboration between businesses and their customers and suppliers is also changing IT. Cross-enterprise collaboration requires sharing, exchanging, and managing information across enterprise IT walls. Such collaboration has expanded beyond virtual meeting rooms and conference calls to include temporary controlled access to internal information systems, knowledge bases, or information distribution systems. Collaboration could extend into temporarily tapping into the workforce and IT assets of other enterprises and crowdsourcing services. This expansion will create new ecosystems that rely on effectively and selectively enabling access to the required
systems and services, because such ecosystems must be more open and accessible than traditional IT.

**Business Drivers for APIs**

In 2013, the API infrastructure and solutions provider 3scale published the book called *Winning the API Economy*. The book provides valuable insights from the trend of increasing API usage and its impact on businesses. According to 3scale, the emergence of cloud, mobile, and social computing have accelerated the need to put flexible software at the core of what businesses do. For this, APIs are required in order to universally access core systems and resources. And by exposing data, business processes and other services through APIs, organizations can create compelling new business platforms. While software becomes important in the modern business world and provided competitive advantage in the previous decade, it has become table stakes to succeeding in the new decade.

According to 3scale, a business strategy that successfully draws on software is critical to the long-term survival and health of most organizations. Leading adopters with the right strategy gain competitive advantage and market share as a result. By using APIs, it is possible for organizations to create and maintain stable, clear interfaces to businesses while enforcing disciplined, internal usage of well-structured interfaces, providing powerful integration points, and establishing clear strategies for partner and customer engagement. APIs, at their core, provide two types of benefits:

1. They restructure and organize **internal systems** to support innovative new projects in a uniform manner, reducing maintenance costs and increasing agility.

2. They provide new opportunities to generate **new ways to reach customers**, generate revenue, and **build partnerships**.

From the internal perspective APIs provide the following main benefits:

- Reduced complexity and improved change management
- New opportunities by allowing greater experimentation and innovation
- Controlled access to close partners and contractors.

From a wider perspective, APIs enable organizations to create new external partnership, distribution and transaction channels. APIs can transform businesses into platforms that support both internal and external actors. Organizations can enable flexible APIs as major channels into their business to be driven from anywhere, provide mobile, web and other client interfaces as a flexible layer on top of APIs, allow customers to
integrate directly to core systems, and grow strong ecosystems of partners that repurpose, resell and re-bundle assets to reach new audiences that the original organization could never have reached alone. In addition, Accenture (2013) writes that APIs provides agility for development of new applications by using common functionality via APIs to standardize data and service access in order to minimize rework.

Following are more examples of new transaction opportunities that APIs provide presented by 3scale (2013) and HCL Technologies (2014):

- Partners can augment their company’s own offering
- Partners can act as distribution channels
- Customers integrating efficiently with software can drive much higher transaction volumes
- Third parties out of the inner circle can find innovative uses of data and service to promote the brand or drive new customers

In 2014, the consulting firm HCL Technologies published a report called *API-fication: the core building blocks of digital enterprise*. In this report, HCL write that the trend of publishing APIs to encourage the development of user applications is not new. The ubiquity of mobile devices and the proliferation of social interactions have increased the motivation for enterprises to provide APIs. HCL mean that historically businesses have had either product or process centric approaches, but the recent drive towards customer and user centricity have created demand for applications to be built rapidly with frequent iterations. HCL also identifies mobile and cloud to be major drivers for API-fication in order to support different segments of users through focused applications that bring business functionality to specific customer contexts, create cheaper innovation cycles, and allow users to access enterprise assets at their convenience. APIs allow different groups of developers, internal, external and partners to gain access to enterprise systems in an easily consumable way, typically by using an API platform.

The strategy of providing APIs has the following benefits for the providing organization according to HCL Technologies:

1. Reduction of costs: APIs is a cheaper way of building applications by increasing the reuse of services.
2. Increasing business agility and foraying into different eco-systems: Since APIs offer integration with any technology stack, they allow higher productivity for developers.
3. Increasing innovation and new business models: By allowing others to build applications that integrate with their captive data and processes, enterprises see new applications using their services in new and previously unforeseen contexts.

4. Increasing consumer loyalty: By involving consumers and passionate developers in a new generation of applications, the enterprise can increase brand awareness and loyalty in the core groups.

In 2014, McKinsey & Co published their view of API developments in an article at Forbes. In the article McKinsey state that over the past few years, APIs have transformed how B2B and B2C companies share information and reach new customers. APIs have increasingly become a business development tool and a go-to-market channel that can generate substantial revenues from referrals and usage fees. McKinsey predicts that this is just the first wave of value that APIs can deliver for businesses and mean that, given the strategic importance and revenue potential of this resource, discussions about APIs should be elevated to the head of marketing and head of sales.

Accenture published the paper *Driving Agility and Innovation through an API Strategy* in 2013 where they list potential benefits of APIs. From a provider perspective, exposing parts of their businesses through APIs allows companies to let other parties disseminate their products through value added software and services offered by those parties. In essence, they take advantage of other parties' network externalities.

Accenture also publish three main drivers for API adoption: Integrating new channels, Rolling out mobile applications and Building a developer community. From a consumer perspective, the straightforward benefits are decreased time and effort when developing new applications and services. Developers can combine seemingly different APIs in creative and new ways with relative ease, producing innovative products extremely fast and at low cost. Finally, as a common benefit for providers and producers, Accenture state that they must get involved in the API Economy, or it will put them behind with respect to competition and their abilities to efficiently grow and evolve their business.
4.2.2 BUSINESS MODEL CHANGE AND INNOVATION

Importance of unified data and digitization of products and processes
Naturally, all the covered reports agree that APIs are an important building block in digital transformation and that change in business models will happen. However, opinions regarding the magnitude of the impact on business models are varying.

Large successful companies often have difficulties in generating a common view of customers or products because they often operate in siloes where each have their own systems, data definitions, and business processes. Advanced approaches to customer engagement or process optimization cannot occur without the common view. Web-based companies are therefore more able to gain advantage through analytics and personalization more readily than traditional business by using unified data and processes.

Digital technologies have enormous potential to change a company's underlying operating model and business processes. Especially through ability of digital to deliver radically more efficient processes, as well as entirely new products and services. In the report by Capgemini & MIT (2011), they mention companies that are reshaping their boundaries through digital by complementing their traditional products with digital products. This is exemplified in 0
Customer Experience & Value Adding Services.

To prepare for the digital transformation many traditional companies are therefore investing in integrating data and processes, with the help of digital, across the enterprise. Already implemented ERP and CRM systems are one step in this direction.

**How digital transformation affects business models**

EY (2011) states that many companies are responding to the challenge of digitalization by moving from *single transaction* relationships to *interaction* relationships. However, to succeed in the digital world, forward-looking companies have to embrace innovation and creation of enhanced or new business models, new ways of interacting with consumers, and new ways of selling by grasping new opportunities that exist outside the traditional markets.

Additionally, giants of technology are recognizing the need to shift and adapt business models and organizations are therefore in need to develop end-to-end digital engagement strategies and comprehensive digital operating models that address suppliers and employees just as much as customers.

Organizations must decide whether they can enhance or transform their existing models, or whether they need to invent a new model. The IT Advisory Division at EY published the reports *The digitization of everything* (2011) and *Born to be Digital* (2014) – based on interviews with 170 IT executives such as CIOs and CTOs – that concludes that the digital transformation will lead to three core changes of the business model.

1. Use digital technology to enhance traditional business models
2. Transform existing business models digitally
3. Invent entirely new business models or different engagement models

McKinsey (2014) exemplifies a type called *Plug-and-Play Business Model*. While digital forces reduce transaction costs, value chains are being disaggregated which third party products or services easily can be integrated into the gaps. Amazon is a great example of such, where they offer businesses logistics, online retail storefronts, and IT services. For many companies it may not pay out to hold and develop those functions themselves. Instead they simply integrate existing offerings into their value chains. This creates strong motivation to have standardized methods of integration to ease the integration with other actors.

Another example are found in the travel industry where new portals assembles entire trips – consisting of flights, hotels, and car rentals – in real time with dynamic pricing...
that is based on supply and demand. Small companies and even individuals, that offer third party stand-alone offerings, can plug into these portals. Competition is therefore intensifying when more and more niche providers can gain access to these new platforms.

**Business opportunities driven by API usage**

In the book by the API management solution provider 3scale (2013), they argue that organizations who open up APIs typically innovate more rapidly, improve data access and provide uniform data and transaction to developers, partners and customer. Software applications accessing these APIs can be developed to create new functionality and value both for the organization and externally, as exemplified with *Plug-and-Play business models* in McKinsey's 2014 report.

Reaching new customers through partners and third party apps is also supported by Accenture (2013). Their report concludes that APIs enable new business models and modes for efficiency such as: interacting with customers over social channels, monetizing your data and services for use by others and maximizing IT efficiency. Furthermore, APIs has traditionally been viewed as standard interfaces to interact with underlying hardware and software. Accenture (2013) states that this is no longer only the case, today's APIs offer a simplified interface to access valuable business data and functionality through standards. The right set of APIs enables a framework for internal, partner and external users to reuse, evolve and scale your capability: new users and use cases can begin consuming your data and services via APIs without need to re-implement your back-end services.

Organizations can use APIs to enable *Self-service Models* that can be used for empower internal groups, partner organizations and independent developers to enhance functionality on their own without being limited by capabilities of their IT department. Internal departments can for instance refactor data to group a specific dashboard.

APIs can contribute to *Unique Offerings* where public or open APIs give access to unique data or services. An example is Netflix using Amazon Web Services Elastic Compute Cloud APIs means that as Netflix gets more popular, the usage of Amazon's API increases, results in financial gains for Amazon.

Moreover, 3scale (2013) presents five business areas where APIs drive success:

- **Mobile enablement:** The API architecture offers a stable backend for multiple applications on different device types and platforms.
- **Customer and partner ecosystem growth:** By exposing content or transactional capability for others to build integrations on top of.
- **Developing massive reach for transactions and content** by creating multichannel distribution of data and content and facilitating transactions
- **Powering completely new business models:** API becomes the primary product for a company or one of its divisions.
- **Driving internal innovation:** Creating an environment that is ready for change and innovation

3scale presents, in their book, that APIs can have a lifecycle that transform between different use cases as they mature, see Figure 4.2.

![API lifecycle diagram](image)

**Figure 4.2 The API lifecycle (3scale, 2013)**

### 4.2.3 CHALLENGES & LIMITATIONS

**Challenges and Limitations in Digital Transformation**

Capgemini & MIT (2011) discuss how to overcome challenges in order to successfully driving digital transformation in organizations. According to them, companies can do much more to gain value from the IT investments they have already made, while also envisioning more radical new ways of working. Capgemini & MIT state that successful digital transformation comes not from creating a new organization, but from reshaping the organization to take advantage of valuable existing strategic assets in new ways. And they continue to present challenges of digital transformation into three categories: *Initiation challenges, Execution challenges* and *Governance challenges*.

In terms of initiation challenges, they highlight management sponsorship as a major issue. Executives are justifiably skeptical of benefits in emerging technologies and experience from e-commerce taught many executives that a fast follower approach can sometimes preferable to a pioneering approach. Many executives, especially in healthcare and financial services, are being careful about mobile and social technologies because of security and privacy concerns. Healthy skepticism or regulatory
concerns are legitimate reasons to be careful and, certainly, not all digital initiatives make sense for all companies. However, these reasons should not prevent companies from investing in potentially valuable digitally enabled experiments or business changes. Figure 4.3 illustrates how the executives in Capgemini & MIT's study justify their investments in digital transformation.

![Figure 4.3 How companies justify digital transformation investments (Capgemini & MIT, 2011)](image)

Capgemini & MIT (2011) highlight some execution challenges in their report. Missing skills for emerging technologies are a common problem, especially in areas such as mobility and social media which drive much of the change. Cultural issues can also become a problem, especially when it involves changes in jobs due to automation or information empowerment. Since digital transformation initiatives require a solid foundation of technology-enabled processes and data, analytics, and solution delivery, IT is a fundamental part of the firm's digital capabilities. However, in Capgemini & MIT's study many companies found their IT infrastructures and capabilities severely lacking.

Governance challenges emerge since benefiting from digital transformation typically requires changes in processes or decision-making that span traditional organizational or functional structures. Like any major organizational change, top-down effort is required to help employees envision a different reality and to establish coordination to ensure change is taking place in the right direction. While small incremental investments can be effective starting places to build digital capability, the largest benefits of digital transformation come from large-scale initiatives. This requires a more radical vision and senior executives need to establish an overarching
transformation of the future since managers in the rest of the firm often will tend to locally optimize within their own spheres of authority.

Capgemini & MIT (2011) also discuss the importance of business & IT integration. Digital Transformation requires strong integration between technology and business executives and companies with a history of strained business and IT relationships are handicapped in digital transformation. These companies often have issues common to those that do not govern IT well and have complex IT architectures, unintegrated data, and less technology-enabled processes. On the other hand, in businesses with a solid business & IT relationship, IT executives can help business executives meet their goals, and business executives listen when IT people suggest innovations. Where strong relationships exist, executives on both sides of the relationship are willing to be flexible in creating new governance mechanisms or digital units without feeling threatened.

EY's (2011) report *CIOs born to be digital* also provides experience-based insights of challenges in digital transformation. According to their results, traditional IT functions are often not well set up for innovation and new ideas. They don't have the ability and skills to discuss how to drive revenue growth with the sales and marketing organization. To counter this, CIOs need to know what drives the business, how business processes work, and how these all fit together. CIOs can actually provide a high degree of innovation, especially as they already service many business units. But to get this right, companies need to rethink how they organize themselves.

In EY's other report from 2011, The Digitization of Everything, EY also states that while agility is important, for some businesses, the risk of adopting new and disruptive digital business models is that certain customers become uneasy with the change. In this case, or if businesses want to experiment with digital business models, an additional option is to spin off smaller businesses and learn from them.

In Gartner's (2014) latest report, Top 10 Strategic Predictions for 2015 and Beyond, show that many organizations are beginning or in the midst of digital business transformation initiatives. Gartner predicts that 30% of these efforts will be successful, and attributes this success to four differentiating factors:

- Innovated business models that harness technology as the enabler.
- Business processes that are designed to be super-maneuverable, enabling them to shift as customer needs shift.
- The embracing of standardization and variable business processes, referred to as deliberately unstable processes, enabling them to productively scale and seize opportunities as needed.
Organizational liquidity, which enables the organization to change readily and seamlessly when facing significant change.

Challenges and Limitations with APIs

3scale (2013) emphasizes that an API strategy is not about technology. In their view, it is an architectural approach with a particular way of thinking about interfaces: providing self-service, one-to-many, reusable interfaces. It appears similar to SOA though the focus is different and in many ways an evolution, though closer to SOA’s original goals. According to 3scale, though reusability is emphasized in SOA the reality is that it focuses primarily on a limited number of tight, one-to-one integrations and specific use-cases, which hinder reusability. API architectures attempt to deal with the one-to-many integration issues more directly. While there is no silver bullet, having an API strategy in place helps businesses execute software-driven strategies successfully.

HCL Tech offers states that digitalization of businesses has inherent complexities such as the following needs:

- Need to serve both internal and external needs within an enterprise with conflicting goals of governance and security
- Need to leverage key assets and services, without compromising the focus on agility and customer centricity
- Need for building capabilities that support new business models without causing business disruption in the existing business services
- Need to support agility in development, delivery and operations and support adjustment to elasticity of demand often through cloud (public or private), and yet leverage the existing assets in infrastructure, processes, and support, by crafting suitable business case for selective transformations

These challenges cannot be answered by technology alone. Any digital shift for an established enterprise must balance with the existing assets, processes, systems, and operations. HCL suggests SOA as a primary candidate for basing API systems on to support reusability. However, since SOA itself is actually built upon legacy systems of record there are several problems such as:

- SOA services are dependable and stable, but slow to change
- SOA services are inward focused and promote reusability, making them coarse grained and complex
- SOA services are standardized in their output, which makes the output slower to modify, and subject to interpretation
• SOA services are unable to keep pace with the current speed of innovation and short iterations in app development

Accenture (2013), just like 3scale and HCL, means that just having APIs is not enough. There is a big difference between an ad hoc set of APIs and a carefully curated and managed set. To achieve the latter business need to run an API program that covers APIs through strategy, governance, design, build and operation. Together the stages work towards the desired outcomes.

According to Accenture, APIs are simple to build as technical components alone, but by themselves they only enable access. The challenge and reward lies in creating an API program directed to a common goal where the key elements are:

- A compelling set of services that will attract and satisfy users
- A standardized governance and management model for consistent operations

It is important to have visibility into the APIs and accesses that are used and have consistent application of policies and development not to introduce business and IT vulnerability. Without a structured approach, APIs will lose the simplicity that makes them valuable.

4.3 INTERVIEWS

This section presents primary empirical data from interviews where opinions, insights and views on API-enabled digital transformation are presented. Several types of companies are represented to capture different perspectives on the topic. Therefore, the interviewed persons represent consulting firms, IT-solution providers and API-utilizing companies. The purpose of this section is to provide primary data that is more focused on the topic. Also, the API-utilizing companies are intended to provide counterbalance to the optimistic, visionary and sales-oriented reasoning among consulting firms and IT solution providers.

To provide some structure in section 4.3.2 to 4.3.4 where the interview results for each exploration framework area are presented, the empirical data has been divided into a few main themes that identified after the interviews were performed. If not explicitly specified that a certain company states something, all statements are summarized common views from all the interviewed companies in the section.
4.3.1 INTRODUCING THE COMPANIES AND INDUSTRIES

Among the companies that were contacted, senior employees with combined IT and business experience and skills were requested for interviews. At API-utilizing companies this included Chief Information Officers, IT Directors, Business Developers or similar. At consulting firms and IT solution providers a variety of titles were contacted under with the request of interviewing someone with knowledge on the topic of digital transformation. The requested criteria for interviewees were fulfilled except for a few cases, where the interviewed positions were less senior and more versed towards technical aspects (see titles in
Table 4.1. A summary of the represented companies with interviewees can be found in
Table 4.1.
Table 4.1 Summary of interviewed companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Type</th>
<th>Respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accenture</td>
<td>Consulting Firm</td>
<td>Executive Director, Per Österman</td>
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<tr>
<td>Capgemini Consulting</td>
<td>Consulting Firm</td>
<td>Senior consultant, Anton Redfors</td>
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<td>Evry</td>
<td>Consulting Firm</td>
<td>Consultant, Anton Fjällström</td>
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<td>DHL Supply Chain Bank X</td>
<td>API-utilizing Company</td>
<td>IT Director Nordics, Helena Sjöberg</td>
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<td>IT Solution Provider</td>
<td>Enterprise Architect, Johan Westman</td>
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<tr>
<td>SAP</td>
<td>IT Solution Provider</td>
<td>Technical Quality Manager, Conny Dahlgren</td>
</tr>
</tbody>
</table>

Consulting firms & IT solution providers

All the consulting firms that have participated in the study offer digital transformation consulting services to enterprises and the representative from the consultancy firms are working in Sweden. The consulting firms are well versed in digital transformation, and have knowledge of digital transformation projects.

The firms are in consensus that the digital transformation is inevitable and that both new and traditional companies will need to adapt to change that is happening right now. More and more things are getting connected and integrated. APIs provide interfaces and integration points to businesses in a clear way and can easily be exposed both internally and externally.

Airline Industry

SAS is one of Scandinavia's leading airlines with destinations in Europe, the US and Asia. The company is a membership in the Star Alliance and provides customers with access to countries around the world.

SAS was one of several airlines who collaborated in the 80s in order to develop a digital ticket standard and created the global distribution system Amadeus which is where the digital tickets are stored. The ticket standard in combination with integration to other
airlines and their systems provided a simpler check-in process than non-digital tickets. However, the standard is limiting further development of the system because the initiator of further development must be certain that the improvements works with all the collaboration partners' systems, which leads to great development costs. The high degree of collaboration and integration with each other's systems in combination with the opportunities to reach customers more efficiently has resulted in airline sales offices have been replaced with online solutions. The sales distribution today is 60% through agents which is also connected to Amadeus and 40% are from in-house sales.

The business concept of offering transportation from A to B is unchanged in the digital transformation. However, the airline industry is extremely competitive which has led to that business processes are already very streamlined. Airlines are now competing with price and the offering of additional services.

**Logistics & Warehousing Industry**

The logistics and warehousing industry is an interesting example of an information intensive business. The companies interviewed are either (or both) shipping or third party logistics providers and are among the largest on the Swedish markets. Both shipping and warehousing companies have existed long before IT, but have benefited tremendously from IT development. Today, orders in and out of these companies are managed digitally with various systems. Some customers even have ERP systems directly integrated with the shipping and warehousing systems, and several third parties have introduced intermediary services with shipping administration and integration platforms. Digital technology has also contributed with drastically increased transparency, accessibility and availability through APIs which have been significant for the outsourcing trend.

**Banking Industry**

The interviewed banks are among the largest in Sweden and one of the banks contacted is a niche player in internet banking and operates without any bank-offices. The banking industry is a transaction-oriented and information intense industry which has led to early usage of technology to increase efficiency. Early on, banks has not just improved the back-office with technology but also developed their services throughout the process up to the interaction with customers, by using automation and self-service solutions such as card terminals, ATM and etc.

Today, the introduction of internet and mobile banking is transitioning the industry from a physical to virtual banking where the number of interactions with customers is growing. The development of virtual banking has led to the possibility to found banks
without bank offices; this was not possible 15 years ago. Moreover, consumers and companies don't want to deal with papers anymore which are apparent nowadays when invoices, payments and even money in itself are becoming digitized. The number of bank offices has been reduced to the advantage of the bank's website and mobile solutions. The role of APIs that provide real-time and consistent data is becoming greater when more interfaces and services share the need for the same data for various purposes are expected to be available for the customer all hours of the day.

4.3.2 BUSINESS DRIVERS

In the interviews with representatives from consulting firms, IT solution providers and API-utilizing companies, the following three themes were identified among the business drivers: business agility, cost reduction and understanding and satisfying customer needs, seen in Error! Reference source not found.. However, the emphasis and priorities between the themes vary somewhat among the three interviewed groups which are described in the sections below.

<table>
<thead>
<tr>
<th>BUSINESS AGILITY</th>
<th>COST REDUCTION</th>
<th>UNDERSTANDING AND SATISFYING CUSTOMER NEEDS</th>
</tr>
</thead>
</table>

Figure 4.4 Interview themes for business drivers

Consulting Firms

The driver that has received most focus and importance among consulting firms was the need to better understand and satisfy customer needs. The main reason for this is that many industries have seen new and stronger expectations from customers recent years. It is considered that the companies who offer the services that best simplify customers' everyday lives will be the most successful. Because of this, many companies are currently investing to start providing personalized offers to their customers. The trend is that companies constantly try to reduce the number of options and the number of decisions customers have to take. Moreover, better customer experience is created through creating Omni-channels, creating an experience that will meet the customers’ expectations regardless of interaction being physical or digital, allowing customers to have a seamless and simple experience.

Traditionally, cost reduction has been a driver for investing in IT and is still a driver today. IT entails the potential to more efficiently automate, streamline and control the processes of a company. APIs allow integration within and between processes internally and externally to a greater extent which give rise to completely new and innovative
automation and ways of working and result in a more flexible organization that can reduce the cost of business processes significantly. An example of this is Försäkringskassan where they have invested a lot in automation of processing, in certain types of cases the processing is completely automated while processing of other types are a highly automated.

The meaning of business agility is that companies need to work more agile internally and be flexible in order to better adapt to the changes in the company's business environment. APIs plays a big part in this as it becomes more difficult to plan and predict the future companies need to form digital ecosystems to be able to react fast, where APIs act as the communication between the nodes in the ecosystem. A company's future competitor may not be in the market today but can make introduced quickly with the help of new (digital) technologies.

**IT Solution Providers**

Among the driver themes, the business drivers emphasized less on cost reductions. Instead, they indicated understanding and satisfying customer needs and business agility as more important. They also discussed these two themes as intertwined, where business agility supports the capability to understand and satisfy customer needs.

To be able to achieve a high degree of business agility, and for companies to create and deliver value faster and more efficiently, they need to have a stable base and a high degree of integration of services, processes and systems. This is one of the reasons why APIs play an important role due to its feature to help standardize and ease integration with different systems while having the potential of creating loose relationships between businesses and other players.

Furthermore, IT solution providers have seen an increase in demand for exposure and consumption of data which also contributes to business agility. The combination of organizations becoming more global and the fast increase in number of mobile devices has led to that the need for consuming data and companies to expose services and processes has increased significantly. Furthermore, there is a trend in which companies shift infrastructure from internal networks to internet and cloud. This has also driven the developments and more usage of APIs. Cloud relies on APIs and IT solution providers have seen a great rise in demand for exposure of services through APIs. APIs are no longer a technical discussion or an obstacle. However there are companies that still want to provide the services themselves in order to have full control and have therefore not committed fully to this.
**API-utilizing Companies**

Among the API-utilizing companies, the priorities of the business driver themes were different within each industry. In general, all the companies promote understanding and satisfying customers as the most important driver. Today, the customers are better at telling companies what they want. This has led to increased expectations and demands which sets high standard in the interaction and experience both with customers and internally in the company. The banks are currently investigating in personalizing services, process automation and cognitive solutions.

Automated self-service is a clear trend overall which increase customer satisfaction and reduce cost. This service has been introduced to the airline industry early on due to its cost reduction effects which is very important in their extremely competitiveness business environment.

Every company mentioned business agility in different ways. While API-utilizing companies did not explicitly talk about their capability to change, they emphasized the increasing importance of continuously becoming more efficient, improve customer experience, running shorter projects that quickly show results and to evaluate upcoming opportunities. In order to support this, the companies are starting to standardize information and integration by investing in IT that offers transparency, accessibility and availability of services. Companies has chosen different approaches, some companies are migrating business processes to the cloud, some forge omni-channel strategies, and others are looking at tools for real-time modelling and data usage. The common goal for all the IT integration initiatives is to obtain competitive advantage through different value-adding services that extends their current offerings. APIs is especially used for value-adding services in business to consumer e-commerce solutions.

### 4.3.3 BUSINESS MODEL CHANGE AND INNOVATION

In the interviews with representatives from consulting firms, IT solution providers and API-utilizing companies, the following three themes were identified among the business model change and innovation: increased integration, customer experience and digitally enhanced processes, seen in Figure 4.5. Emphasis and priorities between themes for the interviewed industries are described in the following sections.

![Figure 4.5 Interview themes for business model change and innovation](image-url)
Consulting Firms
On the integration theme, several of the consulting firms promote that companies should start (or continue) to build digital ecosystems. In digital ecosystems, APIs are identified as the foundation to manage, control and analyze information that is exchanged, while also providing excellent scalability. APIs are pointed out as a proven success factor for driving digital development in companies. With a strong digital ecosystem in place, organizations become more agile through their capability to reconfigure processes, channels and collaboration. Also, new revenue models can be introduced through digital technology and APIs. For example, companies can start selling some of their data over APIs, or they can buy APIs with data to use for customer insights or optimization of processes internally. Though Evry was the only firm that mentioned an actual (confidential) client project for selling data over APIs, and that client was already selling the same data in a file-based manner in the purpose of ease integration and be able to offer real-time data.

Capgemini Consulting highlights that digitalization is forcing co-opetition & demand for collaboration in many industries and organizations. Customers are often interested in a combination of several products or products with associated services. Therefore, organizations must understand the customer's perspective and work together with other organizations to adapt to the customer. Through integration, new channels are established that enables new customer segments to be reached. Capgemini also discuss that while information exchange is becoming more standardized, it also has to be flexible enough for change and developments to take place.

Customer experience was the second theme discussed in interviews with all consulting firms. Through digitalization, innovation and change is happening in the front-end of companies. Digital technology provides opportunities to link knowledge, advice and information to physical products, and by providing these value-adding services to customers companies can extend their offerings and build loyalty. Accenture mentions how hybrid platforms can be used connect anything to legacy systems, allowing reception of more data in a cost effective way through APIs to build a better front-end to customers with web and mobile solutions.

Digitally enhanced processes, the last theme in the interviews, is about how digitalization creates opportunities to improve existing processes or create completely new processes. Several firms mention that digitalization has increased globalization and transparency, allowing processes to be implemented with increased reach and efficiency. APIs provide modularity and flexibility of internal and externally facing processes in companies. Accenture highlights that by opening up interfaces publicly in a
controlled manner, great potential can be unlocked in terms of development of new business models, products, and services in collaboration with suppliers. Accenture has seen a shift in how, historically, IT has worked with cost cutting, and now it is more about innovation opportunities by managing data and creating intelligence. Capgemini Consulting has also seen a shift in how organizations, instead of applying IT on the current way of working, are doing the opposite and designing processes after the new prerequisites introduced by IT.

**IT Solution Providers**

Common thoughts among IT solution providers revolve around how collection of data from different sources will shape future businesses. All of the providers see how the vast majority of industries are developing ways of working with data and manage knowledge from a rising number of sources. IT solution providers also agree on the increasing service-orientation across all industries and help customers develop and deliver digital value-adding services.

IBM contributes with further thoughts on future trends for digitally-influenced business models. They predict continued focus on social media, problem solving, collaboration and crowdsourcing in business models. IBM also suggest that further virtualization of traditional sales channels will happen, and provide an example where IBM helped a client create a virtual experience for car dealership. IBM is also investing heavily in cognitive computing, addressing complex problems characterized by ambiguity and uncertainty. This cognitive computing problem solving service is sold over APIs, allowing customer companies to utilize the service in their business models, while the collective data input from customers contributes to improving quality of the service at the same time.

**API-utilizing Companies**

Although all of the API-utilizing companies are subject to digitalization, none state that their core business idea have radically changed because of it. Increased service-orientation in both business and IT areas is common across all industries. Just as the perception that IT and business are becoming increasingly intertwined because of IT increasingly becoming a business enabler.

There was no consensus regarding how to source IT and the arrangements vary even within industries, though all companies seem to agree that active work and investments in digital service development is becoming more and more important. Most of the companies are actively investigating how to utilize the large amount of information that
is available to provide personalization, with the exception of the airline industry where they see limited opportunities for personalization.

More specifically in the Airline industry, which always has been driven by partnerships and collaboration, companies are currently looking into integration of content such as destination descriptions or in-flight entertainment. Competition has forced airlines to look for new revenue streams, currently talking about extra sales such as seat upgrades, extra baggage or meals on board, which require integrations with new systems and suppliers. In a more distant future, integrations will probably involve extended travel, e.g. transportation to and from the airport. Further innovation will happen though front-end IT towards customers, providing further automation in customer-facing processes to increase efficiency and customer satisfaction.

In the logistics and warehousing industry, several companies have extended their business network through integrated partnerships, providing value-adding services such as invoicing and payment transactions. The customer base is fragmented in terms of integration, with direct customers and third parties managing own integration layers. Though the industry is strictly standardized with labels for goods and packages, digital communication is still far from standardized because of buyers' power. Innovation is happening on the consumer-side of the industry though. Traditionally, customer relationships have primarily been with senders, but companies are looking into using digital technology to start building relationships with recipients. For example, Postnord Logistics recently launched an app providing value-adding services for receiving packages.

In the banking industry, new digital channels are developed gradually to generate value and increase efficiency. More automation is being developed in customer-facing processes and there is a common vision in the industry about offering more proactive services. There are several examples of platform sharing and co-opetition in the banking industry. For example, the instant money transfer service *Swish* and the transition to one shared ATM network, where each bank can control the user experience. In recent years, the industry has seen third party innovations generating value by combining information from different sources, such as Mint (USA) and Tink (Sweden) who analyze and visualize account transactions. Though these are not strictly API-based (since banks do not offer APIs to third parties), they illustrate a concept that could be built on APIs as well.
4.3.4 CHALLENGES & LIMITATIONS

In the interviews with representatives from consulting firms, IT solution providers and API-utilizing companies, the following three themes were identified when discussing challenges and limitations: the need for digital strategy and governance, problems with security & legal aspects and organizational challenges, seen in Figure 4.6.

Figure 4.6 Interview themes for challenges & limitations

Consulting Firms

The consulting firms are, again, quite aligned when it comes to challenges and limitations in digital transformation. Three main themes can be identified: the need for digital strategy and governance, security and legal aspects, and organizational challenges.

Digital strategy and governance is needed to achieve coherence and coordination across digital transformation initiatives. When goals, strategy and governance have been defined, then companies can choose what the capacity and extensiveness of the digitalization should be. According to Capgemini Consulting, the digital strategy should be part of the company strategy. Conflicting objectives in initiatives that span across divisions or organizations can easily lead to complications. Therefore, it is important to develop approaches and objectives in line with the overall vision for the organizations' digital initiatives. Accenture also emphasizes the need to find balance between digital visions and seeing to tomorrows' business, being able to manage both in parallel.

Today, anyone in the business organization can purchase a cloud service, essentially bypassing any traditional governance structure. When IT loses this control, problems will often occur after 1-2 years when business needs the services to be integrated with the company's systems. To prevent this, IT needs to step forward and take responsibility for how to create the digital ecosystem that facilitates the business, which increasingly becomes dependent on digital support.

Security and legal aspects is the second area, which all consulting firms perceive as a very common road block for change. Many organizations are afraid to be first in the industry to implement changes or want to wait for provisions on regulations or laws to be processed. Capgemini Consulting also highlights that cyber security is increasingly
important, and some EU countries have begun to implement laws on the subject. On the other hand, Accenture suggests that digital transformation is largely based on trust. Opportunities are created based on the data that we are prepared to hand over, and the use of data needs to be transparent and reported.

The final area discussed is organizational challenges. Consulting firms believe that companies need to adjust the way of working. IT and business need to become more integrated and agile, because the business does not know where to begin and IT knows how the data looks and how to manage the data to get maximum value out of it.

With the possible benefits of a digital ecosystem presented earlier, the culture and methodology in the company need to match up. A learning-based organizational approach needs to be applied and the practice should involve use of proof of concept projects that are scalable and can easily be rejected if unsuccessful, while learning from each project. As Accenture puts it: Think big, start small, scale fast and fail cheap.

Transformation can be a long and painful process for organizations and question the very foundations of the business. Capgemini Consulting emphasizes that tenacity is needed since transformation will take years, or even decades. Uncertainty and fear about the future development where many roles will change or disappear will naturally lead to resistance to change.

Consulting firms also agree that many organizations incorrectly address challenges by investments in new technology, which usually do not play out well. The most important things to change is the culture and the way business works. Accenture mentions that one reason for slow change is that it takes time for digital opportunities to reach and be accepted by senior management. This is very important since large change initiatives need management sponsorship to be successful, preferably at CXO-level.

Finally, Accenture argues out that technology does not solve the question of competence; it is hard to find the right skills. Even though many large corporations have people with the right skills, they might be hard to find.

**IT Solution Providers**

The identified themes among IT solution providers’ thoughts on challenges and limitations are well aligned with the consulting firms.

In terms of strategy and governance, the IT solution providers also see challenges in how to manage exposure of APIs. Road mapping and governance will be needed and little experience exists about this today. As it becomes easier to collaborate and share
information in different constellations there is future uncertainty in questions like: *Who owns which information? Who can use it? How do we control it?*

Regarding security and legal aspects, the IT solution providers emphasize the importance of these issues as in a more connected and integrated future. IBM also mentions ethics and privacy is important adjacent factors. The consensus seem to be that compromises will be required between businesses organizations who want things fast and the enterprise IT that must see to legislation, security, policies, and so on.

Organizational challenges mentioned are aligned with those mentioned by consulting firms. Organizations need to create agile prerequisites for projects to successfully manage digitalization, and they need to manage the power shift between IT and business, as the business becomes more IT-savvy with stronger demands. The idea of separated IT and business might no longer work when the business requires IT skills in order for organizations to react quickly enough to change. The IT solution providers’ perception of the current situation is that in some companies the business knows exactly what is needed. While in others, the marketing officers are still asking IT which systems that are needed.

IBM argues that many industries, especially in retail, have just recently gone from denial to confusion about digital transformation. The current challenge for those businesses is to figure out where to start in terms of which data and value to aim for.

Finally, IT solution providers agree with consulting firms that technology is rarely the limiting factor in change. More often, it is resistance to change, inertia of the organization or lack of competence that hold back change.

**API-utilizing Companies**

There are several common challenges that are mentioned about organizational challenges in the interviews with the API-utilizing companies. The companies agree with IT solution providers and consulting firms that the challenges they face are not really in IT, but in the related service and process areas who rely on IT. The conclusion among API-utilizing companies is similar as well, that there is need to spread IT competence in the organization and that IT and business needs to be brought closer together. Some companies also mention that they need to be better at managing shorter, more intense projects that faster brings results.

Several companies mention great difficulties in changing culture around IT as they are facing a great challenge in getting employees to think of IT as a business enabler. This
involves breaking the tradition of IT budgets as a place for cost cutting. The opposite is needed since companies have to invest in digital service development.

Several companies mention timing and prioritization as challenges, and SEB emphasizes the strategic issue of positioning themselves properly in the S-curve of the digitalization trend. Security, regulation and privacy issues are mentioned by all companies, with extra emphasis in the banking industry that is heavily regulated. Transformation that leads to change or redundancy of existing jobs also means resistance to change. And several companies mention the challenge of developing skills and education among employees when more IT is introduced in products, processes and services.

The airline industry faces internal challenges when companies are introducing extra sales and new products that have not sold before. This means that governance, processes and reporting procedures are very difficult to change when the since they have been extremely streamlined and optimized for the industry. For example there are industry-specific KPIs that are central to control and reporting of the company.

The logistics companies mention managing legacy IT systems as a major challenge, and several mention managing customers' legacy systems as a challenge as well. The latter means that industry-wide adoption is required, since both logistics providers, customers and other stakeholders all take part in the same integration system. Postnord's CIO estimates that the current initiatives in consumer interaction and internal architectures will take several years to implement before reaping all the possible benefits. He also emphasizes that while there are plenty of technically possible opportunities ahead, the maturity and profitable of those need to be verified.

The banking industry is still in the major challenge of changing the way of thinking in an industry where many of the more senior employees have not worked digitally before, and have neither the knowledge nor the interest to do so. To sell digital products they have to start thinking digitally. Skandia see a shift from in-house developed systems to procurement of standard systems and more focus on integration, value-adding services and interfaces on top, which is a challenging transition. Several banks mention the common problem of spending too much focus on specific technologies rather than on the goals to achieve. A common challenge is to maintain customer relationships when customer automation becomes more extensive. Many banks have built their offerings around personal relationships with customers. Bank X emphasizes that while capabilities of IT have increased, so has complexity, and changes need to be done carefully in an evolutionary and modular way.
5 ANALYSIS

In this chapter, the gathered empirical data is analyzed in a structured way. Analysis is performed in two steps. In the first and most emphasized step, primary data from interviews with API-utilizing companies, consulting firms and IT solution providers is analyzed based on the frame of reference. The data is examined for confirmation or contradiction with the literature or insights that extend beyond the frame of reference. In the second step, secondary empirical data from contemporary reports is analyzed with two purposes: to increase the amount of data and to extend the frame of reference with connections and knowledge presented in the reports. The empirical data is also reviewed critically for vested interests among sources.

![Figure 5.1 Framework for the analysis process](image)

5.1 BUSINESS DRIVERS

5.1.1 UNDERSTANDING & SATISFYING CUSTOMER NEEDS

The most conforming and emphasized driver from the empirical data gathered was to understand customer demands in order to satisfy the customer needs. Customer demands have in recent years been driven by consumer IT which has led to new and stronger requirements. The requirements are such as self-service and value-adding services which offer transparency through digital experience of business processes. These requirements are expected by the consumer to be available and accessible at any time, in a convenient way. Furthermore, business wants a seamless and simple interaction with customers across digital and physical channels in order to satisfy the new and stronger customer needs of being able of perform actions in the same way no matter the platform.
Using APIs facilitates seamlessness and has a major advantage given that you can access the same data and services, and combining these into different interfaces that are intended to be used for different platforms and purposes. APIs can therefore replace the earlier way of developing where the interfaces or applications were directly connected to the data or file transfer containing the data needed.

The frame of reference does not emphasize as much on customer demands being a major and significant business driver instead the frame of reference states that the business processes must become more efficient in order to offer more value to the customers. The reason can be that companies are directly exposed to the market and its customers, which gives them a better and more current insight of the market which is difficult to understand from a theoretical perspective. In addition, to understand customer needs and to improve business processes has always been promoted to take into consideration and are often recurring.

However, majority of the publications in contemporary reports highlights understanding of customer needs as a main business driver. In the study by Capgemini & MIT (2011), customer experience is one of the three key areas where executives are digitally transforming. EY (2011) and HCL Technologies (2014) agree on developments in consumer IT is influencing the requirements on enterprise IT and how enterprise IT is used. Moreover, customers, suppliers and employees put pressure on organizations to achieve a more collaborative and cross-channel engagement and to be more digitally engaged.

Overall, there are no uncertainties regarding understanding and satisfying customer needs is the most commonly mentioned and one of the most important business drivers in the API-enabled digital transformation.

5.1.2 BUSINESS AGILITY

The empirical data has shown that the organizational need to gain a better understanding of customer has put pressure on business to be more agile in their business processes in order to meet and surpass customer expectations. Business agility is therefore needed to be able to responds more quickly to the rapidly changing business environment while being efficient. Many organizations have consequently performed internal reorganization, started to consume and expose more data, and made use of short-going projects in the hope of achieving results faster and to be better at embracing opportunities. Using APIs are claimed to be essential and has been very beneficial in this aspect due to its characteristics similar to SOA and standardized proceedings that ease communication between processes or services which also
contributes to another business driver, cost reduction. Usage of APIs in short-going projects brings easier integration with different data sources, applications, services and interfaces etc. which results in that the effort put into the project can be focused on carrying out the project instead. New difficulties related to using APIs in short-going projects were not revealed.

Moreover, organizations are investing in cloud solution in order to gain transparency, availability, and accessibility. The data is commonly communicated by using APIs which cloud solutions often are relied on. Logistics companies agree and stated that end users are getting more interested in services where the companies expose their business processes and services. Moreover, reasons mentioned is the globalization of organizations in combination with increasing numbers of devices that requires data to be exposed and consumable at any time which is putting pressure on companies to be more agile.

The empirical data is well aligned with the frame of reference which also states that business agility is a factor that organizations are constantly looking to improve. As mentioned in the frame of reference, business processes management are of importance and have been used by organizations in order to continually improve activities and operations by managing business processes with internal and external reach more efficiently, effectively and adaptably. IT is widely important when improving business processes (Davenport, 1993; Margherita & Petti, 2010) and offers dynamic, flexible and interactive information and knowledge systems (Anttila & Jussila, 2013) which give possibilities to generate new methods to help organizations to remain current and achieve an advantage to their competitors. The benefits with APIs is consistent with Guo et al. (2014) opinion about how modularization of business processes with plug-and-play capabilities will contribute to companies increasingly differentiating themselves by richly linking internal and external digital assets into business networks. Konsynski & McFarlan (1990) states that information partnership is one of the most intriguing ways of joining forces without merging. This is consistent with the advantageous of exposure and consumption data where information is used to enhance business.

HCL Technologies (2014) explains that APIs has the benefit of enabling access to partners in a controlled way, and business platforms can be created by exposing data and business processes. Capgemini & MIT's study also points out operational process as one of the three key areas where executives are digitally transforming. According to 3scale, putting flexible software at the core of business is a necessity to be more agile. Using APIs when restructure and organize internal systems is preferred by 3scale (2013)
and HCL Technologies (2014) because APIs help reduce complexity and improve change management.

Improving business agility has been significant, traditionally, and is still a very important business driver today. APIs are commonly used and also seen as the main building block by some companies when linking processes and assets into business networks in order to adapt to new and stronger customer demands. Business agility is very important in order to take advantage of the opportunities that arises in the changing business environment in a more agile approach.

5.1.3 COST REDUCTION

Cost reduction can be viewed from two aspects, the first as a business driver which has been mentioned in the empirical data, and the second as an effect derived from IT investments. According to the empirical data, the use of APIs contributes to reduced cost by its integration and sourcing capabilities which is used in for instance to reduce work by offering self-service solutions and automation of business processes where APIs are used as linkage in order to integrate and combine multiple parts and enables the solutions and automations. Cost reduction was not mention primarily as a business driver in the interviews but was mentioned as a secondary business driver.

The frame of reference and contemporary reports does not point out cost reduction as a business driver but rather as a prerequisite when investing in IT. Moreover, Model, Keen & Williams (2013) promotes that cost can be reduced by sharing IT investment cost by being more integrated with suppliers and customer. The ATM network initiative is one example of lowering cost through partnerships. However, the focus has mainly been on being more effective and efficient in business processes and in offering services in the purpose of increase customer satisfaction rather than to reduce cost primarily.

Cost reduction has traditionally been one of the drivers for IT investments. But nowadays, according to the frame of reference and contemporary reports it is seen as a prerequisite and a positive effect of other business drivers and IT investments. In the end, cost reduction is not considered to be one of the main goals nor a main business driver in API-enabled digital transformation. However, cost reduction is still something organizations want to achieve.
5.2 BUSINESS MODEL CHANGE & INNOVATION

Frame of reference, contemporary reports and companies interviewed all agree that APIs are an important building block in digital transformation which affects business models. However, the degree of impact and time-perspective vary in different areas and industries.

5.2.1 INTEGRATION, CO-OPETITION & COLLABORATION

The empirical data shows general increased focus on building digital ecosystems to increase capabilities to reconfigure processes, channels and collaboration within and among companies. These digital ecosystems consist of integrated digital services, devices and systems where APIs are the natural facilitator of integration, boosted by cloud computing and mobile trends. Increased influence of social media collaboration & engagement and crowdsourcing on business models is also mentioned. Consulting firms mention new revenue models and revenue channels that can be established through integration with partner challenges, networks or platforms. Overall, these developments align well with Jarvenpaa & Ives (1994) and Bharadwaj et al. (2013) which predicted stronger focus on network and service organizations, though shift in general seem to be much more subtle than suggested by the authors. The contemporary reports focus more on digital ecosystems than the modularization of businesses, with the exception of McKinsey's (2014) Plug and Play Business Model report.

Companies see gradually increasing degree of integration with existing suppliers and partners, especially evident in the logistics and warehousing industry. Many of the integrations have existed many years through file-based exchange, but are not being replaced with APIs that extend functionality and introduce real-time communication. Integration among companies in the same industry, even competitors, is also increasing, driven by customers’ demands for combinations of products. This corresponds well to Cohn et al. (2014) and Konsynski & McFarlan (1990). The information partnerships presented by Konsynski & McFarlan (1990) are all relevant today, though the interviewed companies mention somewhat different incentives. Reduction of technological cost and risk seem less important today, but partnering can aid in collective ownership of information standardization. The shared integration projects in the banking industry are good examples this, and align well with Grover & Kohli (2012) on co-creating value through common platform investments. This area is also recognized in contemporary reports, focusing mainly on developing new digital channels through partnerships or collaboration.
5.2.2 CUSTOMER EXPERIENCE

The empirical data offers thoughts on customer experience oriented business model impact from API-enabled digital transformation, where the corresponding blocks in the Business Model Canvas are *Value Proposition, Customer Segments* and *Channels*. With customer needs being one of the major drivers for digital transformation, it is no surprise that companies focus most on change and innovation in the front-end of the business. API-utilizing companies are building and improving digital channels to enhance customer experiences, providing personalized offerings, creating digital value-adding services and further virtualization of traditional sales channels. Several companies talk about Omni-channel strategies which revolve around integration between physical and digital channels. These changes begun with the internet and now APIs are enabling a broader context where customer experience can be created across a variety of digital channels.

The frame of reference does not offer extensive information about customer experience. The overall development is as described by Cohn et al. (2014) as data being used to improve business models to improve customer value. It also aligns with Keen & Williams (2013) who argue that digital business will stand out through innovation through interfaces to customers, partners, and suppliers. In the contemporary reports this area gain more focus. Capgemini & MIT (2011) are spot-on about companies currently reshaping their boundaries by complementing traditional products with digital products and services. And EY (2011) describes how organizations are responding to digitalization by moving from one transaction relationships to interaction relationships, where interaction with customers continue after the initial purchase through value-adding services.

5.2.3 DIGITALLY ENHANCED PROCESSES

The third area of the empirical data is about how API-enabled digital transformation creates internal business model change and innovation, affecting *key activities* and *key resources* in the business model canvas. In the interviews, companies mention a shift where businesses start to adapt their processes after IT opportunities, instead of adapting their IT to old ways of working. APIs offer benefits in terms of increased modularization and service-orientation in the business and IT, and can partly be seen as a new generation of SOA, though being much more than an architectural concept. APIs are an important part when digital transformation allows companies to increase transparency, insights and analytics in processes and build solutions with increased automation and cognitive solutions. APIs are also foundational in building more agile business and IT architectures, allowing companies to faster respond to change.
The benefits of APIs and many of the applications that companies talk about in interviews align well with Bell & Marks (2006) about SOA, who argue that SOA provides indirect opportunities to gain competitive advantage through increased customer satisfaction, business agility, faster time to market, ease of partnering, IT cost reduction, and increased IT productivity. In the business model canvas context, APIs can act as a facilitator of value flows between blocks as suggested by Westerlund et al. (2014). API-enabled service-oriented processes also enable the plug-and-play like business models suggested by Jarbenpaa & Ives (1994).

In the contemporary reports, MIT & Capgemini (2011) emphasize that digital technologies have enormous potential to change a company's underlying operating model and business processes. Especially through ability of digital to deliver radically more efficient processes, as well as entirely new products and services. 3Scale (2013) also argue that APIs drive internal innovation by creating an environment that is ready for change.

5.3 CHALLENGES & LIMITATIONS

5.3.1 DIGITAL STRATEGY & GOVERNANCE

Consulting firms and IT solution providers emphasize the importance of establishing digital strategy and governance to achieve coherence and coordination across digital transformation (including API) initiatives. This is certainly a biased opinion (since they sell consulting services for this) and the importance might be exaggerated, though having some kind of vision and plan should be common sense. The API-utilizing companies did mention some challenges that could be somewhat aided with strategy and governance, for example in which and how much to invest in digital initiatives. They also mentioned that IT departments must adapt governance & policies in general to meet the increasing skills and demanded by the business. Several API-utilizing companies discuss that high degree of integration with customers, suppliers and partners and transaction systems requires mutual technical maturity and adoption to achieve change. An example of this is in the logistics industry where API adoption is slow because of lacking system support and incentives among customers.

The suggestions above about the need for digital strategy and governance are in line with Bharadwaj et al. (2013) who argue for the establishment of a digital business strategy that represents both IT strategy and business strategy. The companies did not mention much that could be directly related to the Three Mediation Strategies by Andal-Ancion, Cartwright & Yip (2003), though examples of the strategies could be seen in industries (such as transport administrators in the logistics industry). Capgemini & MIT
(2011), EY (2011) and others all agree that digital strategy is needed and that traditional IT functions need to be reorganized to better support IT-enabled innovation and new ideas.

An interesting overall strategic challenge in digital transformation that several companies mention, but is not covered in the frame of reference or contemporary reports, is the challenge of maintaining customer relationships when customer automation becomes increasingly digitized and automated. This is especially true for companies whose brands have been built around personal service and personal relationships, for example many of the large traditional banks.

5.3.2 SECURITY, REGULATORY & LEGAL ASPECTS

Many companies express security, legal aspects and regulations as common fears and roadblock for change in the empirical data. However, some companies perceive that this is sometimes used as pretext not to take action, since it is easier to do nothing than to deal with something difficult and uncertain. Companies in traditional industries are afraid to be first-movers with data usage for personalization, analytics and so on. Capgemini Consulting state that cyber security is an increasingly important matter that will need to be dealt with properly in more industries. Accenture argue that many of these issues, especially privacy, will depend on mutual trust and transparency in exchange and use of data.

No further analysis of this area is done since the scope has been limited not to investigate security, regulatory and legal aspects of the topic.

5.3.3 ORGANIZATIONAL CHALLENGES

Organizational challenges can further divided into two kinds of challenge, initiation challenges and execution challenges.

One of the initiation challenges mentioned in almost all interviews is that companies need to adjust the way of working. IT and business need to work more integrated and cross-functional in order to better exchange IT skills and business understanding. If businesses can do this, it contributes to a more flexible organization which can take advantage of the technical opportunities that arises. In almost every source in contemporary reports state that business and IT need to become more integrated for the same purposes. Moreover, in order to create IT-enabled innovation, companies need to ignore the view of IT merely contributing to cost reductions. This is well consistent with Sandberg (2014) who states that IT is becoming more integrated into business practices because of the abundant advances in technology has shifted the
view of IT as significant drivers of strategic change rather than just a functional resource.

An initiation challenge that is mentioned in empirical data as well as in contemporary reports is that management sponsorship is needed before serious change will happen. This is a major issue since senior executives are often slow to understand and accept the impact of digitalization. Though certainly, a reasonable degree of skepticism is needed against opportunities in emerging technologies and a fast-follower approach can be preferable to a first-mover approach. Consulting firms emphasize that skepticism must not prevent the initial assessment, consideration and investigation of potential digital initiatives.

The most frequent execution challenges mentioned in the interviews was that companies need to work in a more agile and learning way, which is why the companies’ culture and methodologies need to be aligned with new technology. It is more important for companies to focus on the goal of the change and invest in processes rather than focusing on technology and tools. However, managing old legacy systems and processes is still something that needs to be done and can be challenging even though APIs aid with modularization and loose couplings. But as mentioned earlier, technology and tools are not the most limiting factors in digital transformation, the organization is. This is also highlighted in the frame of reference where Marchand & Peppard (2013) promotes that IT projects should focus on understanding how people create and use information. Leonardi (2013) adds that to get people to use new technology is not enough to bring out organizational change, how the technology is used makes a big difference. In the contemporary reports, Capgemini & MIT (2011) state that successful digital transformation comes from reshaping the organization to take advantage of valuable existing strategic assets in new ways rather than creating a new organization. This can be argued to be the same, but the key lesson is that change is a learning process where multiple parts need to be streamlined and understanding of organizational change is a major factor. Because of this, companies need to realize that digital transformation can be a long and possibly painful process because of comprehensive organizational restructuring, requiring tenacity from managers.

Both Leonardi (2013) and Marchand & Peppard (2013) state that many firms struggle to capitalize on the heavily investments in IT due to their conventional approach to designing and implementing IT. Capgemini & MIT (2011) also highlight this challenge and point out the fact that companies can do much more to gain value from already performed IT investments by envisioning more innovative new ways of working.
To summarize of the organizational analysis, Leavitt’s Diamond shows that the four edges are getting more tightly related. Higher degree of integration between creates more and stronger organizational interdependencies, and the four edges are increasingly affecting each other. These relationships in Leavitt’s Diamond should be considered by managers when creating strategies and planning for API-enabled digital transformation.

Overall the challenges and limitations brought up in this section are not directly related to API-enabled digital transformation (but covers APIs) they are rather related to the general digital transformation.
6 CONCLUSION & DISCUSSION

In this chapter, the significant findings from the analysis are presented and discussed in relation to the purpose and research questions. Directions for future research are also suggested.

6.1 FINDINGS

6.1.1 BUSINESS DRIVERS

RQ: Which are the business drivers that relate to API-enabled digital transformation?

The most emphasized business driver from the empirical data gathered, including both interviews and contemporary reports, was Understanding & Satisfying customer needs. Companies perceive stronger and more demands for automated, personalized and accessible value-adding services. Some businesses are striving to achieve seamless and simple interaction with customers across digital and physical channels with Omni-channel strategies. APIs facilitate this integration across channels as a simple way to access data and services over the internet, and connecting these sources to various interfaces for different platforms and purposes. Customer demands are not discussed in the frame of reference as a significant driver, but mention that data will become increasingly important to create more customer value.

The second business driver found in the empirical data is Business Agility which is one of the major drivers discussed in the frame of reference. The interviews stated that the need for business agility derives from more rapidly changing environments in combination of becoming more efficient. The contemporary research confirms this, and several reports point out APIs as a way to reduce complexity and increase flexibility to become more agile. APIs allow organizations to embrace short IT projects to build lightweight applications separated from legacy back-ends, being able to achieve results faster. APIs can be used to increase business agility through modularization and service-orientation using concepts similar to SOA. Companies are increasingly turning to accessible and scalable cloud computing services, which rely on APIs for service communication and integration.

The final and third driver, Cost Reduction, seemed to be a lesser driver than the other two. Cost reductions are considered more as a prerequisite and a positive effect derived from the other two business driver. However, it is commonly mentioned as a benefit for IT investments and in the frame of reference cost reductions are presented as the traditional main driver for IT investments.
**6.1.2 BUSINESS MODEL CHANGE & INNOVATION**

*RQ: What kind of business model change and innovation does API-enabled digital transformation create?*

The emphasis of the business model change and innovation is happening in the front-end of the business model, towards the customers. API-enabled digital transformation is creating change and innovation in *Channels*, *Value Propositions*, and *Customer Relationships* business model canvas blocks. APIs are an important building block in creating value-adding services & digital customer experience and interaction.

Business network focus and modularization of businesses are taking increasing slowly. APIs seem to be a natural intermediate step in this change and not a major driver for it. Co-opetition and collaboration are becoming more common, with notable examples in industries like the banking industry which have seen several successful resource sharing and platform projects recently. There exist several examples of purely API-enabled businesses that sell information, management, communication or other services over APIs. These make great examples of increased modularization and integration, and more traditional companies can consider how they can connect these services to their business models. Modularization and service-orientation is also taking place within organizations. APIs enable internal process change and innovation based on the same concepts as Service-Oriented Architecture with increased freedom, creating changes in the *Key Activities* and *Key Resources* business model canvas blocks.

Data as a product for trade over APIs has yet to mature. Some examples exist though these are mostly companies that have previously sold or bought the same data through other channels.

**6.1.3 CHALLENGES & LIMITATIONS**

*RQ: What are the challenges and limitations that businesses are facing in API-enabled digital transformation?*

The changes and limitations found were mostly classic general challenges of using IT in businesses and not specific to use of APIs. The general consensus is that IT and business need to become more integrated and cross-function and that strategy and governance for digital transformation and API initiatives need to be established. Companies also need to develop a culture and mindset that enables IT-enabled change and innovation while not falling for technological reductionism.
Managing customer relationships in a digitized and automated world will be an important challenge, especially in industries where businesses have built their brands on personal service and personal customer relationships.

6.2 DISCUSSION

It is necessary to discuss the relevance and robustness of the findings in relation to the argumentation in the methodology discussion in section 2.6. Since the gathering of empirical material and analysis could be performed as planned with a sufficient amount of data the authors would argue that the results do carry acceptable reliability and relatively high validity claimed.

In general, empirical data and the frame of reference were in unity without direct disagreements and some empirical data that brought up issues outside of the frame of reference, which was expected in the exploratory study. The empirical data was generally consistent and conforming, with the exception of some variations in terms of different priorities between industries.

As expected, interviews and reports from consulting firms and IT solution providers did reflect their vested interests. This included increased emphasis on areas in which they offer products and services, and that they tend to promote the urgency of taking action. These tendencies has been somewhat mitigated in the presentation of the empirical data, though readers should still be aware.

6.3 DIRECTIONS FOR FURTHER RESEARCH

The results of this thesis open up for many opportunities for further research. Suggestions of further qualitative research include similar follow-up studies to study the development over time or more focused and studies of certain areas of the exploration framework, for example integration and buyer/seller relationships or collaborative digital platform initiatives.

Suggestions for quantitative research that would be interesting include studies that measure API adoption in relation to variables in the exploration framework or parameters found in the empirical data. It would also be interesting to perform studies measuring standardization of integrations in companies and industries and the acquired benefits on organizational and industry levels.
7 REFERENCES

In this chapter a complete collection references used throughout the thesis are presented, categorized in written sources, web articles and interviews.

7.1 WRITTEN SOURCES


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7.2 INTERVIEWS

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8 APPENDIX

8.1 INTERVIEW GUIDE

The following structure and guidelines was used to perform the semi-structured interviews.

8.1.1 FORMALITIES

- Ask the respondent for consent to record the interview
- Inform that a summary of the interview will be sent back for the respondent to review
- Inform the respondent that it is possible to be confidential

8.1.2 DEFINITION OF TERMINOLOGY FOR CLARIFICATION

**Business model:** Our definition of Business model is based on the Business Model Canvas and focuses on value proposition, channels, customer relationship key resources, key activities and key partners

**API:** A standardized interface for exchanging information against an IT Service which represents a function, process or a business unit.

**API-enabled Digital Transformation:** Increased use of APIs, increased communication and data exchange between devices, services and systems. APIs is used to connect systems and business processes.

8.1.3 INTERVIEW TOPICS AND QUESTIONS

**Business Drivers**

- What have been the largest and most important IT-related changes that affected the company?
  - What were the desired benefits of the change?
  - What were the underlying business drivers of the change, what did the company want to achieve?
- The theories mention that IT has transformed business in three waves. Would you agree of the following waves and could you describe how these waves have meant for the company?
  1. Increased automation has led to cost reduction of operational and management processes
  2. Introduction of the Internet has created opportunities for new business models and new business opportunities
3. IT-enabled innovation, using IT to create new innovative ways of doing business

- Has the company taken any steps towards data leveraging?

Examples of ways of leveraging data according to theories are the following:
  - Using data that physical objects now generate (or could generate)
  - Digitalizing physical assets
  - Combining data within and across industries
  - Trading data
  - Codifying capability

**Business Model Change & Innovation**

- Based on the major IT-related changes, how has the business model been affected? Have there been any changes in:
  - Customer or customer segments?
  - Value proposition or customer offerings?
  - The channels that you use to reach out your customers?
  - Key resources?
  - Key activities or abilities?
  - Key partnerships?

- Is the company integrated with its partners and clients?
  - How much are you integrated with each other?
  - In what way are you integrated with each other?
  - To what purpose are you integrated with each other?

- Is the company or the industry becoming more partnerships oriented?

- What is the company's view on increased integration internally and with other partners?
  - How has this view on increased integration changed?
  - The theory presents three mediation strategies for new IT; does the company use any of them?
    - Classic mediation: Eliminate middlehands
    - Remediation: Use technology to enhance existing relationships
    - Network-based mediation: Build networks of strategic alliances and partnerships in complex relationships
  - How do you think that this view will change in the future?

- What do you think are the future IT-related innovation in the industry?

**Challenges & Limitations**

- Related to the last question above
  - How is the company going to adapt to the IT-changes in the future?
  - What are the obstacles to take into account?
• What are the most important lessons learned regarding the largest and most important IT-related changes that affected the company?
• How has the implementation of the IT-related changes impacted the way the organization work (Task, People, and Structure)?
  o Have there been any problems?