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Development of a Managerial Approach for a New IT Organisation Design Framework (ITODF) Based on Digitisation Trends

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Prof. Dr. Gonzalo Wandosell Fernández de Bobadilla

Prof. Dr. Rüdiger Buchkremer

To my parents

‘The best way to predict the future is to create it.’

Peter Drucker

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ACRONYMS AND ABBREVIATIONS

α	Type I error
ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
AWS	Amazon Web Services
β	Type II error
CDO	Chief Digital Officer
CEB	Corporate Executive Board (Company)
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CHES	Chapel Hill Expert Survey
CIO	Chief Information Officer
COE	Centres of excellence or Centres of expertise
CRM	Customer relationship management
CTO	Chief Technology Officer
CXO	Chief [x as placeholder] Officer
d	Cohen's d – effect size
ERP	Enterprise resource planning
GE	General Electric
HiPPO	Highest-paid person's opinion
HR	Human resources
ICoE	Innovation centre of excellence
ICT	Information and communication technology
IS	Information systems
IT	Information technology
ITIL	IT Infrastructure Library
ITODF	Information technology organisation design framework
KPI	Key performance indicator
K-S test	Kolmogorov-Smirnov test
κ_w	Cohen's kappa
M	Mean
MANOVA	Multivariate analysis of variance

MAXQDA	MAX Qualitative Data Analysis (software program)
MVP	Minimal variable product
OT	Organisational transformation
p	p-value
partial η^2	Partial eta-squared – effect size
PS	Problem scope
QCA	Qualitative content analysis
r	Cohen's correlation coefficient
RPA	Robotic process automation
RQ	Research question
SAF	Scaled agile framework
SD	Standard deviation
SMAC	Social media (S), mobile computing (M), analytics (A) and cloud computing (C)
SME	Small and midsize enterprises
T	Hotelling's T^2
V	Pillai-Bartlett trace
Λ	Wilks's lambda
Θ	Roy's largest root

1 INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

Information technology (IT) is currently at a tipping point. The digitisation trends of social media (S), mobile computing (M), analytics (A) and cloud computing (C), also known as 'SMAC trends', are fundamentally transforming many industries (Durkee, 2010; Etro, 2011; Friedrich, Le Merle, & Peterson, 2012; Sabbagh et al., 2012). In addition, the concept of 'digital' has strengthened these trends and goes even further than SMAC in the direction of the Internet of Things or telematics (Deichmann, Roggendorf, & Wee, 2015). Finally, in the last two years, the concepts of connected products and the connected enterprise have eroded the distinction between physical and virtual systems (Lade, Ghosh, & Srinivasan, 2017; Ritz & Knaack, 2017; Rymaszewska, Helo, & Gunasekaran, 2017; Shamim, Cang, Yu, & Li, 2017; Wixom & Ross, 2017).

All these developments blur the traditional lines between business and technology (Hinssen, 2012). IT becomes a commodity that business can tap into anytime, anywhere – without requiring help from an internal IT organisation (Sullivan, 2009). Consequently, a growing number of business departments now see themselves as the new owners of the IT agenda. Marketing owns the digital strategy, group strategy owns the information strategy, and finance determines the landscape of analytics tools, to mention only three players within any organisation (Brinker, 2013; Gartner, 2013a; Westerman, 2013).

These developments go hand in hand with macroeconomic trends that shape a world in which everyone is connected with everyone else (Group, 2012; Krimpmann & Stühmeier, 2017; Pigorine, Divakaran, & Fleichman, 2012; Rymaszewska et al., 2017; Vikram Bhalla, 2017). This gives rise to a complex environment in which business requires IT to simplify things by joining all the dots and making relationships transparent instantly (Granados & Gupta, 2013). The requirements associated with these developments can be summed up as follows: IT must anticipate behavioural patterns that have changed the way consumers interact with technologies in their daily life (Davenport & Patil, 2012; Greengard, 2010; McAfee, 2011; Nambisan, Lyytinen, Majchrzak, & Song, 2017; Ritz & Knaack, 2017); and the role of the IT organisation must change to that of a 'service supporter', rather than a 'service provisioner' (Heier, Borgman, & Bahli, 2012; Hinssen, 2012).

The key to fulfilling these requirements within an organisation is organisational change – and change of this kind calls for organisation design. As Cichocki and Irwin put it: 'Organisation design is the art, the science and the business of building effective organisations. The aim of organisation design is to match the form of an organisation as closely as possible to the purpose for which it exists' (Irwin & Cichocki, 2011, p. 12). Organisation design models have been used for more than a century to acknowledge changes and implement corresponding adjustments aimed at creating effective organisations (Irwin & Cichocki, 2011; Mintzberg, 1980). The first researcher and practitioner in the field of organisation design was Frederick Taylor (F. W. Taylor, 1914), who broke down different tasks into manageable, autonomous elements. This marked the beginning of the division of labour into distinct organisational units within one organisation. One of the best-known examples of Taylor's approach is the Ford Motor Company assembly line, where different organisational groups simultaneously executed different tasks contributing to the same end product. Taylor's work was adapted and refined by other researchers, who created their own approaches. The most widely acknowledged of these are Leavitt's diamond (Leavitt, 1989), Galbraith's Star Model (Galbraith, 1995), McKinsey's 7-S (Waterman, Peters, & Phillips, 1980) and the Burke-Litwin model (Burke & Litwin, 1992). After Taylor's groundwork, these researchers discovered the impact of change on the existing model. Initially, Leavitt found that change does not occur in isolation but, rather, that it affects multiple parts of the organisation. He therefore built his 'Diamond Framework' on four elements that are affected when any organisation faces change. This was a fundamental shift in research because most organisation designers at that time considered organisation structure to be the only element of organisation design (Galbraith, 1995).

However, it must be remembered that most of the above models were developed during the past two decades. Stanford (2007) remarks that '[…] each was developed in an era of relative stability when organisations tended to have a single overarching business design that for the most part flowed down through the various divisions and business units'. He goes on to argue that in today's agile times, these frameworks provide a reasonable foundation but must be applied wisely by practitioners in the respective contexts and will probably have to be adapted to the rapid pace of change. Friedman (2006) and Haffke, Kalgovas, & Benlian (2017; 2017) support this argument by giving various examples of how today's world changes the way organisations organise themselves. While some models suggest strictly separating different organisational structures, he gives specific examples of companies that did the opposite to promote collaboration.

But these two authors are not the only ones to have recognised this trend. Others have looked into it further by using new frameworks or adapting existing ones. Baldwin (2012), for example, has written a report that elaborates the changes required to organisation design in a world of distributed innovation. The author shows the different effects of distribution on various dimensions and how these effects influence the other parts of the design. She uses the abovementioned frameworks to reach conclusions on how organisations must change. Other frameworks include the 'Fractal Web' (McMillan, 2008), Ralph Kilmann's 'Five Track Model' (Kilmann, 2003) and the 'Holonic Enterprise Model' (Ulieru, Walker, & Brennan, 2001).

Besides pure organisation design models, IT-specific models have been derived from the literature cited above. DeLone & McLean (1992) used Leavitt's diamond to derive specific success factors related to information systems (IS) and combined them to create the 'IS success model'. Gartner, a leader in IT-specific research, published its 'IS Model' and its 'IS LITE Model'. Well-known consulting companies have also made contributions in this area: for example, Accenture, with its unpublished 'IT Operating Model', and CEB's 'World-Class IT Organisation' (CEB, 2012; Chuck & Woolfe, 2003; Mok, 2012). Focusing more specifically on the history of the IT-related models reveals a slightly different development. Like organisation design models generally, IT organisation design models have developed continually over the last century. However, they have also changed dramatically from decade to decade. While the 1980s and 1990s proposed completely integrated IT departments, the turn of the millennium saw the advent of 'IS Lite' and 'Reduced IT' models driven by the question of whether IT is relevant at all (Carr, 2003).

As mentioned at the beginning of this section, we are now at a tipping point, where IT organisation design must change if it is to mirror the demands that digitisation places on any internal IT organisation. Moreover, for the first time since the advent of mainframe computers in the 1950s, internal IT organisations are on the verge of becoming totally irrelevant to the business (Group, 2012). As already stated, any business unit can purchase most standard IT services from an external IT service provider, leaving only the cumbersome and difficult-to-manage services to the internal IT department (Horlach, Drews, & Schirmer, 2016; Jain & Bhatnagar, 2016; Shamim, Cang, Yu, & Li, 2016). If business takes on ever more IT responsibilities, IT is destined to become a capital drain rather than a driver of innovation, process efficiency and customer satisfaction.

On the other hand, if the internal IT organisation can transform itself and become a driver of competitive advantage for the business, it can significantly shape the trajectory of the business. Some research also suggests that the Chief Information Officer (CIO) is advancing towards one of the most crucial job positions within an organisation. This research often cites examples where an understanding of IT instruments and tools delivers insights into unstructured data that would otherwise not have existed. This point of view is backed up by examples involving IT staff with extensive knowledge of financial instruments such as analytics, marketing instruments including salesforce.com, HR tool suites like workday.com and many other innovative IT solutions (Babcock, 2013; Bernnat, Zink, Bieber, & Strach, 2012; McAfee, 2011; Münzl et al., 2009; Plummer, 2012). According to research by Gartner, the future role of the IT organisation will move away entirely from 'keeping the lights on' to '[…] fuel[ing] top line growth, […] [offering] business-IT expertise, customer insight, versatility and hybrid thinking' (Morello, 2012). However, moving into a very different age also presents challenges in the area of IT workforce management (Beninger & Carter, 2013). Different skill sets are needed (Jahn, Messenböck, Caye, & Mingardon, 2012), governance mechanisms must be adjusted (Heier et al., 2012; Raj, Sepple, & Willcocks, 2013; Weill & Woerner, 2013) and more intense supplier contacts require IT staff to be deployed worldwide (Group, 2012).

The literature offers different ways of acknowledging those changes and adapting organisations accordingly. These include process adjustments, introducing new roles and governance processes (Lacity, Willcocks, & Craig, 2015; Willcocks, Lacity, & Craig, 2017) or acquiring other players in the market. In an age when organisations face changes of this kind, the research into organisation design conducted over the past century strongly suggests that a changing and agile environment – in this case, driven by digitisation – requires a holistic perspective. As multiple researchers have shown (Galbraith, 1983; Nadler, Tushman, & Hatvany, 1982; F. W. Taylor, 1914; Waterman et al., 1980; Weisbord, 1976), change must be seen in the overall context of various dimensions (e.g. people, skills, tools) that affect each other. Organisation design models offer an overarching approach to adapting organisations in line with new requirements. IT organisations generally need to understand how and where digital forces are affecting IT, what opportunities new technologies offer for their operations and how the business can benefit from these. If IT organisations can develop in this way, IT becomes a driver of competitive advantage for the business (Group, 2012).

Regarding the specific topic of digitisation, it is necessary to focus on customer interaction with IT. Current trends have given rise to three dimensions that have been analysed to determine how digitised technology changes the way customers interact with IT:

(1) Context

(2) Content

(3) Continuum (Hinssen, 2011; Lund, Manyika, & Ramaswamy, 2012).

(1) IT demands are unpredictable because of evolving trends (Group, 2012); (2) IT customers are better educated and have a generic understanding of IT terms (McAfee, 2011); and (3) the speed of communication requires highly adaptable and skilled IT workforces (Babcock, 2013; Berry, 2012; Mok, 2012). Research shows, however, that today's IT organisations have not succeeded in making the adjustments required to manage the new challenges posed by these dimensions, nor do they take a coherent approach to implementing adjustments (Berry, 2012; Group, 2012; Heier et al., 2012; Hinssen, 2012; Loescher, 2012; Mok, 2013).

Current academic publications examine how organisation design shapes the effectiveness of organisations (Liker, 2003; Senge, 1990; Wong, 2011; Woodham & Weill, 2002). These sources highlight the necessary organisational skills, processes and structures, and how these define an effective IT organisation. Furthermore, Heier et al. (Heier et al., 2012) and Group (Group, 2012) have looked at general changes that are becoming strategically relevant in a digitised world. Both come to the conclusion that IT organisations need to deal with two different sets of requirements – one based on an industrial view of strong guidance and stability, and one based on a more digitised view, where adaptability and scalability are key to the success of an effective IT organisation. Marchand & Peppard (2013) call this a 'schizophrenic IT organisation'.

While a great deal of work has been done in this area, contemporary research still lacks a holistic view of what an IT organisation model should look like. At present, there is no model that incorporates existing organisation design research and digitisation trends. Research is currently at an early stage, and more in-depth analysis is required in this field. Only a few articles have been published that elaborate on the various dimensions CIOs must consider when adjusting their organisation (Burton, 2013; Galbraith, 2013; Marchand & Peppard, 2013; McDonald, 2013). The majority of articles concentrate on specific terms such as workforce enablement (Krimpmann, 2015a, 2015b) or shed light on the adjustments required at corporate governance level to incorporate the new digital requirements (Raj et al., 2013). Others analyse the patterns found within current IT organisations and the factors that determine these patterns (Guillemette & Paré, 2012). In addition, there are authors who discuss the general changes that occur but not the specific strategies that must be adopted to enable IT organisations to harness these changes (Mahoney & Gomolski, 2008). However, this final aspect is a good starting point for further research. In addition to researchers, practitioners are now publishing their points of view, especially through social media channels. This delivers valuable insight into what a future IT organisation model should incorporate if it is to succeed (Burton, 2013; Galbraith, 2013; Levie, 2013; McDonald, 2013; Woods, 2013).

These considerations provide the point of departure and motivation for the research presented in this dissertation. The aim of this research is to develop a generic framework that any IT organisation can use and structure in line with the current needs of the business and the new requirements arising from digitisation.

The following section analyses the research positions outlined above, states the problem defined by this dissertation and derives the associated research questions.

1.2 PROBLEM SCOPE AND RESEARCH QUESTIONS

The problem scope (PS) demarcates the research area and provides an understanding of the questions this dissertation seeks to answer. Furthermore, it details the aspects where the IT organisation design framework (ITODF) delivers specific solutions to the problem.

There is no model that provides generic guidance on how to design an IT organisation in an increasingly digitised world (problem scope PS1). 'Generic' here means not only across industries, but also across geographies, cultures and sizes of organisations. The models introduced in section 1.1 provide an excellent point of departure for both organisation design and IT organisation design. However, because digitisation trends are still comparatively new, a generic ITODF has not yet been developed. Some researchers have examined pattern development within IT organisations (Guillemette & Paré, 2012). Work in this area is published mainly in blog entries and other online media, but not in formally conducted qualitative or quantitative research. Additionally, small-scale studies have recently been undertaken to support the view that there is currently a lack of a holistic ITODF (Haffke et al., 2017). Because there is no generic model, most organisations hire external consultants to develop standalone organisation design models for specific purposes. Most of these models are not developed further and remain unused after implementation. This means that while the purpose of the initial work is fulfilled, the solutions are not sustainable and do not provide guidance for practitioners. A generic framework would enhance the body of knowledge in IT organisation design and offer benefits including the following:

1. Cycle time reduction: The key aspect of a generic ITODF is its reusability, which greatly reduces the cycle time for analysis, conceptualisation and implementation of an IT organisation design. Some researchers state that a generic model helps to reduce cycle times by more than 30%, if followed (F. W. Taylor, 1914).
2. Better communication: A framework enhances communication consistency by providing standardised terminologies, reducing the likelihood of a demotivated workforce due to a lack of communication experience. Many reorganisations fail because of deficiencies in stakeholder communication (Halm, 2011).

3. Pattern search for best practice success factors: A generic framework enables data to be compared as it becomes available when the ITODF is applied. The various dimensions of the ITODF can be evaluated in terms of the patterns that different organisations fulfil, thus providing guidelines for further implementation in other organisations. Possible information includes structural preferences and the centralisation approach, to mention just two dimensions.

The literature lacks a common understanding of the legacy requirements an IT organisation needs to fulfil as it moves towards the digital age (problem scope PS2). The latest literature, blog posts and conference proceedings give a clear impression of what must change if IT organisations are to stay agile. What articles seldom mention, if at all, is that an IT organisation still needs to support the business's legacy environment. This is a particularly important point, as the following example, drawn from my own professional experience, shows. A globally positioned organisation realigned its IT department to better support the business customers with up-to-date IT solutions like salesforce.com and workday.com. IT changed its human resources (HR) strategy to focus on a 'jack of all trades' profile (people with a comparatively general functional education, rather than a highly specialised technical education). The business greatly appreciated this decision because they perceived the IT department as innovative and 'on their level'. However, when a major outage at a central data centre put the core ERP system and other business-critical systems out of action, the lack of experienced and specialised IT staff meant that it took more than two days to get the data centre back online. This example highlights a situation in which concentrating exclusively on agility and digitisation fails to provide coverage for the IT organisation's full range of responsibilities. It is therefore highly advisable for IT organisations to establish two different organisational arms. Some call this 'two speed IT' (Group, 2012). Marchand & Peppard (2013) refer to this as the 'schizophrenic IT organisation', but focus more on the danger of two speed IT potentially being torn between the need to make IT happen rapidly (digitised IT) and business demand for compliance, security, reliability and effectiveness (legacy IT). Consequently, the IT organisation framework developed in this dissertation will seek to address this issue directly and provide a generic solution to designing IT organisations that meet the new requirements of digitisation while supporting the 'old world' of legacy IT.

An ITODF that covers not only current digitisation trends, but also legacy requirements, enhances the body of knowledge from both angles, not only from the digital perspective, which is the focus of most recent research. An ITODF should provide a complete overview of all the aspects that CIOs must consider – not just snippets of the big picture. Section 1.5 discusses the generic framework in greater detail, giving special consideration to digitisation and legacy requirements. It is necessary to research both aspects carefully and distil managerial requirements from the existing literature and practical case studies. This approach enhances the body of knowledge by enabling the ITODF to be used as a framework that considers the IT organisation with all the challenges it currently faces: in other words, not only digitisation trends, but also the existing requirements of the 'old' business. This is important because legacy requirements greatly influence how an organisation deals with the new digitisation trends (Group, 2012). Another advantage of complete integration is that it allows a single framework to be used instead of a patchwork of various frameworks. Although research shows that combining different frameworks increases the likelihood of success (Mintzberg, 1980), implementation times are a more important consideration for most organisations. An integrated framework enables implementations to be accelerated.

The objective of this dissertation is to create an ITODF that addresses the two parts of the problem scope (PS1 and PS2). To achieve this, the following research questions (RQ) must be answered.

RQ1: What (IT) organisation design theories and models already exist?

A sound understanding of the existing theories and models provides a firm foundation for analysing their strengths and weaknesses when it comes to meeting today's requirements. It also helps to locate these theories and models in their overall context, providing an understanding of the scope and dimension of the topics examined in this dissertation.

RQ2: What dimensions must an IT organisation design framework have in a digital world?

The answer to RQ1 is used to build a set of all design dimensions currently included in the existing models and latest scientific papers. These dimensions are then critically examined, amended and narrowed down by means of qualitative research to create an initial ITODF.

RQ3: What determines a successful IT organisation design framework in a digitised world?

The answer to RQ3 uses the answers to RQ1 and RQ2 to derive a set of hypotheses on what determines successful IT organisation design and which dimensions are most relevant to such a design and how they interrelate to each other. Survey-based quantitative research is then used to test these hypotheses to prove or disprove the statements derived.

RQ4: What are the implications for using the IT organisation design framework in a practical environment?

The final research question concerns the kind of guiding principles that can be derived, particularly from the quantitative research, to make the derived ITODF as useful as possible for practitioners.

These research questions are used throughout the dissertation as the underlying structure that guides the research. Sections 4.2 and 5.3 elaborate further on the research methods and processes.

1.3 KNOWLEDGE GAP AND RESEARCH CONTRIBUTION

While the knowledge gap has already been discussed in sections 1.1 and 1.2 above, it is worth emphasising this gap again and looking at how this dissertation contributes to closing it. Figure 1 highlights the existing knowledge gap.

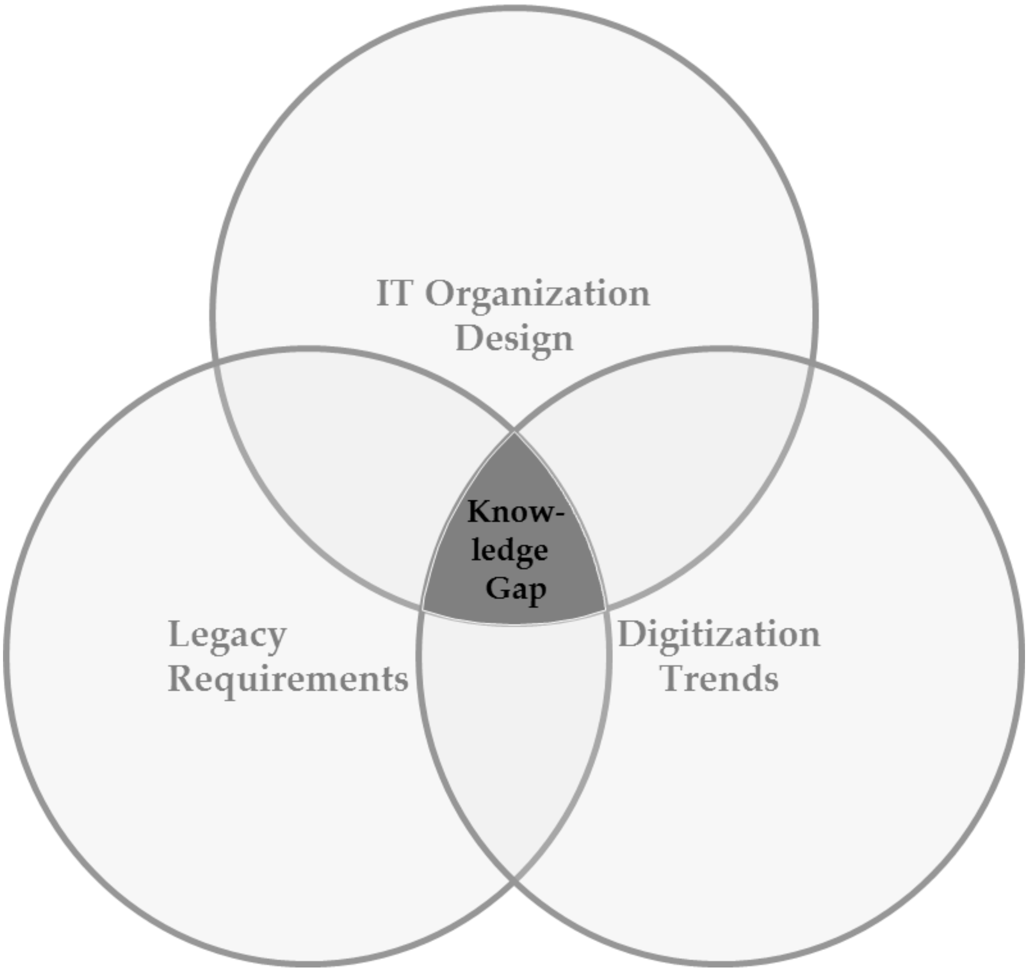

Figure 1: Knowledge Gap

The present section defines the three dimensions of 1) IT Organisation Design, 2) Legacy Requirements and 3) Digitisation Trends and goes on to present the knowledge gap in greater detail.

IT organisation design is a subcategory of organisation design, which is defined as 'The action or process of organizing, ordering, or putting into systematic form; the arrangement and coordination of parts into a systematic whole; and an organized body of people with a particular purpose, as a business, government department, charity, etc.' (Simpson, Weiner, & others, 1989). Design, on the other hand, can be defined in many ways. It is referred to in the context of art as well as construction to give just two examples. In the context of this dissertation, design is understood as the 'the preliminary concept or idea that will be taken forward' (Irwin & Cichocki, 2011). Therefore, this dissertation uses the following definition:

IT organisation design is the preliminary concept that will be taken forward to create an IT organisation that most closely fulfils the purpose for which it exists.

Legacy requirements are requirements inherited from the past and are defined for the purposes of this dissertation as follows:

Legacy requirements are the requirements that business has of IT that result from the past and remain relevant today.

While digitisation is generally understood as the process of transforming analogue input into digital output (McQuail, 2010), it also denotes the 'mass adoption of smart and connected information and communication technology (ICT) [trends] by consumers, businesses, and governments' (Sabbagh et al., 2012). The term 'digital' can be confusing in certain contexts because different schools of thought understand it in very different ways. See, for example, the following quote from a recently published research paper by (Dörner & Edelman, 2015):

'For some executives, it's about technology. For others, digital is a new way of engaging with customers. And for others still, it represents an entirely new way of doing business. None of these definitions is necessarily incorrect. But such diverse perspectives often trip up leadership teams because they reflect a lack of alignment and common vision about where the business needs to go. This often results in piecemeal initiatives or misguided efforts that lead to missed opportunities, sluggish performance, or false starts.' (Dörner & Edelman, 2015)

Matters are complicated even further by a lack of clarity regarding the range of trends covered by the term 'digital'. This dissertation assumes digitisation to denote a constant evolution of new technologies and new ways of working that accelerate delivery (see Figure 2 for a sample of trends).

Figure 2: Digital Trend Samples

Digitisation trends denote the adoption of new ways of working in any business context that are predominantly driven by new technologies.

In the current body of knowledge, there is extensive research into organisation design focusing on IT organisation design (see also section 1.1 for further information and the current state of the literature). By contrast, digitisation trends have been researched only in the last three to five years, mainly because of the emergence of the SMAC trends during this period. A role has also been played by other industrial trends, such as the Internet of Things, telematics and, more recently, trends relating to 'smart products', where the basic physical product is enhanced by technologies, making it even more powerful (Porter & Heppelmann, 2014). Consequently, although several field reports, best practice reports and practitioner guides have been published, few detailed studies have been conducted. While research has been undertaken into the effects of digitisation trends on organisation design, it does not consider the specific area of IT organisation design (Burton, 2013; Galbraith, 2013; McChrystal, 2013). Legacy requirements are also mentioned in some publications (Group, 2012; Jahn et al., 2012), but their effect on IT organisation design has not yet been studied in any detail.

To summarise: This dissertation aims to close the knowledge gap at the overlap of IT organisation design, legacy requirements and digitisation trends. The resulting contribution to the body of knowledge will provide a basis for meeting any IT-related demands that may arise in the future.

1.4 SCOPE OF THE DISSERTATION

One of the major misunderstandings of organisation design is that it relates only to organisation structure (Mintzberg, 1980). The problem is that when most companies talk about organisation design, they automatically think about 'moving boxes from left to right'. This dissertation creates a generic framework that can be used to supplement material already published by other researchers (Burke & Litwin, 1992; Galbraith, 1983; Leavitt, 1989; Nadler et al., 1982; Waterman et al., 1980; Weldon, Hunter, & Lopez, 2013). As Stanford (2007) states: 'A reorganisation or restructuring that focuses – sometimes solely – on the structural aspects is not organisation design and is rarely successful. Ask anyone who has been involved in this type of reorganisation and there will be stories of confusion, exasperation and stress, and of plummeting morale, motivation and productivity.' To avoid errors of this kind, chapters 0 and 5 define the different dimensions of an ITODF while chapter 6 summarises them and creates an overall IT organisation design framework that can be used by practitioners.

This dissertation is not intended to provide detailed consideration of the question of the specific strategies, capabilities, skills, assets and processes that an IT organisation requires to deliver on its promise. Research often uses the expression 'operating model' to summarise these aspects (Cooper, Dhiri, & Root, 2013). This dissertation considers only the aspects of organisation design that an IT organisation requires if it is to be ready for the age of digitisation, including those relating to the business's legacy requirements. Further research could be conducted to extend the findings to develop an IT operating model in a digitised world.

1.5 STRUCTURE OF THE DISSERTATION

This dissertation is structured in nine chapters. The first two outline the motivation and the research design of the dissertation. Chapters three to six define the new IT organisation design framework. The final three chapters present limitations of the dissertation, suggest areas of further research and provide an afterword. The following illustration outlines the structure of the dissertation in graphical form.

Chapter	Content	Framework Components	Methods
1	Introduction		
2	Research Design		
3	Existing Frameworks	6 Frameworks	Literature Review
4	Initial ITODF	23 ITODF Sub-Categories	Qualitative Content Analysis
5	Refined ITODF	6 ITODF Dimension	Reliability Analysis
			Mean *T*-Test
		4 ITODF Pattern	ANOVA
		3 ITODF Cluster	Hierarchical Cluster Analysis
6	Final ITODF	Consolidation of all Findings into the Final ITODF	Results Discussion
7	Limitations		
8	Further Research		
9	Afterword		

Figure 3: Structure of the Dissertation

1.6 PUBLICATIONS BY THE AUTHOR RELATED TO THE RESEARCH

This dissertation uses already published peer-reviewed papers written by the author during the research for this dissertation. The following table lists the relevant publications. Because these papers were published to evaluate the quality of the research conducted, parts of this dissertation use the publications in full. The peer-review process was used as quality assurance throughout research on this dissertation.

Publication Year	Title	Paper Reference
2015	IT Workforce Enablement – How Cloud Computing Changes the Competence Mix of the IT Workforce	(Krimpmann, 2015a)
2015	IT Workforce Transformation – How the Digital Age Changes the IT Organisation	(Krimpmann, 2015b)
2015	IT/IS Organisation Design in the Digital Age – A Literature Review	(Krimpmann, 2015c)
2017	Big Data and Analytics: Why an IT Organisation Requires Dedicated Roles to Drive Sustainable Competitive Advantage	(Krimpmann & Stühmeier, 2017)

Table 1: Publications by the Author

1.7 GENERAL FRAMEWORK REQUIREMENTS

As stated above, the result of this dissertation is an IT organisation design framework (ITODF). This framework is designed to be applied generically across different functions, geographies and industries, permitting wide application in various contexts. However, to allow such generic application, the framework must fulfil a prerequisite; namely, it should be autonomous in its field of application. To fulfil this prerequisite, the research conducted for this dissertation uses two dimensions.

The first dimension is autonomy in the field of application. The second concerns the characteristics the framework provides for the user. As regards autonomy, three conditions must be met. The generic model must be:

1. **Industry neutral**: The model must be applicable in any industry. It cannot use terms specific to any one industry. In addition, the structure of the model must be derived holistically and not be related to any industry focus.
2. **Size neutral**: The framework must be applicable to start-ups as well as global conglomerates. This does not mean that every part of the framework must be applied in every organisation, but this should be possible. The sole underlying purpose of the framework is that it can be applied as a foundation for the entire lifespan of the IT organisation, from the very outset, right through to the final day.
3. **Geography neutral**: The framework must be described in English, the preferred international language of research, and it must avoid country-specific characteristics. In addition, it must be described in a way that does not offend or exclude any culture, religion or other aspects unique to a given geography. Good examples of this kind of error are provided by inadequately researched product names that could not be introduced in international markets because of unintended negative meanings and associations.

The characteristics that the framework must provide for the user are described below. Each of them builds on the abovementioned neutral aspects.

The ITODF must be:

1. **Applicable**: The Oxford English Dictionary defines 'applicable' as being 'relevant or appropriate' (Simpson et al., 1989). In line with this definition, the ITODF must be relevant within a given context of IT organisations. It needs to focus on the key parameters derived from the existing body of knowledge. Conversely, a framework that gives different action alternatives but is not related to IT-specific challenges would be inapplicable.
2. **Adaptable**: 'Adaptability' is defined as '[a]ble to be modified to new conditions' (Simpson et al., 1989). This relates to the requirement that even though the ITODF must be applicable to the person in charge of the organisation design of a given IT organisation, it must also be

modifiable to match a given business context. This means that the derived dimensions of the framework must be aggregated to a level that allows the ITODF to function in different situations. As some researchers have argued, (Mintzberg, 1980), this could increase the likelihood of the framework being too broad. However, aggregation of this kind helps to make the ITODF applicable in new or modified conditions.

3. **Reliable**: Reliability is described as 'consistently good in quality or performance; able to be trusted' (Simpson et al., 1989). Even though this aspect is proven over time with each application, it needs to be considered when starting to create the ITODF. In practical terms, this means the framework must promote the same actions for the same situations on different occasions. By doing so, it becomes trusted by the users and therefore strengthens the overall credibility of the framework (Kuckartz, 2012).
4. **Credible**: Credibility comes from the framework's alignment with current scientific methods. Bocking (2004) states that peer review is one of the most commonly used tools for guaranteeing credibility. But peer review alone is not enough; the reputation of the peers is crucial. For the purposes of this dissertation, it was therefore important to select a credible group of participants for the quantitative research to ensure the credibility of the overall framework.

The abovementioned requirements were applied consistently throughout the entire research process to create a generic ITODF.

The following section highlights the overarching assumptions, the selected research method and the research process, which are the guiding principles for all the research conducted for this dissertation.

2 RESEARCH DESIGN

Research projects are framed by a research design that gives clear guidance on the methods used and the process followed. Morrow & Brown (1994) describe this as a series of steps leading from the initial research problem to the research questions and through to the conclusion. More specifically, Cecez-Kecmanovic (2001) elaborate on critical information system (IS) research and how it 'seeks to achieve emancipatory social change by going beyond the apparent to reveal hidden agendas, concealed inequalities and tacit manipulation involved in a complex relationship between IS and their social, political and organisational contexts'. Using Cecez-Kecmonivic's definition, the research design of this dissertation uncovers the complex relationship between IT organisation design and the digitisation trends presented in the preceding chapter. This ensures not only that the results of all analyses are in line with the defined problem scope and research questions, but also that the scope of the research is not unintentionally broadened or narrowed. Figure 4 illustrates the research design of this dissertation as an integrated model (adapted from (Pfeiffer, 2008)), showing the three dimensions of the research design and how they interact with each other.

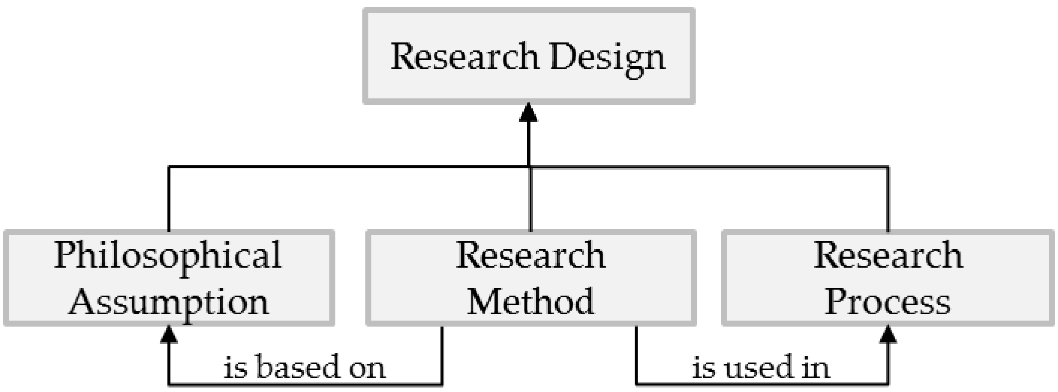

Figure 4: Research Design

The following sub-sections provide a detailed presentation of the philosophical assumptions and research design on which this dissertation is based. They also review other philosophical assumptions and discuss the research methodology and process used, including approaches, tools and data-gathering techniques.

2.1 OVERARCHING PHILOSOPHICAL POSITION

All research is based on a set of philosophical assumptions. While these differ from researcher to researcher, they represent the overarching ecosystem in which research is conducted. Documentation of these assumptions is essential to contextualise the final results of the research and also helps to distinguish the outcomes from those in similar research areas and other studies that have already been published or will be published in future. There are different points of view regarding which assumptions can be applied to define the overall philosophical position. Gehlert (2007) differentiates between ontological, epistemological, linguistic and truth-theoretic assumptions. Others agree on the ontological and epistemological assumptions but replace the remaining two with human nature and methodology (Burrell & Morgan, 1994; Wussusek, 2006). Toepfer (2009) has also noted that different points of view exist and argues that the ontological and epistemological are the main dimensions researchers must clarify when presenting their philosophical position. This dissertation follows (Toepfer, 2009) in this respect. The positions it adopts are explained below.

2.1.1 Ontological Position

Ontology is the branch of philosophy concerned with articulating the nature and structure of the world (Wand & Weber, 1993). To put this more simply, ontology can be described as the way society deals with the fundamental structure of reality. Burrell & Morgan (1994) represent the different positions that research can adopt as a continuum ranging from nominalism to realism.

Nominalism contends '[…] that the world is made out of particulars and the qualities are of our own making: they stem from our representational system (the way we cognize the world) or from our language (the way we speak of the world)' (Borghini, n.d.). Borghini goes on to cite the medieval philosophers William of Ockham (1288–1348) and John Buridan (1300–1358), as well as the 20^{th}-century philosopher Willard van Orman Quine, as examples of well-known nominalists.

Realism on the other hand assumes '[…] the existence of two kinds of entities, particulars and universals. Particulars resemble each other because they share universals (universals can also resemble each other by sharing other universals – e.g. wisdom and generosity resemble each other in that they are both virtues). The most famous realists include Plato and Aristotle' (Borghini, n.d.).

This dissertation takes the nominalist view that there are multiple realities, not one given reality. It also takes into account that reality can be explored and constructed through the use of human interaction within each individual's day-to-day life. The latter aspect is primarily shaped by daily routines and conversations. The first philosophical assumption in this dissertation is therefore as follows:

A1: The real world consists of multiple realities that are shaped by the interaction between human beings in their day-to-day lives.

2.1.2 Epistemological Position

Epistemology is 'the theory of knowledge, especially with regard to its methods, validity, and scope, and the distinction between justified belief and opinion' (Simpson et al., 1989). Other authors (Hirschheim, Klein, & Lyytinen, 1995) define epistemology as the nature of the relationship between the researcher and the object of his or her research, stating that it denotes 'the nature of human knowledge and understanding that can possibly be acquired through different types of inquiry and alternative methods of investigation' (Hirschheim et al. (1995, p. 20)). Burrell & Morgan (1994) also use a continuum to describe the different positions that research can adopt. One extreme on the continuum is anti-positivism, sometimes referred as interpretivism, while the other extreme is positivism. There is considerable disagreement as to whether these research paradigms or underlying epistemologies are necessarily mutually exclusive or whether both can be accommodated within the same study or research. (Myers, 1997)

The interpretive extreme 'start[s] out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings. Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them' (Myers, 1997).

The positivist view 'assume[s] that reality is objectively given and can be described by measurable properties which are independent of the observer (researcher) and his or her instruments. Positivist studies generally attempt to test theory, in an attempt to increase the predictive understanding of phenomena' (Myers, 1997).

As discussed at the beginning of this section, there is no general agreement on whether interpretivism and positivism are mutually exclusive approaches. This dissertation uses the following assumption for the research as a whole:

A2: Interpretivism and positivism complement each other.

2.2 RESEARCH METHODS

Myers (1997) describes research methodology as the strategy for gaining the relevant insights to solve the research problem. Denzin & Lincoln (2003) in their definition elaborate further on gaining the most relevant information to be collected. They state that research methods are the set of presuppositions, skills and operational practices that help the researcher to address a given research problem. This section uses a combination of the two definitions of research methodology given above and focuses mainly, but not exclusively, on the practices used to derive the ITODF. Starting with a general discussion of the different types of research methods, it goes on to present those used in this dissertation and explains why they were chosen. In addition, it provides clear orientation on how the research is structured so as to answer all the research questions while remaining within the defined scope.

Research in general, and research methods in particular, are commonly structured using *qualitative* and *quantitative* approaches. Both of these approaches help the researcher to answer the corresponding research questions.

Qualitative research originated in the social sciences but is today used in many different research fields. Its overarching aim is to understand human behaviour and the rules governing this behaviour (Denzin & Lincoln, 2003). Qualitative research is mainly associated with inductive research – in other words, research that examines specific phenomena or events. These are analysed to derive patterns that help the researcher to establish hypotheses about the problem under consideration. However, qualitative research is by no means always associated with inductive reasoning. The literature provides a wide and detailed discussion of this point (Schloss & Smith, 1999). Qualitative research is also more concerned with reality as a social construction of outcomes rather than an objective documentation of reality (quantitative research) (Denzin & Lincoln, 2003; Kuckartz, 2012). Because qualitative research is concerned with specific occurrences and not with generic causal explanations (see below), it is often used by researchers to shed initial light on a research problem that has not yet been examined in great detail (Schloss & Smith, 1999; Toepfer, 2009). Methods used for qualitative research include questionnaires, semi-structured and structured interviews, field studies, case studies and other interpersonal approaches. It can be assumed that methods that offer scope for interpretation, like those mentioned, are most likely to be used to conduct qualitative research.

Quantitative research, on the other hand, is mainly concerned with the question of whether causal explanations that are largely based on hypotheses are true or false (Toepfer, 2009). This approach uses statistical, mathematical or computational techniques to prove or disprove the hypotheses (Schloss & Smith, 1999). In contrast to qualitative research, quantitative research is mostly, but not always, associated with a deductive research approach. This approach is called 'top-down' by some researchers as it moves from theory to data (Kuckartz, 2012). Discussions regarding the question of whether there is a need for quantitative evidence for every theory under development have been ongoing for many years. Some researchers claim this is necessary while others use opposing research results to argue that qualitative research can also prove a developed theory (Kornmeier, 2011). Methods used for quantitative research include structured interviews, standardised questionnaires, online surveys and other structured ways of gathering data. The data used must be structured so as to allow the statistical tools to be applied consistently across the different data sets (Kuckartz, 2012). However, because quantitative research uses statistics, it must also comply with the rules of statistical research. This generally means the researcher must consider the statistical sample size to understand the potential impact of the research. If, for example, a generic framework is developed through quantitative research, the population of the study would have to be considered. If a survey has only five respondents, the outcome derived cannot be called a generic framework because the research lacks the required statistical sample size (Kuckartz, 2012).

There is a long history of disagreement surrounding which of these two research methodologies helps to derive better results. Advocates of qualitative research argue that its results are more comparable because it tries to understand the context in which each of the correspondents acts. This research approach therefore provides considerably better arguments and takes the surrounding factors into consideration. Conversely, they argue, using anonymous mass data leads to this understanding being largely lost when textual data is quantified (Kaplan & Maxwell, 2005). Advocates of quantitative research generally argue the opposite, asserting that data based on only a minority of cases and that lacks an objective analytic process cannot produce well-researched results (Schloss & Smith, 1999). Although there is a tendency to prefer either one methodology or the other, some authors have suggested combining both, thereby using the best of both worlds (Myers, 1997). Following Meyers, this dissertation adopts the following assumption:

A3: The application of qualitative and quantitative research is complementary.

This dissertation uses both qualitative and quantitative research methods to derive the final ITODF. Qualitative research is used to develop a set of hypotheses (exploratory research), which are then confirmed or denied with the help of a quantitative study (confirmatory research).

2.3 VARIABLES

A variable is measurable and differs from person to person (Babbie, 2013; Corbin, Strauss, & others, 2008). In this dissertation, variables are used to capture the different dimensions of the ITODF developed. Each of these dimensions is encapsulated in one research variable. This dissertation examines three specific types of variable that will be used to derive the hypotheses regarding the ITODF: dependent, independent and extraneous variables.

Dependent variables are affected if an independent variable is changed. This is illustrated by the following example of average workforce age in the context of organisation design: the fewer managerial positions there are in an organisation, the younger the average age of the workforce will be. Here, the age of the workforce is the dependent variable as it changes depending on the number of managerial positions.

The independent variable in the above example is the number of managerial positions, which influences the dependent variable. These constructs are used particularly in the social sciences to explain linkages between different behaviours (Schloss & Smith, 1999).

Extraneous variables are all other variables that could influence the relationship between the dependent and independent variables. In the example above, the extraneous variable 'industry' might change the way the independent and dependent variables relate to each other. In this case, it would make sense to examine the research results taking the extraneous variable into consideration and divide the test set into different subsets (e.g. per industry in this example).

2.4 HYPOTHESES

A hypothesis is a statement of the predicted relationship between two or more variables (Kuckartz, 2012). It provides an understanding of what the research is expected to determine. A hypothesis also helps to structure research by framing the scope of the phenomena under consideration. Creating a hypothesis normally starts with the analysis of causalities in a given field of knowledge (Berelson, 1952; Myers, 1997).

There are two different ways to derive a hypothesis – deductively and inductively. The deductive approach is generally based on existing and tested hypotheses in closely related research fields. Another deductive approach involves translating existing theories from a related field and applying them in the given research area (Kornmeier, 2011). The inductive approach, also known as 'empirical exploration' uses existing practical examples, determines causalities between them and finally derives the hypothesis that describes this causality. Inductive hypothesis derivation generally uses individual case studies or semi-structured interviews (Kornmeier, 2011).

This dissertation employs a deductive approach to derive its hypotheses based on the results of the qualitative content analysis. The hypotheses are then tested in a quantitative study, which provides the confirmatory element of this dissertation.

The initial qualitative research in this dissertation uses the *qualitative content analysis* developed by Berelson (1952) as the foundation for the qualitative work. A qualitative method was chosen because the area of research is relatively new. Research has already been conducted into digitisation trends but it is not sufficiently extensive to allow existing frameworks or other existing studies to be built on. As highlighted in section 2.1, while independent areas of this field of study have been analysed, there has been no holistic approach to date. Qualitative content analysis has been chosen rather than grounded theory, another well-known qualitative research method (Priest, Roberts, Woods, & others, 2001). The reasoning behind this is that grounded theory, as initially described by Glaser & Strauss (2009), intentionally ignores existing theories. The overall purpose of grounded theory is to derive a new theory that is 'grounded' in the data, not in hypotheses (Glaser & Strauss, 2009). Advocates of this research method state that it permits an objective view of the material within the scope of the research. Qualitative content analysis, by contrast, explicitly allows existing theories to be taken into consideration during the analysis (Berelson, 1952; Kuckartz, 2012). This dissertation takes organisational design models into consideration because they are essential for the success of the research. The explicit aim is to avoid reinventing the wheel and to focus exclusively on deriving a new ITODF by analysing the existing organisation models as well as the literature on digitisation trends and legacy requirements. Moreover, the chosen research method concentrates on reducing the volume of material by paraphrasing and categorising, whereas grounded theory extends existing knowledge by creating theories based on the material analysed. The following section provides a more detailed explanation of qualitative content analysis.

2.5 QUALITATIVE CONTENT ANALYSIS

Like most qualitative research methods, qualitative content analysis originated in the social sciences. Its founder describes qualitative content analysis as 'a research technique for the objective, systematic, and quantitative description of manifest content of communications' (Berelson, 1952). The technique can use inductive or deductive reasoning to derive themes and categories from the data sets. This is achieved by analysing and continually comparing data. Although initially developed as a predefined method for analysing patterns in spoken interviews, qualitative content analysis is today applied to various forms of media, including academic literature and transcribed interviews. When used with literature, for example, its overall goal is to analyse the presence of certain words, phrases, quotes or sentences in a predefined corpus of texts. Literature in this context includes books, book chapters, essays and conference proceedings. Presence is defined as the number of occurrences. The presence is then used to create QCA categories and QCA subcategories that give an answer to the initial research questions. A qualitative content analysis generally involves seven steps (Y. Zhang & Wildemuth, 2009):

Step 1: Prepare the data: This initial step transforms any media into written text. (The research undertaken for this dissertation is based entirely on the current state of written media in the relevant context and therefore does not require any transformation.) Additionally, the preparation phase includes deciding which media are within the scope of the research and which are not. This needs to be carefully evaluated while conducting the research. Section 4.2 describes the selection of literature for this dissertation in detail.

Step 2: Define the units of analysis: This phase concerns the level of categorisation. How deep should the analysis be? What are the guiding principles? How should the process be executed? It is important that these guiding principles be defined before the actual coding execution starts. This guarantees a consistent and therefore objective way of analysing the media.

Step 3: Develop categories and coding scheme: This is the most important part of the research method. As described earlier, there are two main ways of developing the categories – deductively and inductively. If a theory must be developed from scratch, or if existing theories are intentionally excluded, an inductive approach is normally chosen. The inductive approach overlaps considerably with the coding approach of grounded theory (Y. Zhang & Wildemuth, 2009). Conversely, if the aim is to confirm an existing theory or develop more detailed insight, a deductive approach is more common (Y. Zhang & Wildemuth, 2009). Each approach has its advantages and disadvantages, which vary depending on the overall purpose of the specific research. This dissertation uses the inductive approach to exclude a category system that is biased by other existing organisation design models. One overarching aspect of this step is that the outcomes (the categories) must be collectively exhaustive and mutually exclusive; in other words, they must cover the entire research scope and not overlap. Most of the literature cites this as one of the most challenging and time-consuming activities of this research method (Mayring, 2010; Priest et al., 2001; Y. Zhang & Wildemuth, 2009).

Step 4: Code all the text: This is the execution of the actual coding of the media within the scope of the research. It is an ongoing process executed on an iterative basis. The addition of new media is likely to result in the creation of new categories, which must be embedded recursively.

Step 5: Assess coding consistency: Human error makes it necessary to recheck the consistency of the coding executed in step 4. Inconsistency is usually due to factors such as subsequently added categories, spelling mistakes and ambiguous categorisation definition.

Step 6: Draw conclusions from the coded data: This is explained well by (Y. Zhang & Wildemuth, 2009) who state that '[t]his step involves making sense of the themes or categories identified, and their properties. At this stage, you will make inferences and present your reconstructions of meanings derived from the data. Your activities may involve exploring the properties and dimensions of categories, identifying relationships between categories, uncovering patterns, and testing categories against the full range of data. This is a critical step in the analysis process, and its success will rely almost wholly on your reasoning abilities.'

Step 7: Report your message and findings: This is the final step in the research method. It covers the documentation of the different categories and subcategories. No statistical tools are applied to the results, as the content analysis concentrates on the qualitative view of the research conducted. The report may include quotes from different media. It can use paraphrasing to put forward specific arguments for a given category and should use interpretation by the researcher (Y. Zhang & Wildemuth, 2009).

The results of the qualitative content analysis are the research variables and the hypotheses for testing. This dissertation uses the qualitative content analysis as an exploratory study. In other words, this part of the research helps to develop a theory but not to confirm that theory. This confirmation is provided by a confirmatory study. How the hypotheses are tested (the quantitative research) is explained below.

2.6 ANALYSIS OF VARIANCE (ANOVA)

Analysis of variance (ANOVA) is a method for comparing different groups. Group means are used to verify or falsify stated hypotheses. This approach is an extension of the *t*-test, a method for comparing two independent samples with each other, or one sample with a test value. Instead of examining three or more *t*-tests, ANOVA is used to analyse three or more variables in one test. This means that ANOVA compares different variances (Field, 2013): the 'estimated variance within', as a weighted mean from sample variances, and the 'estimated variance between', as the variance of observed sample means around the total mean. The null hypothesis states that there is no difference between the estimated variances, so different values shown would be randomly distributed. Accordingly, the alternative hypothesis is expected to have a considerably larger 'estimated variance between' because the groups would have different means. A significant result would entail that at least two group means are more than randomly different from each other. There are various options for using ANOVA. Depending on the purpose and the kind of variables used, the analysis can be *univariate* or *multivariate*. These two alternatives will be explained below.

2.6.1 Univariate ANOVA

Univariate ANOVA includes one dependent variable within the analysis (K. Kim & Timm, 2006). This enables different types of analyses of variance depending on the number of independent variables, the relation between variables or the repetition of measurements. Because repeating measurements is not important in the research undertaken for this dissertation, it is not explained here. In cases where there is one dependent variable and one independent variable with more than two characteristics, 'one-way ANOVA' is the method of choice. As described earlier, the group variances are compared internally and between the different groups of the model (Field, 2013). An alternative method would be analysis of covariance (ANCOVA) to include other variables affecting the outcome or the dependent variable itself. Another method would be the factorial ANOVA including more than one independent variable that influences the dependent variable.

However, it should first be noted that univariate ANOVA involves three assumptions that must be complied with. These are as follows:

1. Randomness and level of presentation: data should be randomly sampled and presented at an 'interval level'.
2. Independence and normal distribution: the Kolmogorov-Smirnov test (K-S test) can be used to fulfil this requirement.
3. Homogeneity of variance: this explains the 'standard error of means'. Levene's test is used to assess the assumption.

In general, the ANOVA tests differences using the F-ratio. Therefore, the overall fit of a regression model is tested using a set of observed data. The F-ratio shows whether the group means tested are different. In general, ANOVA follows the interpretation of a linear model. As a result, the simplest model is taken as the starting model provided by the mean of all outcome variables. Consequently, no relationship between predictor variable and outcome is assumed (Field, 2013). If the hypotheses are covered by a different model that is a good match for the data collected, it is better to use this model than to continue with the starting model. The new model is then defined by different parameters: the bigger those parameters, the greater the deviation between the new model adopted and the starting model. Furthermore, the F-ratio is then used to compare the fit achieved by using the model to the error that remains by unexplained variation. This is also known as dividing the systematic variance by the unsystematic variance, which yields the F-ratio. The significance level or p-value of the analysis is critical for ANOVA. Researchers define a level of significance before conducting the analysis. Usually 1%, 5% or 10% levels are chosen for interpreting the results (Sedlmeier & Renkewitz, 2008). If the comparison model is a better fit than the starting one, the starting model can be rejected.

2.6.2 Multivariate ANOVA (MANOVA)

It is also possible for a study design to provide multiple outcomes where differences need to be tested. In those cases, a multivariate analysis of variance (MANOVA) can be used. The MANOVA is an ANOVA with multiple dependent variables (Field, 2013). Rather than examining several ANOVA, the multivariate method is used to additionally identify interactions between the tested dependent variables. Group differences could also be explained by interactions between the dependent variables instead of between the independent variables and the dependent variables.

The assumptions that must be complied with to conduct a MANOVA are the same as those already presented for the ANOVA, but are extended to cover the multivariate factor:

1. Randomness and level of presentation: data should be *randomly* sampled and presented at an *interval level*.
2. Independence: residuals should be statistically independent.
3. Homogeneity of covariance matrices: extension of the homogeneity of variances where the correlation between two dependent variables is also equal.
4. Multivariate normality: assumption that the residuals have multivariate normality. Each dependent variable should be tested for univariate normality The Kolmogorov-Smirnov test (K-S test) can also be used in this case to comply with the assumption.

The following brief description gives an impression of how MANOVA functions. Two matrices are divided by multiplying them by the inverse matrix (Field, 2013). In contrast to ANOVA, where the F-ratio is yielded by dividing the systematic variance by the unsystematic variance, here the result is a complex matrix of p^2 values, where p is the number of dependent variables. With the help of discriminant function variates determined by the mathematical procedure of maximisation, eigenvalues are calculated for the resulting matrix. The eigenvalues are conceptually equivalent to the F-ratio. The final step is to investigate how large the values are when this model is compared to a model that assumes no effects in the population (Hair et al., 1998). There are four ways to assess these values (Field, 2013) that are listed in the following table:

Statistics	**Formula**
Pillai-Bartlett trace: sum of the proportion of explained variance on the discriminant function.	$V = \sum_{i=1} \frac{\lambda_i}{1+\lambda_i}$

Statistics	Formula
Hotelling's T^2: sum of eigenvalues for each variate	$T = \sum_{i=1} \lambda_i$
Wilks's lambda (Λ): product of the unexplained variance of each of the variates	$\Lambda = \prod_{i=1} \frac{1}{1+\lambda_i}$
Roy's largest root: eigenvalue for the first variate	$\Theta = \lambda_{largest}$

Table 2: Four Statistics of MANOVA

If the MANOVA statistics yield significant results, it is useful to continue with separate ANOVAs for every dependent variable or perform a discriminant function analysis (also known as *discriminant analysis*). While MANOVA considers groups as linear combinations of outcome variables, discriminant analysis breaks down the linear combinations by determining how a set of groups can be distinguished using several predictors. This explains group differences more precisely.

2.7 CORRELATION

Correlation is used as a method to show whether variables are connected (Cortinhas & Black, 2014). A connection means that responses given by participants for one variable determine the response for another variable. A perfect connection between variables is therefore the perfect case in which all responses for one variable would be determined by the other variable. Those connections are called 'functional' or 'deterministic' and are found in mathematics or physics. For example, if the radius of a circle is known, the circumference is determined because of the relation: U=2rπ. If this scenario were plotted in a scatter diagram, a perfect association would be shown by a straight line and the correlation of $r = 1$. It is also possible to find positive or negative relations between variables. A high negative correlation means that increasing one variable results in the other variable decreasing constantly. There are different kinds of correlations depending on the measuring level and the distribution of variables. To examine Pearson's correlation, the interval level of measurement and a normal distribution are required.

Therefore, the Kolmogorov-Smirnov test (K-S test) must be performed before actually calculating any connections between variables (Field, 2013). If the K-S test finds a normal distributed structure of both variables, Pearson's correlation can be used to determine a connection. Otherwise, Spearman's correlation must be used. This correlation is based on a rank-order mechanism and represents the non-parametric version of Pearson's correlation. Spearman's correlation then determines the strength and direction of a monotonic relationship.

Once it has been decided which is the right correlation to use, it is useful to first show the variables in a scatterplot. This graphical representation can help to find non-linear relations that cannot be found in the calculations. If a linear or monotonic correlation is found between two variables, the value of the correlation coefficient r shows how to evaluate the effect. The greater the sample size, the greater the chance of significant results. This is important when analysing the results of larger sample sizes. A significant correlation means that effects shown in the data are not random. To determine whether there is a significant correlation, a null hypothesis of 'no relation between the variables' is examined. Significant results can be plausibly transferred to a whole population or the target group. The correlation coefficient was defined by Cohen (1992) and is outlined in Table 3: Cohen's Correlation Coefficient. The value of the coefficient ranges between -1 and 1, with negative values indicating negative correlations while positive values indicate positive correlations. In addition, the size of the correlation determines the strength of correlation between two variables while the significance represents the credibility of the effect.

	Cohen (1992)
Value	Interpretation
$\|r\| = 0.10$	Weak connection
$\|r\| = 0.30$	Medium connection
$\|r\| = 0.50$	Strong connection

Table 3: Cohen's Correlation Coefficient

R. Taylor (1990)	
Value	Interpretation
r ≤ 0,35	Weak correlation
r ≤ 0,67	Moderate correlation
r ≤ 1	High correlation

Table 4: Taylor's Correlation Coefficient

Empirical research focussing on interpretations of the correlation coefficient have shown that $|r|$=.50 represents a strong correlation. Presenting this in a scatterplot reveals a distribution close to a correlation line. A correlation of 0.5 can therefore be used as a cut-off value when comparing different levels of correlation between the dimensions here. The interpretation of the correlation coefficient has been widely discussed, and a clear distinction should be drawn between two popular interpretations. Table 2 shows the two distributed definitions stated by Cohen (1992) and R. Taylor (1990). The number of citations shows an important difference between the two sources. Cohen (1992) has been cited 25,013 times, while R. Taylor (1990) has been cited only 740 times in the literature. This indicates not only that Cohen's definition has received more attention but also that the different interpretative views on the correlation coefficient support Cohen's position. It can also be argued that a weakened version of interpretation is appropriate in this dissertation. Different dependent variables were examined to determine whether they are interconnected: As a result, there was no direct impact of one variable that led to changes in another variable, as is often the case in correlation studies. In these studies, the independent variable affects the dependent variable because there is a manipulated connection. But this is not the case when comparing independent constructs with similar answering structures. The different design yields a weaker definition of the correlation coefficient than that put forward by Cohen, because $|r|$ = 0.5 should be a large correlation in this case.

2.8 HIERARCHICAL CLUSTER ANALYSIS

Hierarchical cluster analysis is a method for classifying objects in groups so that objects in the same group are very similar while objects in different groups are very different (Wilkinson, Engelman, Corter, & Coward, 2004). Before performing a cluster analysis, it is necessary to have criteria that result in the clustering. Hierarchical cluster analysis is a standardised procedure for forming clusters within a dataset. Different methods can be used for the clustering process. Two distinct approaches are therefore distinguished: agglomeration and division (Field, 2013). These share the same aim – building suitable clusters. The agglomerative method starts with every variable forming one cluster, so it begins with n clusters for n variables. By proximity, clusters are formed until all the variables are classified. The division method, by contrast, starts with all the variables in one cluster. Here, differentiation helps to split the cluster until a defined cut-off value is reached.

Clustering variables is similar to factor analysis because it looks for a model structure by comparing statistical values (Köhn & Hubert, 2006). The method of hierarchical cluster analysis used in this study is the agglomerative method. This was selected by choosing the correlation coefficient as the proximity parameter and centroid clustering as the procedure for including the mean of the specific variable manifestation. The centroid method takes the distance between two mean vectors of the clusters as the distance between two clusters. Two clusters with the smallest centroid distance are combined at each stage of the process. Thus, the centroid method defines the 'closest' distance between variables. Using the correlation is beneficial when looking for similarities in patterns across multiple profiles, regardless of the overall magnitude. Here, the correlation does not function as the criterion for the clustering but as a meaningful value for further interpretations. The results of the clustering process can be shown in a dendogram, which is a visualisation of how the variables are clustered together. The dendogram therefore differs between linkage variants.

In this dissertation, the main goal entails clustering the variables derived in the exploratory study and confirmed in the confirmatory study. Consequently, the clusters are a subordinate structure within the ITODF developed in this dissertation.

2.9 RESEARCH PROCESS

The research process specifies the various activities involved in the research and provides the overall research framework. This approach is often used for guidance, not only for readers of research publications, but also for the researchers (Toepfer, 2009). Figure 5 shows the research process of this dissertation. The figures uses in some cases (e.g. the problem statement) a shorten phrase to align to the available space.

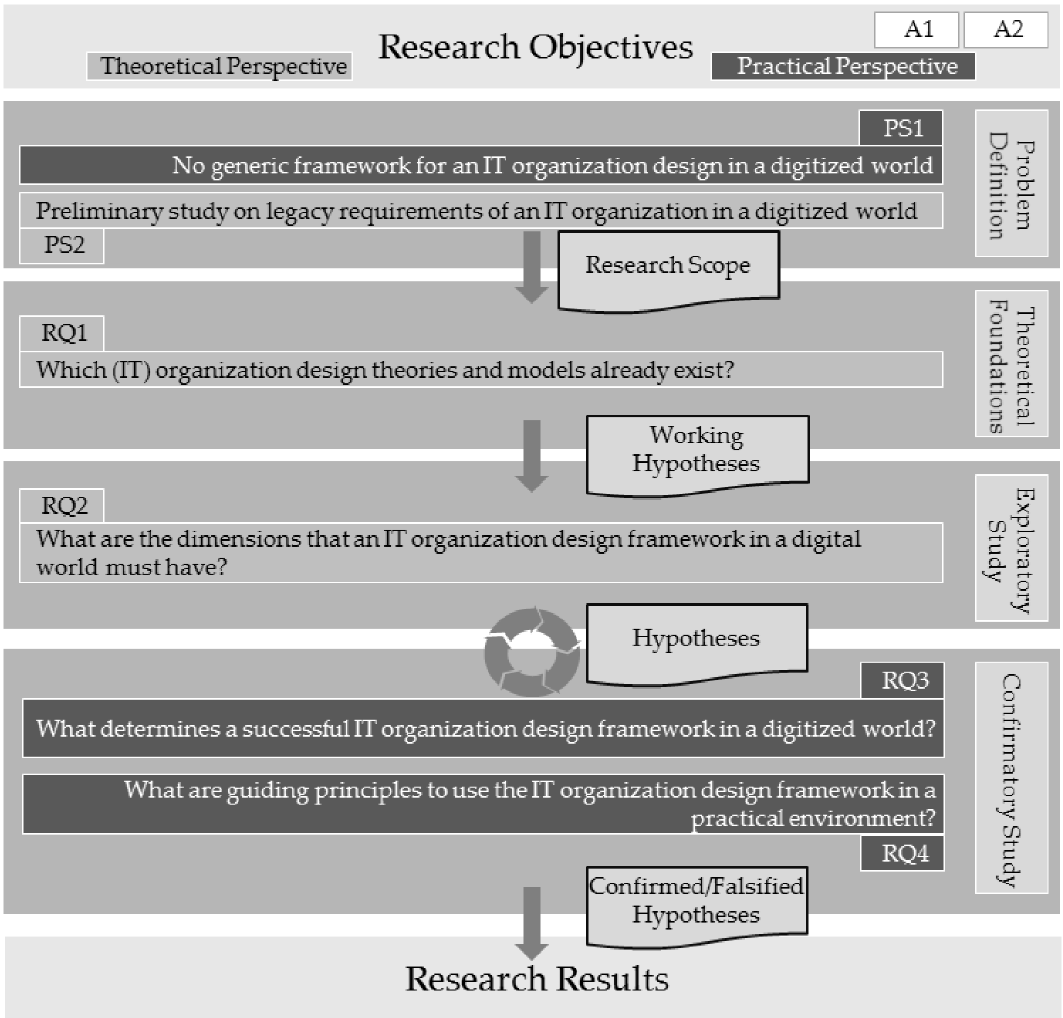

Figure 5: Research Process of the Dissertation

The vertical structure represents the different phases of the research process: from the research objectives, problem definition, theoretical foundations via the exploratory study through to the confirmatory study and summary of the research results.

The first phase of the research process sets out the research objectives. The two main aspects here are the assumptions already described in section 2.1 as well as two key perspectives. The theoretical perspective comprises all the research items with a more literature-based focus while the practical perspective comprises all the research items that focus on the practitioner's point of view. This second perspective has been used only to give an overarching structure to the research process. It is not specifically used during the research process.

The second phase of the research process concerns defining the problem. This has already been described in detail in section 1.2. Both the theoretical and practical perspectives have been used to verify the scope of the problem researched.

- PS1 originates from a practitioner problem: namely, that there is no generic framework for designing an IT organisation in the context of the new digitisation trends.
- PS2 originates from a theoretical issue: namely, the fact that the current literature does not fully research the necessary legacy requirements relevant for IT organisation design.

The artefact[1] (illustrated in Figure 4 by the curved rectangle) of this phase is the defined research scope that guides the overall process throughout the subsequent phases.

The third phase is concerned with the theoretical foundations of the content under research. It establishes a general understanding of the existing theoretical models in organisation design and specifically in IT organisation design. Furthermore, it summarises the collective sum of all organisation design dimensions currently used within various frameworks. The artefact of this phase is a selection of generic IT organisation design hypotheses that are mutually exclusive but also collectively exhaustive.

The fourth phase further develops the working hypotheses from the third phase and uses qualitative content analysis to extract the most important organisation design dimensions from a variety of media focusing on digitisation trends and legacy requirements. The results are then used to construct final

[1] An artefact is a phenomenon observed in a scientific investigation or experiment that is not naturally present but occurs as a result of the preparative or investigative procedure (Simpson et al., 1989).

hypotheses regarding an IT organisation design framework based on digitisation trends.

The fifth phase tests the derived hypotheses in a survey of IT (organisation) specialists. An online questionnaire is used, with a structural equation model providing the foundation for the survey. Two research questions are addressed from a more practical perspective in this phase. The first concerns what constitutes a successful IT organisation and which design dimensions are best for achieving success. This question is answered using correlation analysis to test the different hypotheses. The second question looks at which design principles have been proven successful for each dimension based on the research findings, supplemented and, if necessary, amended by secondary research. These two answers are then used to construct the ITODF, which is the final result of this dissertation.

The following section describes the second phase of the research process. It provides insight into the theoretical foundations in organisation design, IT organisation design, digitisation trends and legacy requirements.

3 THEORETICAL FOUNDATIONS AND TRENDS

3.1 ORGANISATION DESIGN FRAMEWORKS

The following three organisation design models give an overview of key positions within the body of knowledge today. Three specific models were identified as most appropriate for the topic of this dissertation. These were analysed in detail to understand which of the ideas they contain can be used as a starting point for the research presented in this dissertation.

3.1.1 McKinsey 7-S Framework

The McKinsey 7-S framework is a framework used to analyse companies' organisation design. It evaluates seven key elements of any organisation: strategy, structure, systems, shared values, style, staff, and skills (Jurevicius, 2013). The main goal is to ascertain the current level of an organisation's objectives and determine whether the organisation encourages the achievement of the overall goals of the organisation.

The McKinsey 7-S framework was developed in the 1980s by McKinsey consultants Robert Waterman and Julien Philips, with assistance from Richard Pascale and Anthony G. Athos (Jurevicius, 2013). Since its inception, it has been one of the most cited organisation design frameworks in the field of strategic planning and is widely used by many practitioners and academics (Jurevicius, 2013). The framework focuses on human resources rather than on conventional methods centring on infrastructure, capital and equipment as keys to improved organisational performance. The seven variables are referred to as 'levers'. The major objective of this framework is to explain the seven elements that can be used to improve the processes and effectiveness of any company. This framework emphasises the interconnectivity of all seven areas and also explains that failure or change in one area will invariably require changes in the other areas if a company is to function optimally.

The figure below (see Figure 6) shows the interconnections between the seven areas of the McKinsey framework. The illustration of the framework further highlights the interconnectedness of the elements in the different groupings.

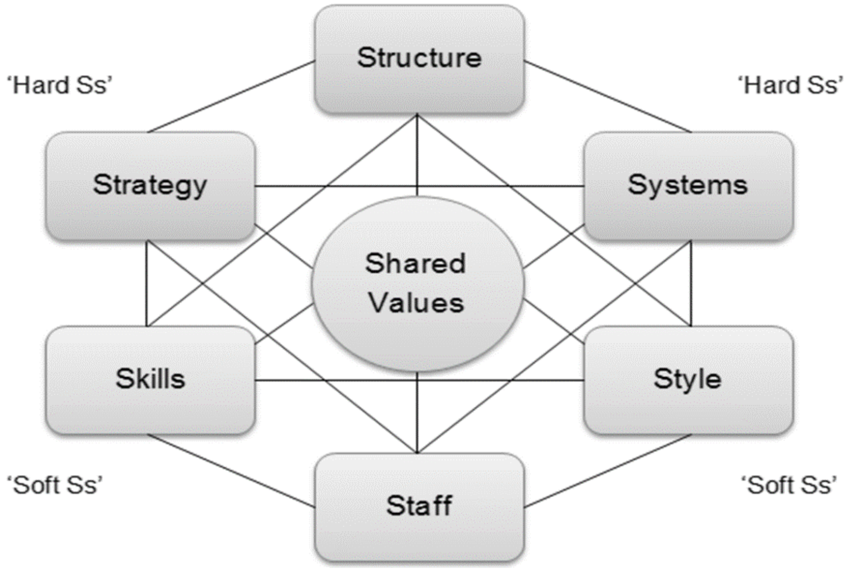

Figure 6: McKinsey 7-S Framework

According to the framework, these variables can be subdivided into 'soft' and 'hard' elements. In the framework, structure, strategy and systems are considered to be hard elements and are easier to recognise and manage than the soft elements. By contrast, the soft elements (skills, staff, style and shared values) are more difficult to manage. These are considered to be the base of the organisation and usually generate greater competitive advantage for the organisation (Ravanfar, 2015).

The framework is applied in diverse situations and is a very pertinent tool in organisational design. It can be applied in a wide range of areas within an organisation, including facilitation of organisational change, implementation of new and improved strategies, identification of the future effects of the changes in these areas, and facilitation of mergers between organisations (C. Lee, 2017). The McKinsey 7-S framework helps organisations to understand their goal and further optimises each of the seven elements in line with the overall corporate ambition. The framework helps to create a better understanding of possible areas of weaknesses in an organisation and to recognise specific areas that offer scope for improving performance (Lee, 2016).

Hard Factors	Soft Factors
Strategy	Staff
Structure	Style
Systems	Skills
	Shared Values

Table 5: 7-S Hard and Soft Elements

Cawsey & Deszca (2007) explain the variables of the framework and summarise each of them as follows:

Strategy involves a plan or course of action created by an organisation with the aim of achieving a competitive edge and fulfilling its goals over time (Waterman et al., 1980). For a strategy to be considered sound, it must be clear and have a long-term perspective that would help the company to maintain its competitive edge. It must also be strengthened by effective values, vision and a mission. The level of integration between strategy and other elements is not easy to determine when analysed alone. However, the key to the 7-S framework is to check how well aligned the structure is with other elements. In some cases, short-term strategies may produce poor results but, if aligned with other elements, the results are impressive.

Structure examines how business units and divisions are organised. It contains the organisation's organisational chart. It is one of the hard elements in the McKinsey framework and is highly visible and easily changed.

System includes procedures and processes used by companies. This element explains the daily business activities that different companies are involved in and how specific decisions are made. It should be emphasised by most managers during organisational change because it explains how the business operations are conducted. Skills are one of the soft elements of the McKinsey framework and explain the abilities of the different employees within the organisation that make them highly effective. In the event of organisational change, analysis is performed to determine the skills the company needs to strengthen its new structure or strategy. The staff element focuses on the types of employees and the number of employees needed by a company. It also includes processes relating to the employment, rewards, motivation and training of employees. Style concerns the method that the top managers use to run the company. It includes how the top managers interact and which of their actions would affect the company. Shared values are the most important element of the McKinsey 7-S framework. They usually involve the principles that guide employees' behaviour and the company's actions and are thus considered as the basis of growth for any company (Ravanfar, 2015).

The McKinsey framework is usually used when there is an issue with organisational design and effectiveness.

3.1.2 Burke-Litwin Model

The Burke-Litwin model helps to establish a hypothesis on the effects of internal and external factors on organisational performance. It usually provides a very important framework on environmental and organisational success and how such a framework can change the performance of a company. This causal model tends to yield a relationship between what can be obtained in a real-life scenario and what has been established through research and theory. It delivers insight into the effects of the external environment on the dimensions of an organisation (Thakur, 2013). In view of the complications experienced in understanding organisational phenomena, this model provides a classification of important organisational dimensions that helps to diagnose the problem as well as the relevant data (Chawane, Van Vuuren, & Roodt, 2003).

There are a wide range of reasons why change occurs within an organisation. The Burke-Litwin model of organisational change and performance helps to recognise the drivers of change and their implications. In the model, the various change drivers are arranged in descending order according to their importance. The model explains the interconnectivity of the factors, each of which affects the others. A change in one will therefore necessarily affect the other factors.

The feedback loops on the left and right sides of the chart move in alternate directions. In the figure below (see Figure 7), it can be seen, for example, that the performance variable affects the external environment through its products and services, and individual and organisational performance is likewise affected by demands from the external environment. Burke & Litwin (1992) make a distinction between Culture and Organisational climate. Culture is explained as each employee's perception of how effectively their work unit is managed and the cohesion in working together with other colleagues (Burke & Litwin, 1992).

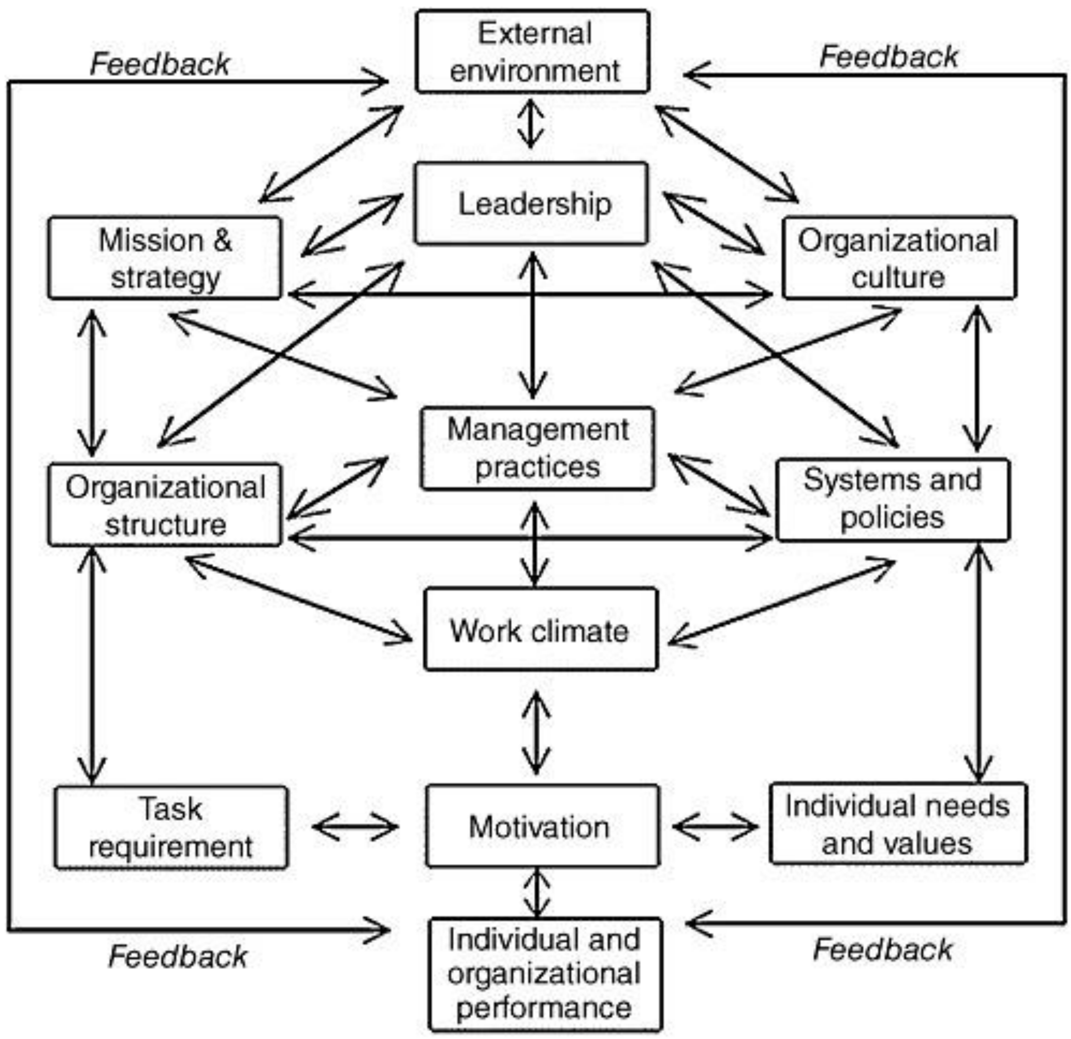

Figure 7: The Burke-Litwin Model

Burke and Litwin argue that environmental factors are a very important change driver. Some important elements of organisational success, including leadership, strategy and organisational culture, result from changes in the organisation caused by external factors.

The following provides a brief description of each of the 12 dimensions identified by the Burke-Litwin change model:

The External environment explains some important factors such as competition, markets, economy and legislation. These all have effects on the operations of any organisation, and it is always pertinent to constantly study such factors and their effect on the team (Burke & Litwin, 1992). The important external factors affecting the organisation should be established, and possible results of some of these factors determined. The Mission and strategy states the reason for the company's existence. This factor highlights how the organisation engages in achieving its objectives. It is very important as it is considered to be the foundation of any organisation. Changes in strategy must be understood and the roles of team members explained to them.

Another dimension of the Burke-Litwin model is Leadership. This highlights the general behaviour of top executives in a firm and the effects of this behaviour on the organisation. The acceptability of change will depend largely on the senior members of the organisation. The Organisation culture explains how processes and work are performed within an organisation. It highlights the behaviours, values, conventions and beliefs that are important in an organisation. Structure focuses on responsibility, communication, decision-making, authority and the control structure that exists between people in an organisation. It also has an effect on responsibilities and relationships in the workplace. Another element is Work climate, which highlights workers' opinions of the working environment and their immediate colleagues. Each worker's working environment has an effect on their feelings and views about the organisation, influencing the level of satisfaction in the workplace. The kind of relationships the employees have with their team members and members of other teams is also an important aspect of Work climate.

Task requirements and Individual needs and values involve a clear understanding of the nature of the job and what is required to effectively fulfil the demands of the particular position. This helps to effectively evaluate each employee with the jobs they are involved in. The dimension of Individual needs and values highlights the different opinions on the jobs engaged in by the employees and identifies important factors that will result in job enrichment and greater job satisfaction Employee motivation considers the significance of individual and organisational goals. This element is important for maintaining motivation in the workplace. Identifying employees' motivation level helps employers to better understand them and make the efforts required to achieve organisational goals. Management Practices involve studying the level of conformity of the managers to the organisation's strategy when dealing with employees and resources.

The Motivation level dimension involves identifying the level of motivation employees require in order to contribute their efforts to achieve organisational goals. This also involves identifying motivational triggers: Finally, Individual and Overall performance focuses on the level of individual and organisational performance in key areas such as efficiency, quality, budget productivity and customer satisfaction.

3.1.3 Galbraith's Star Model

Galbraith's Star Model is one of the most popular and widely accepted organisational design frameworks in use. It focuses on five areas of design policies: rewards, processes, people, strategy and structure (Galbraith, 1982). These elements help to provide the organisation with direction and improve employee motivation, the flow of information, and employee skills and mindset.

This model provides a basis for companies' and organisations' design choices. It consists of a series of design policies that affect employee behaviour and are primarily controlled by management. These policies enable effective decision-making that helps to shape the organisation.

The figure below (see Figure 8) shows Galbraith's Star Model, which is subdivided into five categories. The first of these is Strategy, which explains the organisation's direction. The second is Structure, which highlights where decision-making powers are located within the organisation. The third element is Processes, which explains the information flow. The fourth element is Reward, which serves to motivate workers to perform and achieve the organisation's goals. The fifth area is People, which comprises policies that relate to people and affect employees, their skills and mindsets (Galbraith, 1982).

Strategy, the first element shown in the figure below (see Figure 8), is necessary for companies that want to be continuously successful.

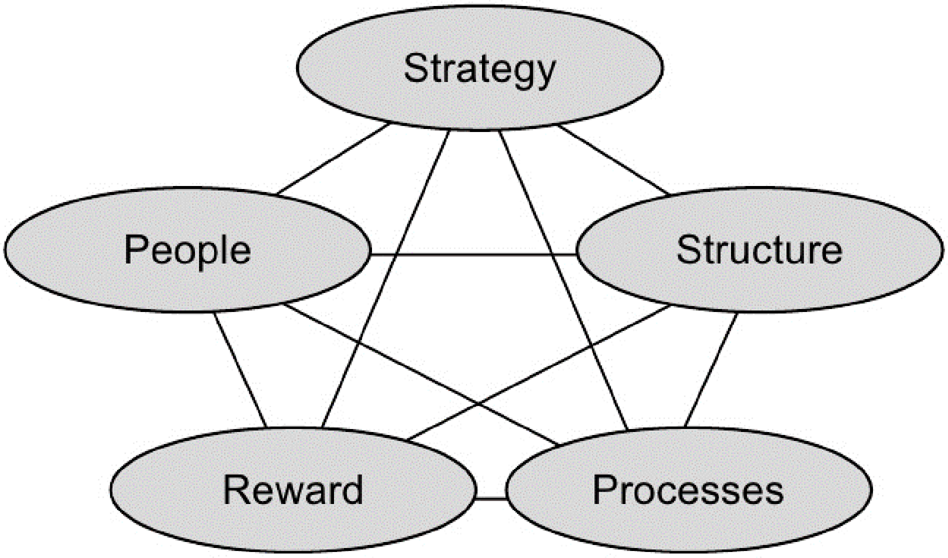

Figure 8: Galbraith Star Model

An organisation's strategy defines its objectives and goals while also considering its missions and values. The Strategy element of the star model describes the value of the products offered by the company the specific market in which the company wishes to operate/operates. It also emphasises the areas in which the company has a competitive edge. The Strategy helps companies choose between alternative organisational forms. Selecting a specific organisational form determines which activity has priority over another. The strategy chosen by a particular company strongly shapes the best way for the company in terms of the organisational design (Galbraith, 1982).

Structure can be subdivided into four major elements: Shape, Departmentalization, Distribution of Power, and Specialisation. Specialisation includes the numbers of workers and job disciplines involved in the execution of a project. Shape refers to the number of workers in each department at each level of the organisational structure. Large numbers of people in each department create flat organisational structures with few levels. Distribution of power, in its vertical dimension, refers to the classic issues of centralisation or decentralisation. In its lateral dimension, it refers to the movement of power to the department dealing directly with the issues critical to its mission. Departmentalisation is the basis for forming departments at each level of the structure. The standard dimensions on the basis of which departments are formed are: functions, products, workflow processes, markets, customers and geography. Matrix structures are ones where two or more dimensions report to the same manager at the same level (Galbraith, 2011).

The importance of the category Reward lies in aligning the organisation's goal with the employee's goal. This helps to provide incentive and motivation to achieve the strategic objective of the organisation. The reward system sets out the policies for regulating promotion, salaries, profits, bonuses, stock options and a host of compensation schemas in a more general sense. This is an extremely useful area, and a growing number of companies are implementing innovative approaches such as the pay-for-skill salary method. There is also the growing practice of motivating employees by means of non-monetary rewards, including challenging assignments and recognition. The star model highlights the need for the reward system to match the particular processes and structure in order to support the overall strategic direction of the organisation (Galbraith, Downey, & Kates, 2001).

Most organisations focus mainly on the organisational chart and structure and pay little attention to rewards and processes. This is clearly illustrated in the star model, in which each of the elements of the model is important, and none should be given greater attention than another. Organisations have focused more on Structure as this has a direct and usually profound influence on power and status, both in the press and across the entire company. However, companies are now realising that structure is losing importance while people, processes and rewards are becoming more valuable and important for the success of an organisation (Galbraith et al., 2001).

The People aspect involves human resources policies on staff selection, rotation, training, development and recruitment. Properly implemented human resources policies enable individuals with the skills and mindset necessary to achieve the organisation's goals to be recruited (Galbraith, 2011). As emphasised in the Star Model, the effects of policies employed in the area of human resources are maximised when these policies are consistent with other design areas. Good human resources policies also help to develop the organisational capabilities needed to achieve strategic objectives. Organisations that employ flexible operations need flexible people. The right human resources policies help to develop such people and such organisation capabilities.

Galbraith's Star Model also highlights that deploying different strategies leads to different organisations. Galbraith emphasised that there is no strategy that works for all organisations; rather, each company needs each company needs to use the current designs that meets their unique needs. He explained that for an organisation to achieve success and be more productive, it must function as the interweaving lines that form the star shape. The organisation must ensure all policies are well aligned and interact harmoniously (Galbraith, 2011).

One very important application of the Star Model is in overcoming certain structural design barriers within organisations. It is generally accepted that all organisations have positive and negative aspects. Organisations can identify their negative aspects and implement new policies designed using the Star Model to offset the negative policies while emphasising the positive ones. Also, in a bid to reduce the negatives, the management can implement appropriate rewards, processes and staffing policies. Implementing the Star Model any organisation will achieve more positives while reducing negatives (Galbraith, 2011).

3.1.4 Summary of Organisation Design Frameworks

In summary, these various frameworks all have their own specific similarities and differences regarding the ways in which they represent the respective variables. These models comprise a number of structures and variables, which are sometimes interconnected.

The McKinsey 7-S framework summarises the internal elements of the organisation: strategy, structure, systems, shared values, style, staff and skills. It does not discuss the external environment and its effect on the organisation, nor does the model include any feedback loops or performance variables.

The Burke-Litwin model helps to generate a hypothesis on the effects of internal and external factors on organisational performance. Thakur (2013) explained the effect of the environment on transformational variables, which in turn influence transactional variables. Collectively, these factors affect individual and organisational performance, resulting in the overall effectiveness of the organisation. While this model includes feedback loops, it is not easy to understand.

Galbraith's Star Model describes the five key categories of organisational design: Strategy, Structure, Processes, Rewards, and People (Galbraith, 1982). It also emphasises the interconnectivity of all these categories and suggests interdependencies between them. The categories are complementary in that a change in one design element may affect another variable in the model. This model is particularly suitable for this dissertation as it provides a detailed description of the important organisational elements.

Model	**Variables**	**Variable Inter-dependency**	**Major Premise(s)**	**Limitations**
McKinsey 7-S Framework (1980)	Style, Staff, Systems, Strategy, Structure, Skills, and Shared values	Variables are interdependent; the graphical represent-tation of the model is called the managerial molecule	Variables must all change to become congruent as a system	External environment not directly represented in the model Legitimacy derived largely from the McKinsey & Co brand and Tom Peters persona rather than through research

Model	Variables	Variable Inter-dependency	Major Premise(s)	Limitations
Galbraith's Star Model (1982)	Strategy, Structure, Processes, Rewards, and People	Assuming alignment among the variables, there is some inter-dependency	Variables in the model are considered organisational design elements that support an organisation's strategy	Model does not explicitly specify any behaviour or performance outcomes, although recent revisions were made to make these outcomes explicit
Burke-Litwin model (1992)	External environment, Leadership, Mission and strategy, Culture, Management practices, Structure, Systems, Climate, Motivation, Skills/job match, Individual needs and values, Performance, (feedback loops)	Variables are inter-dependent and inter-connected.	Variable elements are affected by external changes in the organisation.	Too many variables Too complex

Table 6: Comparison of Organisation Design Frameworks

3.2 IT ORGANISATION DESIGN MODELS

In addition to the generic organisation design models presented in section 3.1, it is important to consider the different models for designing IT organisations. The following three models have been the subject of much discussion among practitioners and professional researchers:

Model Name	Reference
'IS success model'	DeLone & McLean (1992)
Gartner's 'IS LITE Model'	McDonald (2013)
CEB's 'World-Class IT Organisation'	CEB (2012; 2003; 2012)

Table 7: IT Organisation Design Models

DeLone & McLean (1992) applied Leavitt's diamond to derive specific success factors related to information systems (IS) and defined the 'IS success model'. Gartner designed its 'IS Model' and its 'IS LITE Model'. Well-known consulting companies have also made contributions in this area: for example CEB's 'World-Class IT Organisation' (CEB, 2012; Chuck & Woolfe, 2003; Mok, 2012). Consideration of the overall development of IT organisation design models shows them to have changed over the years. While the first models started out with a fully integrated IT department with all responsibilities located within the organisation itself, the years 2000–2010 focused on outsourcing capabilities wherever possible in order to gain both speed and optimise costs (Carr, 2003). During this particular period, Gartner's IS LITE model was very much in vogue as it regarded IT organisations as dispatchers rather than value-add services. In the present digital century, however, IT is becoming an integrated part of the business that drives competitive advantage (Porter & Heppelmann, 2014).

The following section provides more detailed explanations of the main aspects of the models introduced here.

3.2.1 IS Success Model

Delone & McLean (2003) highlighted the fact that the success of any system depends solely on system usage. Their research provides the most successful and popular definition of information system (IS): an IS involves producing information and conveying the information generated to its user. Shannon & Weaver (1949) explained that problems including semantic, technical and effectiveness issues must be overcome before information transmission can be considered successful. Technical problems are said to occur when the communication system is not capable of delivering the information efficiently and accurately (Shannon & Weaver, 1949). Semantic problems involve evaluating the information transmitted and checking whether it is received by the right recipient. Effectiveness problems arise when the information transmitted does not have the required effect on the behaviour of the recipient (Shannon & Weaver, 1949). In a situation where these problems are not effectively taken care of, communication system failure ensues. Based on the postulates by Shannon and Weaver regarding the three problems experienced in a communication system, Delone & McLean (2003) developed a framework for accessing IS structure, which includes tool that measures semantic success, effectiveness success and technical success. 'Technical success is measured through system quality which is a concern of the technical factors of the system, whether the system has the proper characteristic for producing good information. Semantic success is assessed through information quality and effectiveness success is measured through use, user satisfaction, individual impact and organisational impact' (Delone & McLean, 2003).

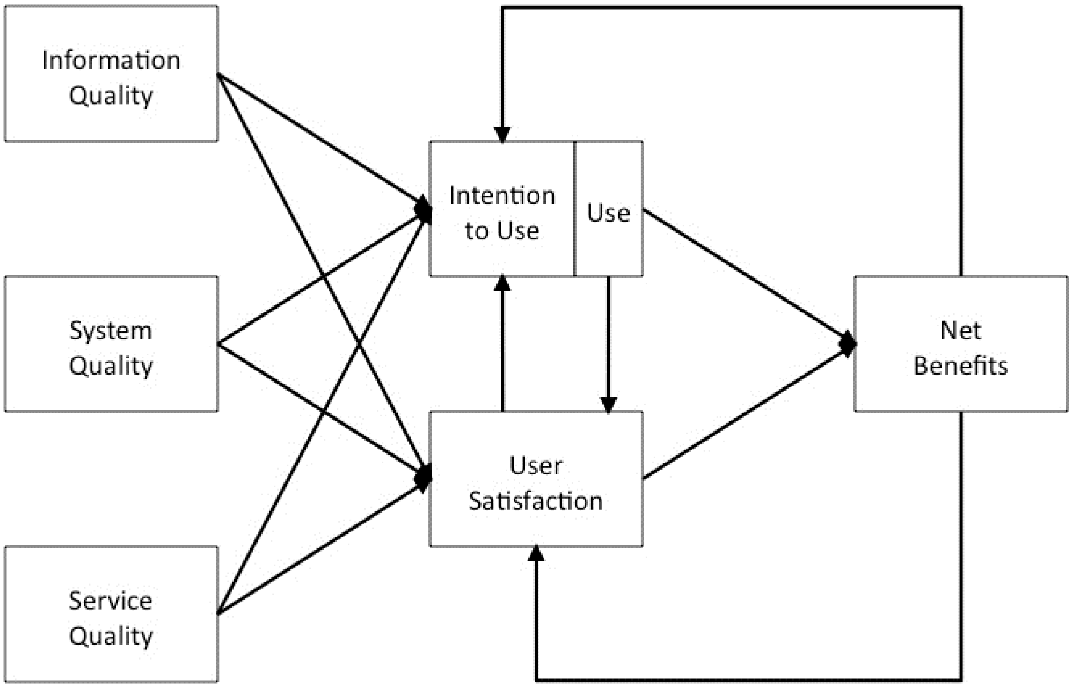

Figure 9: DeLone and McLean IS Success Model

The first IS Success Model analysed six unique dimensions of IS success: system quality, information quality, use, user satisfaction, individual impact and organisational impact. DeLone and McLean's model was developed based on the premise that information system success falls largely under six major interdependent and interrelated categories. The authors reviewed the existing definitions of IS success and the corresponding measures, and classified them under six major categories This classification enabled them to create a multidimensional measuring model with interdependencies between the different success categories (DeLone & McLean, 1992). One of the conclusions derived from the model was that the amount of system use could affect the level of user satisfaction.

Information Quality: This includes some characteristics important for improving system outputs. Some of the elements used in measuring system quality include relevance, accuracy, conciseness, completeness, understandability, currency, timeliness and usability.

System Quality: This includes some qualities and characteristics that are needed for an effective information system. Examples include flexibility, ease of use, system, system reliability, and ease of learning, as well as the system features of flexibility, intuitiveness, sophistication and response times.

Service Quality: Service quality entails the extent of support users enjoy from the information system. Some of the elements that are used to assess the service quality include: accuracy, responsiveness, reliability, empathy of the staff and technical competence

Intention to Use: This entails the degree of usage of the information system by both staff and customers. Some of the factors used to check System use include the nature, appropriateness, purpose and frequency of use.

User Satisfaction: This provides details of the level of user satisfaction with the organisation's services. This information can be obtained from websites, reports and support services (Ives, Olson, & Baroudi, 1983).

Net Benefits: These are the degree to which information systems contribute to the general success of organisations, groups, individuals and the nation.

The DeLone and McLean model is widely accepted and the most popular model of IS success measurement. It is a process/casual model. Following criticism from other researchers for including the construct 'Use', the model was developed further and presented in an extended form ten years later (Delone & McLean, 2003). In their updated model, the authors included 'Service Quality' and 'Use', which were replaced by 'Intention to use/use'. Individual Impact and Organisational impact were replaced by 'Net benefits' (DeLone & McLean, 1992; Delone & McLean, 2003).

3.2.2 IS LITE Model

Introduced by Gartner in 2000, the IS LITE model examined information systems from the point of view of four important trends: specialisation through centres of excellence, process-oriented operation, outsourcing and a clearer division between executing centralised versus decentralised IT activities (McDonald, 2013).

In contrast to the conventional IT factory approach, where process-orientation was not significant and IT-related activities were performed by the companies themselves, the IS Lite model encouraged a reorganisation of IT organisations. This helps companies to retain their competitive advantage by, for instance, redefining activities that should be handled by the IT organisation versus those that can be sourced from external vendors or incorporated into the business organisation. This approach resulted in the IT organisation being positioned as a broker between external vendors and the business units.

The Gartner model identifies a number of roles, including IT leadership, Architecture development, Business enhancement and others (see Figure 10).

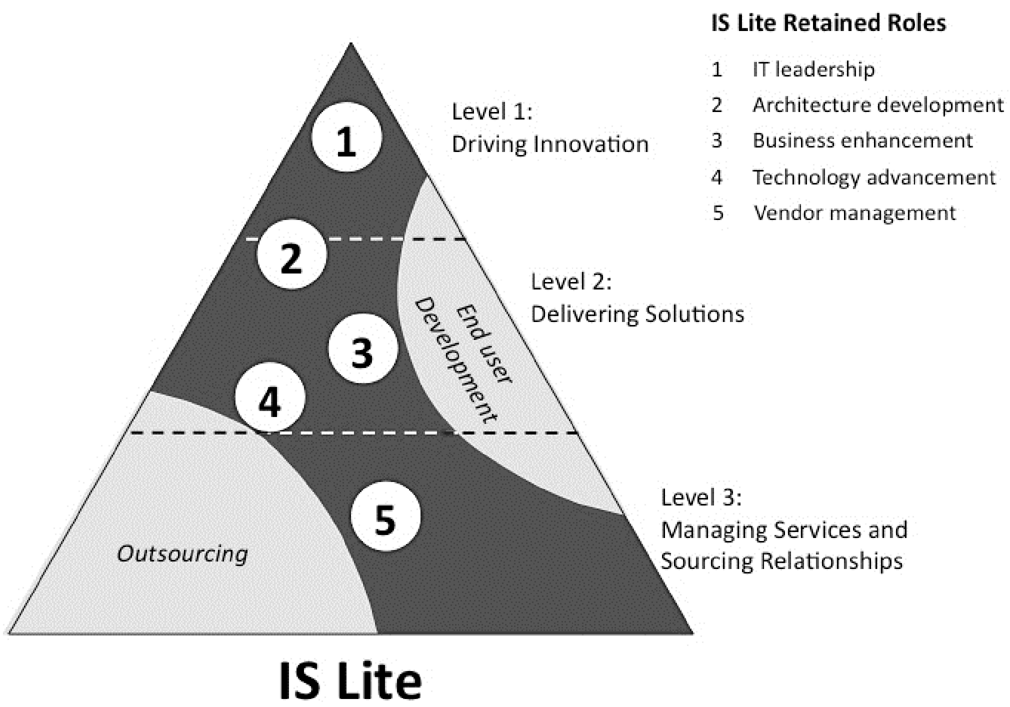

Figure 10: Gartner's IS Lite Model

The model established that roles such as IT leadership, architecture development, business enhancement, technology advancement and vendor management were essential to the success of the IT organisation of the future (McDonald, 2013). It is important to note that this poses a new challenge for conventional IT organisations because the new organisation requires different competencies and usually has a different mode of operation. An additional consequence was the duplication of certain roles that now seemed to appear in both the business and the IT organisation. The Gartner model was limited to addressing IT demand/supply governance without identifying the actual activities that were required to effectively shape the IT demand and supply function within an organisation.

3.2.3 World-Class IT Organisation

The process of developing a world-class IT organisation usually begins with an organisation (M. Harris & Raviv, 2002). According to CEB, a world-class IT organisation employs structures that consider people and processes before technology. In other words, for more organisations to become successful and cost-effective service providers, the focus needs to be in the following order: organisation, people, processes and technology.

The anatomy of the CEB model contains 20 different elements that a world-class IT organisation should possess. These are structured across six different dimensions. Figure 11 illustrates the different elements.

Translate Strategy into Business Architecture	Increase Budgeting Flexibility	Segment Projects by Business Outcome	Adopt a Project Lifecycle Perspective	Assess Risks to Critical Workflow
Develop Challenger Liaisons	Enable Selective Business-Owned Solutions	Get Early User Input into System Design	Prioritize Analytics That Measure Strategic Goals	Frontload Information Architecture Compliance
Analyze Workflow to Pinpoint Social Media Needs	Define Business-Relevant Services	Enable Test-and-Learn Innovation	Maximize Capacity to Change	Become a Customer of Choice
Promote Leader-Led Development	Target High-Potential Staff Development	Establish an Emerging Skills Strategy	Create a Business Value Framework	Measure IT's Strategic Impact

Figure 11: CEB's World-Class IT Organisation

The main aspect of this model is that it provides a quite detailed view of the different functions in IT organisation design.

3.3 DIGITISATION TRENDS

In the present digital century, IT is becoming an integrated part of the business that drives competitive advantage (Porter & Heppelmann, 2014).

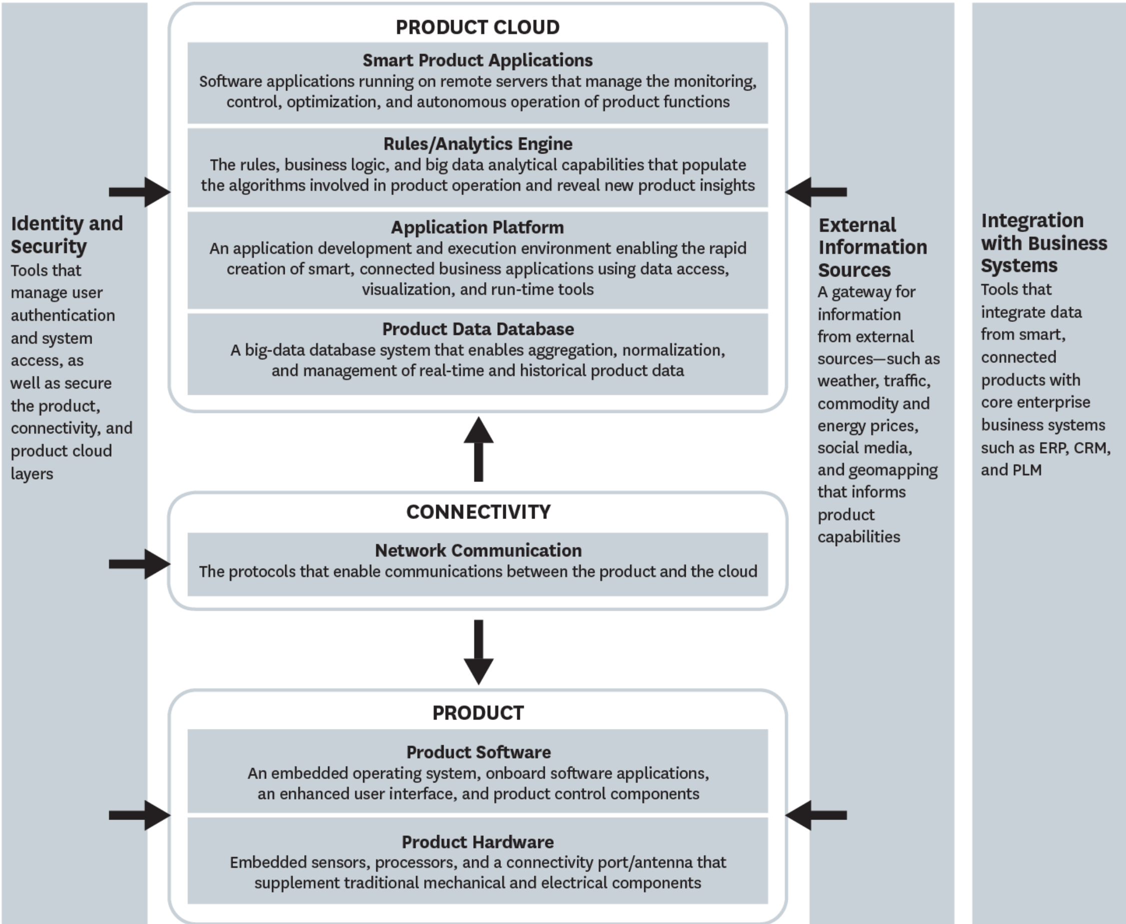

Figure 12: The New Technology Stack

The publication 'How Smart, Connected Products Are Transforming Competition' by Porter & Heppelmann (2014) makes it very clear that IT is on the verge of becoming the business, and not just an enabler. The authors call this the 'third wave of IT-driven competition'.

For platform companies, which basically provide digital services (e.g. smart product applications), IT processes are the core business processes. The physical product becomes the basis for the service but is just one part alongside a range of associated IT services, including analytics and product data. This totally changes the nature of the IT organisation requirements compared to the models referenced in Table 7, which reflect the period 1980–2010, when IT was still a business enabler or merely a dispatcher of externally sourced services. But the requirements of the digital age could be seen as contradicting the old established model, which must be abandoned because all current models suggest that the core capabilities required to ensure sustainable competitive advantage must remain inside the IT organisation. While this still holds true, digitisation trends will change views regarding core competencies, thereby changing the elements of an IT organisation design framework (CEB, 2012; Mok, 2012).

In a digital world, IT increasingly becomes the business, especially in platform business models such as the ones described by Porter & Heppelmann (2014). According to the research by Gartner referred to above in section 3.2.2, the future role of the IT organisation will move away entirely from 'keeping the lights on' to '[…] fuel[ing] top line growth, […] [offering] business-IT expertise, customer insight, versatility and hybrid thinking' (Morello, 2012). The new trend greatly accelerates this development.

Furthermore, skills in the areas of data security, industry understanding and industrial concepts are becoming increasingly relevant not only for the IT workforce, but also for the business staff of tomorrow. As stated at the outset of this dissertation, the lines between business and IT are becoming blurred – especially if we consider companies that are moving into the platform business and using IT services on top of physical products to fulfil customer needs. The following paragraphs shed more light on the digital transformation and how it is defined for the purposes of this dissertation.

In this dissertation, the expression 'digitisation trends' is used with reference to the period from 2010 onwards. This definition was derived from a Google analysis of when the expression began to be used on a larger scale. Today, the words 'digital transformation' can be found in every newspaper and in many TV broadcasts. McAfee (2006), in his article 'Enterprise 2.0', was one of the first authors to describe the influence that technology can have on the core of organisations – in other words, on the way they fundamentally work. McAffee asks whether 'we finally have the right technologies for knowledge work?' (McAfee, 2006). What he describes is the way new technologies change the knowledge management processes we are used to. Turban et al. (Turban, Liang, & Wu, 2011) describe similar ideas in their article on 'collaboration 2.0', in which they map new technologies such as 'microblogs' or 'social networks' to the existing processes and capabilities within an organisation and illustrate how these processes and capabilities change as a result. If we look back on those developments, it becomes clear that the easier to access and more user-friendly those technologies are, the more they disrupt an organisation in its core organisational aspects. This is particularly the case for IT organisations, which have to manage the technologies. Against this background, 'digital' can be seen as the logical next step in covering the wider implications of technology in our daily lives.

That being said, the expression 'digital transformation' by its very nature covers a wide area and consequently has various definitions. It is helpful to start by considering each of the words separately. While some authors define 'digital' very broadly in the sense of IT-enabled/IS-enabled innovation (Ashurst, Freer, Ekdahl, & Gibbons, 2012), others define it using a list of specific elements (e.g. 'big data and advanced analytics'). In this dissertation, 'digital' denotes the sum of technologies that change formerly physical processes into processes that are partly or completely enabled by information technology.

The word 'transformation', on the other hand, has been used for many years in different contexts. It generally denotes a change from one state to another within a certain timeframe (Agarwal, Shroff, & Malhotra, 2013; Besson & Rowe, 2012; Nolan, 2012). In the context of organisation design, these transformations are contextualised by the expression 'organisational transformation' (OT) (Besson & Rowe, 2012; M.-C. Boudreau, Serrano, & Larson, 2014; Weinberg, de Ruyter, Dellarocas, Buck, & Keeling, 2013; Winter, Berente, Howison, & Butler, 2014). One of the central aspects of an organisational transformation is that it touches all elements of an organisation: structure, governance, processes, roles and capabilities (Mintzberg, 1980; Puranam, Raveendran, & Knudsen, 2012). The value chain of a business is typically used to illustrate the overall impact of transformations because it clearly shows all the areas affected. The literature defines three basic OT theories (Besson & Rowe, 2012). The first can be described as iterative, which means that the impact of the transformation develops over time (Hannan & Freeman, 1984; Plowman et al., 2007). Other authors argue that OT does not evolve but instead occurs rapidly and abruptly (DiMaggio & Powell, 1983). The third theory assumes that OT is brought in from outside. In other words, any changes occurring in the ecosystem also have implications for the organisation and therefore result in a need for transformation (Tushman & Romanelli, 2008). Besson & Rowe (2012) compared these three theories with the current literature on IT organisation transformation and confirmed them. In light of the different viewpoints, this dissertation defines the term 'transformation' as the sum of activities that incrementally change a starting state into its future state.

Combining the thinking on digital transformation and (IT) organisation design creates an interesting interplay and, according to (Shamim et al., 2017), a very different set of requirements for organisation design:

'Organisations can range from an organic design to a very mechanistic organisational design, on a broader continuum […]. Characteristics of mechanistic design are specialised task, centralised authority, and decision-making; more formal rules and rigid policies; top down communication; and many levels of hierarchy and authority. This kind of system are more suitable in a stable environment where changes are not very frequent. The environment of Industry 4.0 is not stable, so these types of organisational designs are not suitable for it. In fact, Industry 4.0 needs an organic organisation design which is not very formal; prefers flexible rules and policies; decentralisation; empowerment of employees; collaborative team work; and horizontal communications […]. Innovation capability in a changing environment is more compatible with an organic design of organisation. So it is rational to be in the organic paradigm of organisational design while deciding about the organisational structure for Industry 4.0.'

This change in requirements regarding organisation design generally can be easily transferred to IT organisation design specifically. Flat hierarchies, dynamic structures and other elements are considered fundamental to IT organisational design in the digital age (Shamim et al., 2016). The following chapter highlights how this current state of the literature is used to derive an initial set of research items for the ITODF developed in this dissertation.

The following section analyses connected products and connected enterprise trends in greater detail and derives the implications for this dissertation.

3.3.1 Connected Products

Information technology is transforming physical products. In the past, products were composed mainly of electrical and mechanical parts. Today, however, a growing number of products are becoming increasingly complex, usually through the integration of sensors, microprocessors, data storage and software in different ways. These enhanced, connected products have been made possible by improvements in device miniaturisation, processing power, and connectivity irrespective of location. This has opened up a new area for organisations and companies. (Porter & Heppelmann, 2014)

Smart, connected products present a wide range of opportunities for new improved functionality, for products that go beyond traditional product boundaries and for better product utilisation. The constant transformation and evolution of the value chain is prompting an increasing number of companies to implement new improved internal processes (Porter & Heppelmann, 2014). In many organisations, smart, connected products are the major drivers in reshaping conventional products offered by such organisations. The term 'the Internet of Things' reflects the increasing number of smart, connected products and what these products represent.

Smart, connected products need organisations to develop and use a completely new technology infrastructure. These products consist of different aspects, including the use of embedded software, cloud computing on remote servers, integration with enterprise business systems, and new product hardware.

Connected products deliver new product capabilities and abilities. One feature of such products is their ability to monitor and report conditions autonomously, helping to provide improved insight that was not previous available. In addition, connected products can be operated in very remote, hazardous and hard-to-reach locations through control by users like a drone in an oil and gas mine. Because they can be monitored and remotely controlled, connected products ensure optimisation, reduce downtime and improve performance. Autonomy is another advantage of connected products since products can adapt to user preferences and learn and operate independently. Connected and smart products affect every activity in the value chain. Data is one of the major influences that are reshaping the value chain.

Smart, connected products have three key types of component: smart components, connectivity components and physical components. Physical components consist of electrical and mechanical parts. Connectivity components include antennae, ports and protocols that provide either wireless or wired connections. Connectivity can be either one-to-one or one-to-many. One-on-one connectivity involves connection of the individual product to the manufacturer or user via a unique interface or port. One-to-many connectivity involves a central system that is constantly connected to a huge number of products at the same time. The smart components include data storage, sensors, microprocessors and software which is presented in an enhanced user interface (Chen Songqing & Shi, 2017; Lenka, Parida, & Wincent, 2017; Roethlien & Ackerson, 2004).

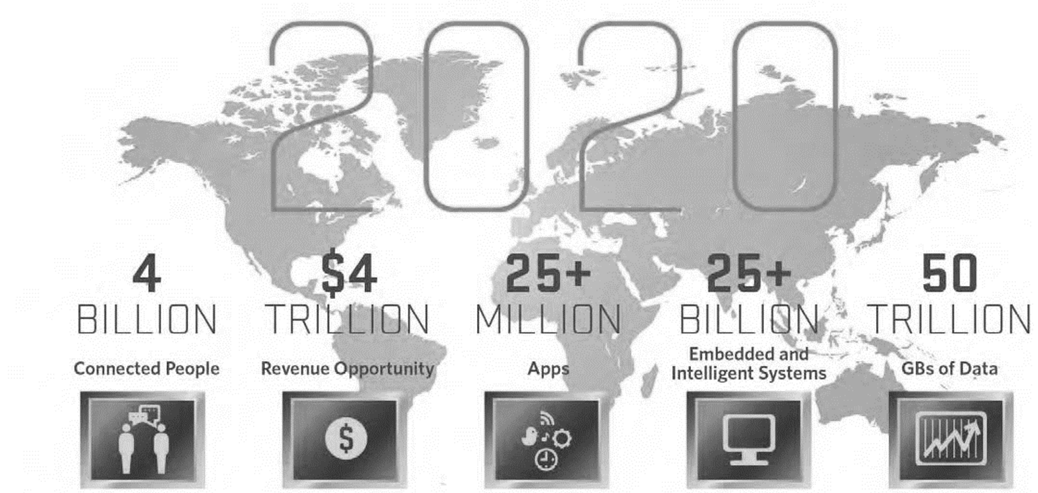

Figure 13: Development of the Internet of Things

Connectivity enables a new set of product capabilities and functions which can be further subdivided into four major areas: control, monitoring, optimisation and autonomy. To effectively improve its competitive advantage, an organisation must choose the set of capabilities that helps deliver customer value.

Monitoring is one of the capabilities offered by connected products, enabling the operation, condition and external environment of a product to be comprehensively monitored. A product can use data to alert consumers to changes in performance or circumstances. Monitoring also enables customers to trace a product's operating history as well as characteristics that can provide a better understanding of the product's usage. In addition, monitoring may expose compliance-related issues and sales opportunities for the products. Monitoring capabilities can be used over long distances without negatively affecting their effectiveness (Ritz & Knaack, 2017).

Control is another important capability offered by connected products. Smart, connected products can be controlled by the use of algorithms and remote commands residing in a product cloud or specifically built into a device. The use of algorithms involves rules that lead products to respond to changes in the environment. Control through cloud-embedded software enables product customisation, a feature that was not previously cost effective (Lenka et al., 2017).

Optimisation is another capability offered by connected products. Connected products that use analytics, algorithms or historical data can effectively improve efficiency, output and utilisation. Real-time data monitoring of the condition of products enables organisations to effectively optimise services by performing preventive maintenance before failures occur. This can help organisations to reduce product downtime and personnel costs. In the event of a failure, information gathered in advance can be used to determine and localise where the fault has occurred, thereby reducing repair times.

Autonomy is achieved when optimisation, control, and monitoring capabilities are effectively combined. Autonomy reduces the need for operators and improves safety in unfavourable environments while facilitating operations in inaccessible locations.

Smart, connected products can also produce accurate, real-time readings of huge data volumes like for example conveyor belt sensors. Data is becoming almost as important as technology, capital and people, and is increasingly an important asset in many businesses.

Patterns from thousands of readings can be identified over a long time, which could provide valuable insights for companies involved with such products. Linking combinations of readings to the occurrence of problems can be useful because these patterns can be acted on even when the root cause of a problem is hard to deduce.

In conclusion, as more connected products having far-reaching effects in every industry, more companies need to modify their corporate goals (Porter &

Heppelmann, 2014). Organisations must change their mode of operations from the conventional process. As more products are designed to communicate and interoperate within networks, there companies must re-examine their core values and mission. Connected products are changing how companies compete, win new customers and increase their competitiveness. These changes have had an impact on every industry either directly or indirectly. This will cause a shift in the overall economy, giving rise to a new age of productivity growth driven mainly by information technology.

3.3.2 Connected Operations

Connected operations means the interconnectivity of different steps of the internal value chain. Looking at a transportation company as an example, it can be pictured that from the pick-up of a good until the drop of the shipment every process step is equipped with a sensor that collects data on the process step. This data is then used in the next process step to optimise itself. The emergence of new technologies has helped more organisations to incorporate connected operations at every link in the value chain. This includes working with tools and practices based on information and communication technology. Resulting from digital technologies, connected operations have a profound effect on business. They do not merely help companies do the same things a little better and more efficiently; they fundamentally change the way business is done. Digitisation is found at every level of an organisation (Porter & Millar, 1985).

Organisations are being affected by new and more efficient connected systems that help them to accomplish additional business objectives and create additional business value. Many organisations still face the challenge of aligning their knowledge with this rapidly evolving digitisation evolution.

The term "smart connected operations" denotes potential future production processes and is closely related to the Industrial Internet of Things (IIOT). Many organisations need to enhance their current processes, because connected processes include technologies that enable big data analytics, the cloud, connectivity and the development of new applications aimed at revolutionising production.

In a large number of organisations, managers are usually responsible for improving performance, ensuring compliance and reducing risks. Connected operations enable excellence in operations by providing unified visibility across all operations.

Connected operations have additional advantages, including less downtime, reduced maintenance, improved design, greater production efficiency and enhanced asset performance.

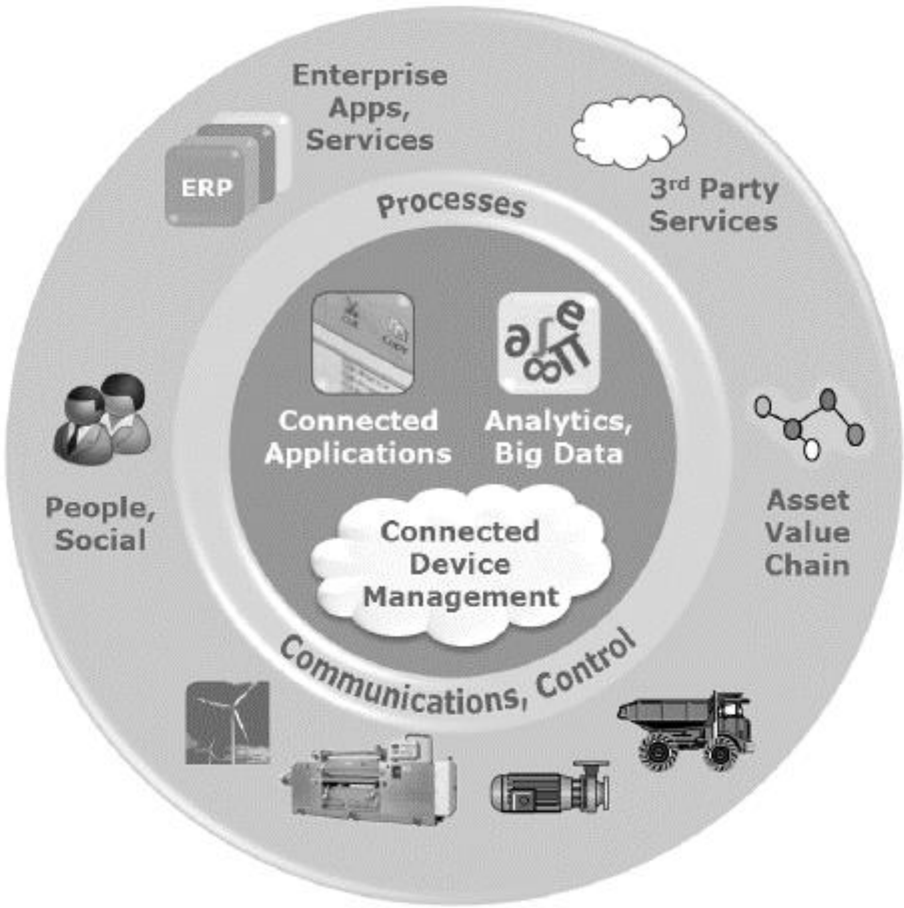

Figure 14: ARC's Industrial Internet of Things Model for Connected Operations

3.4 DIGITAL TRANSFORMATION

A growing number of companies are utilising new digital solutions, including social, analytics, cloud and mobile media. Today, there are a vast number of solutions designed to increase operational efficiency and generate business success. A large number of these companies do not use these tools to their full potential because of poor understanding of what the solutions entails. In some cases, this results in organisations missing out on attractive business opportunities (Ritz & Knaack, 2017; Roethlien & Ackerson, 2004).

Digital transformation involves many processes and usually originates with the consumer. The need to better understand and improve service levels drives digital transformation. This transformation includes three further areas: digitising products, operations and services. This digitisation is achieved by analysing developments in the digital world across a wide range of industries, includes electronics, retail, manufacturing, chemicals and sciences (Ritz & Knaack, 2017).

It is generally known that customers are the major determinant of the success of any organisation or business. To improve service delivery to customers, it is necessary to have a comprehensive knowledge and understanding of them. In the past, this was achieved mainly by companies' internal systems. Customer Relationship Management (CRM) can use internet analysis to help identify the products that individual customers have purchased in the past, potentially improving business relationships with customers.

The information obtained through digital technology can be an extremely important enabler of digital marketing. In recent years, with growing numbers of people becoming increasingly connected, businesses and consumers usually research and gather information about products from the internet before making a purchase (Lacity et al., 2015; Roethlien & Ackerson, 2004; Willcocks, Lacity, & Craig, 2015). If organisations are to remain competitive, they must provide current product information online and actively engage with online communities to gain relevant feedback and advice about their products. The advent of digitisation has increased the presence of customers and businesses online and has allowed organisations to personalise product and service promotions using digital marketing tools with the ultimate aim of increasing customer loyalty (Haffke et al., 2017; Lenka et al., 2017).

Because of the recent upsurge in new channels for interaction, such as social media, customers now demand consistent engagement across all channels. They expect to order a product through a suitable channel and to receive products via their channel of choice. Companies that fail to implement the omni-channel approach run an increased risk of failing to satisfy or even losing customers. It is therefore imperative that every organisation that wishes to remain relevant in the digital world delivers consistent and efficient interactions across all channels.

A growing number of companies have come to realise that they can no longer focus merely on selling products. Today, the emphasis must lie more on selling the experience. The number of goods and services offered through the web generates huge volumes of data, which enables companies to effectively monitor usage of their products and gain insight into any problems associated with them (Haffke et al., 2017).

Organisations are increasingly involved in implementing more sophisticated and innovative methods to better comprehend their customers, potentially fuelling demand for custom-made goods and services tailored to individuals' specific needs. This can be achieved by subdividing products into smaller units, which are then used to configure products in line with each consumer's unique requirements.

New companies are increasingly using IT services to implement their business processes. Standardising, automating and sourcing innovative processes makes it easier for organisations to respond to changing demand and helps them to sustainably increase profits. Because success now depends on predicting customer preferences, these agile approaches are important for any organisation seeking to gain and maintain competitive edge. Regular development and application of new products and software enables companies to adapt to the rapid change of organisational transformation (Laanti, 2014; Vlietland & van Vliet, 2015).

Companies with digitised value chains are increasingly joining forces with other businesses to become part of a larger community that could improve delivery to customers. Digital solutions offer greater assistance for companies operating in the support value chain, encouraging closer working relationships between the various players. Employees working within an integrated ecosystem, the must collaborate across various departments. They also need to learn from one another so that they can respond more rapidly – both to changing market trends and within their organisation. Companies with different locations and branches require tools for sharing ideas, documents, knowledge and experience, thus improving the business and enhancing its value.

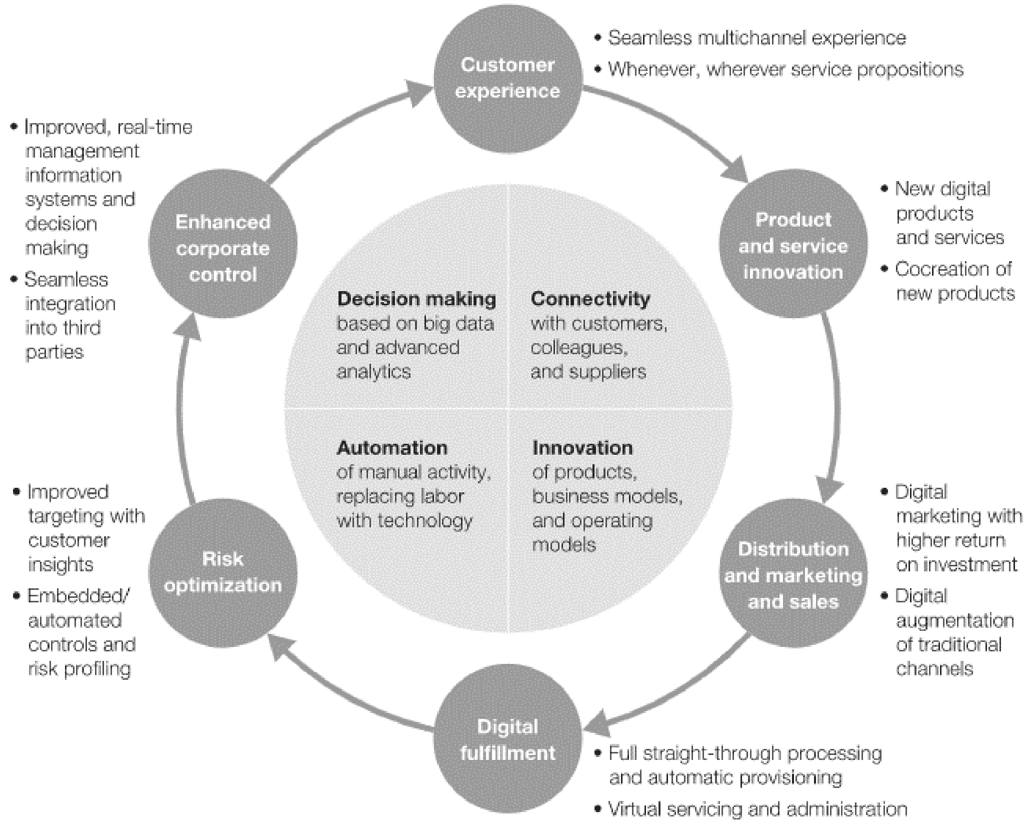

Figure 15: Digital Transformation Overview by McKinsey

There is also the need for a change in corporate culture toward a more digital mindset with increased innovation and improved digital expertise to help employees acquire the skills and knowledge needed to improve the company's output (Ravanfar, 2015).

4 INITIAL ITODF – QUALITATIVE RESEARCH

4.1 OBJECTIVES AND SCOPE

The qualitative research in this dissertation functions as an exploratory study. It derives an initial ITODF based on a number of statements that must be validated and a number of hypotheses derived as part of this research.

4.2 RESEARCH APPROACH

The research methodology used for this chapter combines two approaches. The first is a standardised literature selection process developed by Webster and Watson (Webster & Watson, 2002). The second is qualitative content analysis, a widely used procedure for structuring literature review findings, which originated in grounded theory (Glaser & Strauss, 1970; Kuckartz, 2012; Mayring, 2010). Table 8 presents the methodological steps used in the research and the associated process framework. The first five steps were defined before research began. The final three steps were developed during the literature review process and are described in the findings section of this dissertation. The methodological steps of the qualitative content analysis are described below.

The first step creating search queries incorporating (see Table 8) keywords derived from an unstructured review of a set of twenty peer-reviewed and non-peer-reviewed articles on organisation design, information system and information technology. The special characters (?,/()) are used to build the queries and are purposely chosen.

#	Search Query	Time Span	Field
1	((Organi?ation* NEAR/3 design OR Organi?ation* NEAR/3 structure) AND (information* NEAR/3 technology))	2000–2016	
2	((Organi?ation* NEAR/3 design OR Organi?ation* NEAR/3 structure) AND (information* technology) AND (social* media))	2000–2016	
3	((Organi?ation* design) AND ((information* technology) OR (information* management)) AND	2000–2016	

#	Search Query	Time Span	Field
	((social media) OR (mobile [computing]) OR (cloud [computing]) OR (Analytics) OR (SMAC)))		
4	(("Organi?ation* Design") OR ("Organi?ation* Design")) AND (("Information Technology") OR ("Information Management"))	2010–2016	Title
5	(("Organi?ation* Design") OR ("Organi?ation* Design")) AND ((information* technology) OR (information* management)) AND (("social* media") OR ("mobile* computing") OR (cloud) OR (analytics) OR (SMAC) or (Digital) OR (Digital Transformation))	2010–2016	Topic
6	(("Organi?ation* Design") OR ("Organi?ation* Design")) AND (("social* media") OR ("mobile* computing") OR (cloud) OR (analytics) OR (SMAC))	2010-2016	
7	(("Organi?ation* Structure") OR ("Organi?ation* Structure")) AND (("social* media") OR ("mobile* computing") OR (cloud) OR (analytics) OR (SMAC))	2010–2016	Topic
8	"IT organi?ation*"	2010–2016	Topic
9	"IT organi?ation*" AND (("social* media") OR ("mobility") OR ("cloud") OR ("analytics") OR ("Big Data"))	2010–2016	Topic
10	"IT department"	2010–2016	Topic
11	"IT organi?ation"	2010–2016	Topic
12	"IT organi?ation" AND "Mobile Computing"	2010–2016	Topic
13	((Organi?ation* NEAR/3 design OR Organi?ation* NEAR/3 structure) AND (information* NEAR/3 technology))	2000–2016	Topic

Table 8: Selected Search Queries for Paper Selection

The second step involved determining the journal databases to be used for the research. Based on their self-descriptions, the following four journal databases were used to cover most of the articles:

1. ScienceDirect,
2. Web of Science
3. Wiley Online Library and
4. Springer Link

In the third step, the keywords identified were packaged in search strings for the different databases. Figure 16 below shows an example of one of the databases.

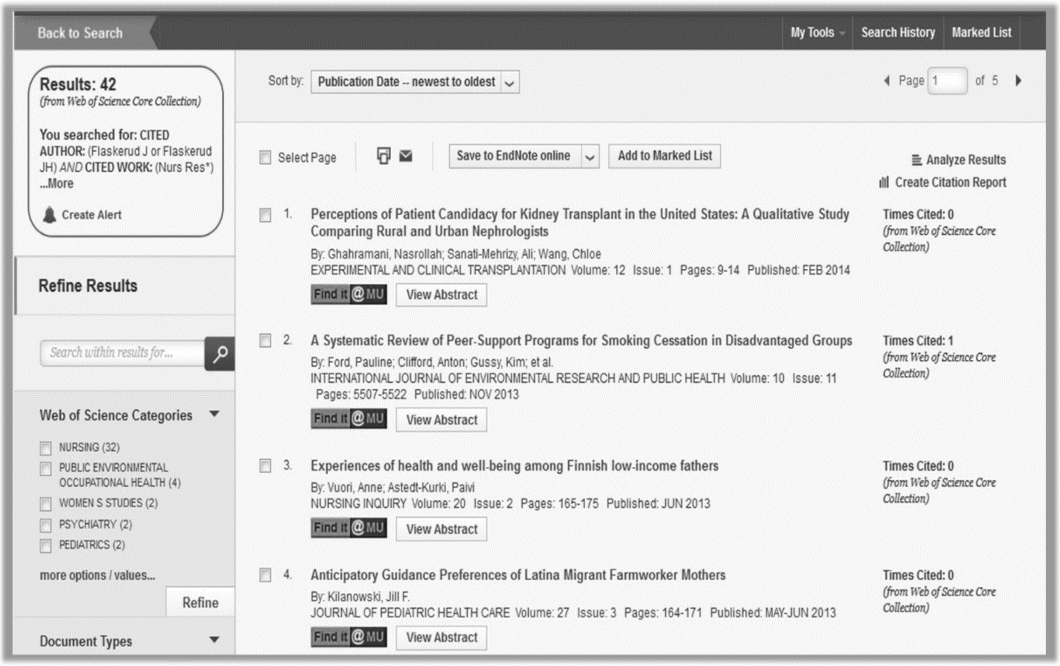

Figure 16: Web of Science Database

The fourth step involved using the backward and forward review process (mainly through Web of Science) to identify other articles of importance for the research. The citation index functionality helped to collect the most influential articles. The fifth step confined the search to peer-reviewed publications and articles published after 2010. This constraint ensured that the articles were written during a period when digital trends, as defined in this dissertation, existed.

This keyword-based search, in conjunction with a manual relevance rating to eliminate articles not applicable for the research, retrieved of a total of 354 papers. These were then pre-read to identify which were of particular relevance to IT strategy and IT organisation design in the context of digitisation. As a result, the qualitative content analysis was conducted on 51 papers dealing with the implications of IT strategy and IT organisation design in the light of digitisation trends.

The final three steps of the research methodology build on the qualitative content analysis (QCA). This analytical approach was chosen because it provides a structured and widely accepted way of summarising findings and deriving implications for further research. For details of the eight distinct steps of the qualitative analysis, see Table 9: QCA Research Steps, and see Table 10: QCA References for the frameworks referred to.

Research Step
1. Define set of keywords related to the field of research
2. Select relevant journal databases
3. Create search mechanism out of the defined set of keywords
4. Use backward and forward citation reviewing to ensure a holistic analysis of the research area
5. Define limiting factors to ensure high-quality and newest article hits
6. Create 'research guiding principles' that ensure an objective analysis process
7. Analyse articles
8. Create summary of findings

Table 9: QCA Research Steps

Research Step
(Webster & Watson, 2002)
(Webster & Watson, 2002)
(Webster & Watson, 2002)
(Webster & Watson, 2002)
(Mayring, 2010; Webster & Watson, 2002)
(Mayring, 2010)
(Mayring, 2010)
(Mayring, 2010)

Table 10: QCA References

ID	Peer-reviewed Paper
1	(Agarwal et al., 2013)
2	(Spraggon & Bodolica, 2012)
3	(Avram, 2014)
4	(Dhaliwal, Onita, Poston, & Zhang, 2011)
5	(van den Hooff & de Winter, 2011)
6	(Nolan, 2012)
7	(E. A. Fang, Wu, Miao, Xia, & Chen, 2013)
8	(Vlietland & van Vliet, 2015)
9	(Y. J. Kim, Lee, Koo, & Nam, 2013)
10	(Bjørn-Andersen & Raymond, 2014)
11	(Simonsson, Johnson, & Ekstedt, 2010)
12	(Cross, Gray, Cunningham, Showers, & Thomas, 2010)
13	(Hopkins, 2013)
14	(Mbuba & Wang, 2014)
15	(Cross & Gray, 2013)
16	(X. Zhang, Ryan, Prybutok, & Kappelman, 2012)
17	(Kaiser & Buxmann, 2012)
18	(Goswami & Mathew, 2011)
19	(Zimski, 2011)
20	(Moreno-Vozmediano, Montero, & Llorente, 2011)
21	(Aminzadeh, Sanaei, & Ab Hamid, 2014)
22	(Rahimi, Ren, Liu, Vasilakos, & Venkatasubramanian, 2014)
23	(Walsh, Kefi, & Baskerville, 2010)
24	(Carcary, 2012)
25	(Orta, Ruiz, Hurtado, & Gawn, 2014)
26	(X. Fang & others, 2011)
27	(Khanagha, Volberda, Sidhu, & Oshri, 2013)
28	(Demirkan & Delen, 2013)
29	(Girdauskiene & Savanevicvciene, 2012)
30	(Teo & Bhattacherjee, 2014)
31	(Kappelman, McLean, Johnson, & Gerhart, 2014)

ID	Peer-reviewed Paper
32	(Luftman & Ben-Zvi, 2011)
33	(Luftman & Ben-Zvi, 2010)
34	(Luftman et al., 2013)
35	(M.-C. Boudreau et al., 2014)
36	(Menguc & Auh, 2010)
37	(Jablokow, Jablokow, & Seasock, 2010)
38	(Pang, 2014)
39	(J. Harris, Ives, & Junglas, 2012)
40	(Tsai, Raghu, & Shao, 2013)
41	(Small, 2013)
42	(T.-C. Lin, Ku, & Huang, 2014)
43	(Costa, Santos, & Silva, 2013)
44	(Elragal, 2014)
45	(Rai, 2012)
46	(Holzmann & Spiegler, 2011)
47	(Winter et al., 2014)
48	(Ozen, Karagoz, Chouseinoglou, & Bilgen, 2013)
49	(A. Lin & Chen, 2012)
50	(Thomson, 2012)
51	(Arcilla, Calvo-Manzano, & San Feliu, 2013)

Table 11: Articles Analysed in the Qualitative Content Analysis

The table above (Table 11) lists all 51 publications selected. This list provides the basis for the qualitative content analysis.

The following pages summarise how the coding themes were derived using the three first steps of the QCA and how the results were applied to derive a set of research hypotheses. They also outline the first version of the ITODF based on the QCA.

Design Dimensions

One of the central activities in any QCA is defining the categories that structure the qualitative research. As described in the preceding section, there are two ways to create those categories: deductively and inductively. The research conducted for this dissertation used a deductive approach, analysing the selected number of 51 publications on organisation design in general and IT organisation design in particular to derive the categories of the QCA. (For a detailed description of the seven steps of the QCA see Table 9.)

Because organisation design models offer a solid foundation for initial categorisation of IT organisational design, it was decided to use Jay Galbraith's Star Model (Galbraith, 1977), which is discussed in detail in section 3.1 above. The five categories of the model, which enjoys a long-established reputation within the research community, were used to mark the different text sections in the different papers. The marked text sections are called 'text snippets' whereas the overall marking is referred to as 'coding'. These are shown in Table 2. The questions for each of the categories were derived from (Kates & Galbraith, 2010).

Category	Question to be Answered
Strategy	How do we differentiate ourselves from competitors?
Structure	How is the IS function organised? What are the key roles? How is the work managed? Who has power and authority?
Processes	How are decisions made? How does work flow between roles? What are the mechanisms for collaboration?
Rewards	How is behaviour shaped by the goals? How do we assess progress?
People	What skills are needed? How do we best develop our talent?

Table 12: QCA Categories Applied in the Qualitative Content Analysis

Additionally, it is very important to define the different terms used in the qualitative content analysis so that these are clearly understood. Table 13 defines the various terms used in this dissertation.

Term	Definition
Text Snippets	Selection of text sections that are used in the MAXQDA analysis

Term	Definition
Category	Organisational category as a link to the organisational design dimensions
Sub-Category	Sub-dimensions of the organisational design that are used in this dissertation
Code	The code is the combination of category and sub-category

Table 13: QCA Terms in Use

4.3 DATA ANALYSIS

The coding software MAXQDA provided the basis for the QCA and constant reviews of the coded elements. MAXQDA summary reports were used to continuously keep track of the text snippets and ensure consistency throughout the coding process (Kuckartz, 2012).

The first step was to load all 51 peer-reviewed papers into MAXQDA (see Table 11: Articles Analysed in the Qualitative Content Analysis). Next, the five distinct categories were established (see Table 12: QCA Categories Applied in the Qualitative Content Analysis) in MAXQDA. The subsequent step involved going through the 51 papers and linking the relevant text snippets to the categories and sub-categories, depending on the message each of the text snippets conveyed.

#	Category	Sub-Category	Number of Text Snippets
1	Processes	Governance	166
2	Strategy	Speeds of Delivery	140
3	Strategy	Information	125
4	Processes	Informal Processes	92
5	People	Shift to Soft Skills	68
6	People	Sourcing	36
7	Processes	Process Automation	32
8	Structure	Decentralised Decision-Making	26
9	Structure	Team Autonomy	25

#	Category	Sub-Category	Number of Text Snippets
10	Strategy	Visionary Leadership	24
11	Structure	Distribution of Power Across the Hierarchy	13
12	Strategy	Role Clarity	11
13	People	People	11
14	Rewards	Training	9
15	Structure	Division of Labour	9
16	Rewards	IT Device Decision	6
17	Structure	Shape of the Organisation	5
18	Structure	Structure	5
19	Strategy	Goals and Objectives	5
20	Structure	Size	4
21	Rewards	Job Challenge	4
22	Rewards	Rewards	3
23	Rewards	Recognition Systems	1
	TOTAL		**820**

Table 14: QCA Coding Overview

Table 14: QCA Coding Overview, shows that 820 different text snippets were assigned a category in the 51 papers (see Appendix for details on article and where the specific text can be found). These 820 categories were distributed across 23 different sub-categories derived from the QCA. Each sub-category was linked to the five initially agreed categories derived from Galbraith's organisation design framework.

The following section briefly presents each of the codes and what was derived from the associated text snippets. The codes are presented in ascending order of the number of hits in the QCA:

4.3.1 Recognition Systems

'Recognition systems' was coded only once in the 51 papers analysed. This one hit stated that monetary rewards drive employees' ambition to innovate (Small, 2013). The article furthermore summarised results on IT-security-related issues resulting from the new digitisation trends to provide evidence of the importance of recognition systems. None of the other articles returned any hits for this specific code, which was the least-mentioned one.

4.3.2 Rewards

Rewards was coded if the term 'rewards' was used in a paper. Overall three codes were made in this category, all of them stressing the importance of rewards. However, as the term was merely mentioned and no specific reasons were given for its importance, these codes have not been evaluated further.

4.3.3 Job Challenge

This sub-category was applied four times in the papers in connection with peer-related challenges as an enabler of change faced by individual employees as a result of digitisation challenges. 'Across a range of organisations we found that the more energizing ties employees have, the more satisfied they are, and also the more trusted they are in the eyes of their peers [when it comes to new challenges arising from digitisation trends].' (Cross et al., 2010). Although this code reflected the role of peer-related challenges in helping to better manage new requirements, it was also found only four times in the entire article base.

4.3.4 Size

Size was likewise discussed in four text snippets. All of these relate to the reduction in the size of IT organisations that is associated with commodity services. In the articles where the codes were found, this is explained by the growing tendency to outsource services of this kind. The use of external staff to deliver commodity services obviously results in a reduction in internal IT headcount. However, the four codes also underscore that business departments are increasingly recruiting staff with IT skills. While this clearly does not count as IT, it does add to the organisation's overall IT-related headcount. The main point here is, therefore, that although IT organisations shrink as the number of digital-related projects rise, these losses are compensated for on the business side. However, as this code was found only four times, it does not add significant weight to this category.

4.3.5 Goals and Objectives

Five different codes were applied in the article base. Burrus (2013) stated that 'the old way stressed cost management; the new [digital] way prioritises driving business transformation and accelerating growth'. This sentence reflects the text snippets that fell under this coding category. All of these snippets clearly stated the areas in which IT organisations must develop in order to set their overall direction. The five articles supported Burrus (2013) contention that, if IT organisations are to succeed in a digitised world, a clear change in direction from an old cost-centre-related approach to a more transformational one is essential.

4.3.6 Structure

The term 'Structure' occurred five times as a factor that differentiates successful from less successful IT organisations in the digital age. As in the section on Rewards above, this term was simply mentioned, with no further explanation of the associated underlying assumptions.

4.3.7 Shape of the Organisation

This sub-category summarises all the text snippets focusing on the ratio of IT staff to business users and the span of control in SMEs as opposed to big companies. The different codes also emphasise that increased speed gives rise to greater spans of control – in other words, managers must manage more subordinates than in the past. The main conclusion reached here is that greater decision-making powers must be given to non-managerial IT employees. This aspect is also addressed under the Governance and Processes category, discussed later in this section. However, this sub-category was also mentioned only five times in the entire data set explored in the QCA.

4.3.8 IT Device Decision

Six codes were found that made the point that reward elements such as 'Bring your own device' are considered important in the new digital world (J. Harris et al., 2012). Potential employees, particularly those from Generation Y and Generation Z, demand reward elements of this kind before engaging with companies and seriously considering starting their career with them or even buying products from them. The ability to bring their own hardware and the provision of support for other IT-related equipment were also said to give potential new employees a sense of freedom. Prospective Generation Y or Generation Z employees see being allowed to use their personal devices as a reflection a company's DNA.

4.3.9 Division of Labour

The Division of Labour sub-category summarises all the aspects that describe how departments are clustered in an IT organisation. The main finding here is that, when it comes to clustering labour, the design of the IT organisation should reflect the different speeds resulting from the legacy environment and the digital environment. One key point in this category is made by Andersson & Tuddenham (2014), who state that functions commonly shared by 'legacy IT' and 'agile IT' should be identified and combined in a shared department while the remaining non-identical responsibilities should be managed differently by one common management. This argument is supported by (Marchand & Peppard, 2013). Virtual groupings, as described by Cross et al. (2010), are also discussed under this code. Finally, seven of the nine text snippets mention the need to manage the different speeds required by increasing digital business demands involving expectations of faster lead times than in the legacy IT environment.

4.3.10 Training

The Training sub-category, which was also mentioned nine times in the article base, summarises the role of a training catalogue on the changes caused by ever-increasing digital business demands. Organisational learning is presented as a key enabler when it comes to understanding the implications of digital trends for the business demands and speed of delivery required by IT organisations in the digital age. The nine text snippets focused particularly on training relating to business demand prioritisation and business operations (Levine & Prietula, 2012; Ozen et al., 2013; Stantchev, Petruch, & Tamm, 2013). However, while the category appears to be relevant, it was mentioned only nine times in the overall article base.

4.3.11 People

Again, this category was applied to all text snippets that stated that people are an important aspect in setting up a successful IT organisation in the digital age. The term was referred to 11 times across the entire paper baseline.

4.3.12 Role Clarity

This sub-category summarises all the text snippets that discuss how IT must communicate its role in a company's digital transformation. Overall, this sub-category was marked 11 times. In summary, the papers state that it is very important that the IT organisation adopts a clear position with regard to the Chief Digital Officer (CDO), the Chief Financial Officer (CFO), but also the Chief Technology Officer (CTO) (Nolan, 2012). In addition, Gottlieb & Willmott (2014) argue that role clarity can also involve the CEO and Chief Information Officer (CIO) using a joint go-to-market strategy communicating joint ownership of the digital agenda for the corporation – with the CEO playing the role of visionary thinker and the CIO as the executive instance. By contrast, other authors state that the respective roles can be reversed, with the CIO setting the direction and the CEO ensuring the technology-driven strategy is implemented in business operations (Thomas Gumsheimer, 2016).

4.3.13 Distribution of Power Across the Hierarchy

This sub-category was used to map all the text snippets asserting that the distribution of decision-making within an IT organisation changes when digital business demands increase. This sub-category was applied 13 times. The main finding here was that IT organisations need to rethink their distribution of power across the hierarchy. However, these text snippets did not clearly state what direction this rethink should take. One common denominator in three articles containing 6 of the 13 text snippets was the assertion that organisational silos must be avoided to support rapid decision-making (Besson & Rowe, 2012; De Hertogh, Viaene, & Dedene, 2011; Dhaliwal et al., 2011). Although it was not possible to identify a clear direction in this sub-category, a general shift in decision-making power is evident. In addition, the silo mentality should be eliminated, wherever possible.

4.3.14 Visionary Leadership

A total of 24 text snippets coded as Visionary Leadership were identified in the article base. The Visionary Leadership sub-category consists of statements in the papers supporting the claim that to successfully manage the changes necessitated by digital trends IT organisations need leaders with a vision for the IT organisation as a whole. (Cox, 2014). Cox (2014) specifically states that IT leaders need to look beyond the IT department to define the appropriate vision. This aspect is also supported by (Westerman, 2013), who states that a true IT leader needs to think like a CIO, looking beyond pure technology to consider business change and business innovation. Gartner research also concludes that visionary leadership is important not only at CEO level, but also for the entire organisation, especially for the IT function as it increasingly becomes a central element of the business strategy (Gartner, 2013b).

4.3.15 Team Autonomy

Team autonomy was coded 25 times. The sub-category refers to the increasing need to push accountability down into the organisation (Shuman & Twombly, 2010). The text snippets coded state that speed of delivery is achieved by taking decisions where they need to be taken, instead of moving them up the decision ladder – mostly from a decentralised position in the organisation to a central position (van den Hooff & de Winter, 2011). In this context, collaboration tools are seen as a critical enabler of team autonomy, giving different team members the insight they need through direct contact to experts inside and outside the organisation (Stephens, Barrett, & Mahometa, 2013). Another enabler seen here is cloud computing, which allows data and knowledge to be shared throughout the organisation, thus giving teams autonomy to make decisions (Peiris, Balachandran, & Sharma, 2014). In addition, autonomy is increasingly demanded by Generation Y and Generation Z. Companies that do not give individuals sufficient autonomy will find it difficult to be attractive as an employer (Hopkins, 2013).

4.3.16 Decentralised Decision-Making

The sub-category Decentral Decentralised Making was coded 26 times. This is closely linked to the findings for Team Autonomy in the preceding paragraph. While Team Autonomy describes the way teams would like to make decisions, Decentralised Decision-Making describes the move away from decision-making based on others' recommendations and towards decision-making at the place where the question arose. In this dissertation, 'decentralised' refers to making decisions at the location of the business operations and not at headquarters, where there are no practitioners (Jablokow et al., 2010). One paper refers to the examples of Telefonica and WalMart, which took decentralisation to the extreme, giving the decentralised organisational entities full control over their decision-making on all IT-related questions. None of the relevant decisions needed to be backed up by a corporate function, whether that was the CIO or CEO (Olanrewaju, Smaje, & Willmott, 2014). The text snippets in this category also support the distinction between the different speeds in IT – the old traditional speed for legacy systems and the new digital speed for digital business demands.

4.3.17 Process Automation

The Process Automation sub-category was coded 32 times. This sub-category refers to the shift towards process automation in the IT organisation. An increasing number of commodity processes can now be automated and are therefore being moved out of the IT organisation (J. Harris et al., 2012). Additional research outside the article base also supports the point on process automation (Willcocks et al., 2017). Robotic process automation (RPA) has been cited in publications not included in the article base as one of the major trends supporting rapid automation of commodity processes within IT organisations. An example of this would be IT incident management, which could be fully standardised at the first and second support levels. By contrast, all the text snippets stated that differentiating processes – especially those relating to business process innovation – should be managed purely by the IT organisation in close collaboration with the business process owners.

4.3.18 Sourcing

A total of 36 text snippets were coded as Sourcing. The fact that this code was initially mapped to the People category shows the driver of the term Sourcing in the context of the QCA. Sourcing is defined in this dissertation as the contention that IT organisations need to incorporate a well-thought-out sourcing strategy into their IT strategy to be competitive (Mahon et al., 2011; McPherson, 2011; Vaughan, 2011). In particular, outsourcing is seen as a means of accelerating speed-to-market (Steffen Fuchs & Shulman, 2013). IT organisations that use outsourcing contracts to rapidly integrate necessary additional skill sets have a competitive edge. This is because they can deliver the requested business functionality much faster than IT organisations that must first develop the necessary capabilities themselves by hiring, training and ultimately integrating new personnel into their team.

4.3.19 Shift to Soft Skills

The Shift to Soft Skills sub-category has 38 associated text snippets. It summarises the move away from an IT organisation focusing on hard skills (mainly developer skills) towards a service-integration function that steers external service suppliers and shapes business innovation with a wider eco-system of partners (Ulieru et al., 2001). The author of this dissertation (Krimpmann, 2015a) also analysed the shift away from hard skills towards industry skills and soft skills when researching the skill sets required when organisations move in the direction of cloud computing. A successful IT organisation in the digital age is driven by IT employees that are familiar with the latest innovations and aware of industry trends but have hardly any of the hard skills needed in the past.

4.3.20 Informal Processes

A total of 92 text snippets were associated with Informal Processes. In this dissertation generally, and in the QCA in particular, Informal Processes comprise text snippets that state that quick and efficient decision-making is clearly driven by informal networks of people. In other words, individuals reach out to each other and work together to resolve specific problems (Sayogo, Gil-Garcia, & Pardo, 2016) without a clearly defined process. Soda & Zaheer (2012) argue that these informal networks are success critical, especially in a digital environment where decisions need to be taken much faster than in legacy environments. The authors go on to make the point that the legacy processes, which are certainly still needed, are too standardised and too strict for the digital environment. However, a connection between Informal Processes and robotic process automation (RPA) can be made if the insights from the Informal Processes text snippets are combined with research into RPA (Lacity et al., 2015). One of the main arguments for RPA is process documentation and automation. As a result, two approaches (informal, where quick decisions are required, and formal and well documented, where standardisation is key) need to be considered when creating a digital IT organisation design framework. If processes are neither a source of competitive positioning nor a source of innovation, they should be outsourced, if possible, or fully automated using RPA (Willcocks et al., 2015).

As regards Informal Processes, some authors also state that the importance of knowledge exchange tools should be taken into account. Ozen et al. (2013) underline the importance of knowledge sharing among IT professionals as a means of resolving problems. The authors argue that the tools become a critical enabler of informal networks where people can discuss challenges, get others' input and points of view, and take this input back to their working groups to further refine the problem scope and ultimately resolve the problem. Vlietland & van Vliet (2015) provide an additional argument in support of the importance of Informal Processes. They state that Scrum teams need informal processes because this is one of the central building blocks of the entire Scrum development methodology. The main conclusion to be drawn here is therefore that informal processes are essential for rapid decision-making in a digital world, while standardised and strict processes are required in areas where process automation is a key element (specifically where this is driven by RPA technologies).

4.3.21 Information

Information was associated with 125 text snippets. The following perspectives were gathered: information as a source of competitive advantage (Porter & Millar, 1985), information as a driver of business insights (Goswami & Mathew, 2011; Markus & Loebbecke, 2013) and data visualisation as a key enabler of information (Kundu & Garg, 2015; van der Aalst, 2014). These three perspectives were continuously linked to another point of view that argued for a set of required roles designed to achieve a quantifiable effect by using data. Examining these perspectives one by one gives a clear understanding of where IT organisations need to act in the digital age. Considering information as a source of competitive advantage is linked to the idea that IT organisations that help the business to better understand its customer base are much more successful than those that see this as common practice (Notowidigdo, 1984). Successful organisations of this kind understand individual customers' behaviour and habits. By contrast, companies that do not use their data are less customer-centric and less profitable.

In addition to customer insight as a source of competitive advantage, the text snippets discussed Business Insight Gathering as a key aspect of the importance of information. This argument is based on the fact that all companies own vast amounts of data, but not many make use of it (Provost & Fawcett, 2013). Provost & Fawcett (2013) argue that companies that gain business insight from their data create an additional source of competitive advantage by using the insight gained from this data to optimise their internal processes. Another key element in the text snippets associated with the Information sub-category concerned data visualisation. According to (van der Aalst, 2014, 2014), if data is not properly visualised, informed decisions cannot be made. Linking this point to the fast pace of decision-making in the digital age, the author states that good data visualisation is key to enabling senior decisions-makers to easily grasp the main message and arrive at decisions based on the data.

As regards the point mentioned above concerning roles, the coded text snippets argued for clearly defined integration of information into the organisation by defining dedicated roles for the distinct activities that must be performed to understand, interpret and visualise data, and make decisions based on the associated insights. However, the snippets also gave consideration to helping the business to understand what might be hidden in the data it already owns. The main aspect in Information is therefore to embed a role that helps the business to understand requirements regarding self-owned data, on the one hand, and the capabilities needed to derive the right information from the data, visualise it and prepare it for decision-making, on the other.

4.3.22 Speeds of Delivery

Speeds of Delivery as a sub-category in the Strategy category was associated with 140 text snippets. Rahimi et al. (2014) argue that, with the growth of SMAC trends, speed of delivery for IT organisations has increased tenfold. Players like Amazon (with its S3 storage), Google (with its AppEngine) and Microsoft (with its Azure environment) demand totally different skill sets, focusing more on tool management than on server administration. In addition, because business representatives can use the same services by simply applying for a corporate account on the supplier’s platforms (e.g. AWS platform), there is growing pressure on the internal IT organisation to perform at a totally different speed with a different set of capabilities. Furthermore, changing delivery methodologies demand training for individual IT employees or even the hiring of completely new capabilities if in-house resources cannot be trained in the new methodologies (Dhaliwal et al., 2011). In the area of software development methodologies alone, the past five years have seen the creation of three new frameworks that are widely used and have gained extensive recognition in the software development community (Ahimbisibwe et al., 2017).

Software Development Methodology	Source
Agile Development	(Heikkilä, Paasivaara, Lasssenius, Damian, & Engblom, 2017)
Scaled Agile Framework (SAFe)	(Laanti, 2014)
Iterfall	(Pamela et al., 2007)

Table 15: Agile Software Development Methodologies

All of the three frameworks in Table 15 focus on speed and minimal viable product (MVP) generation. This requires business and IT to work hand in hand on a daily basis and develop very small essential product features. While legacy development methodologies such as Waterfall and the V-Model concentrate mainly on process compliance and quality gate compliance from one tier of the model to the next (Kazim, 2017), these new models focus on the solution much more than on the process. Teams need to get together and develop a 'fail-fast' attitude, allowing them to quickly create MVPs, determine whether they work and whether the business is satisfied with the outcome, and then either redevelop or continue with the next feature. This shift in delivery methodologies and tool management gives rise to different speeds that are expected from IT organisations depending on the business demand involved. Gourévitch, Rehberg, & Bobier (2012) analysed this trend, calling the approach, in which IT organisation need to deal with an agile and a traditional speed of business demands, 'two-speed IT. (Shimel, 2016) anticipated the two-speed IT model but argued that it runs at multiple speeds depending on the complexity of the relevant business demand – and therefore called this 'multi-speed IT'. (Horlach et al., 2016) refer to 'bi-model IT', also focusing on two speeds at which an IT organisation needs to perform. The analysis of this text snippet clearly indicates that an IT organisation must handle agile business demands differently than traditional business demands, which are less customer-centric.

4.3.23 Governance

The Governance sub-category received 166 text snippet assignments. The text snippet content was subdivided into two main areas: one focusing on the importance of governance bodies and the various perspectives on how best to manage the allocation of decision rights between business and IT; the other centring on how much governance, especially regarding organisational hierarchies, is needed in an IT organisation facing the challenges of the digital age. Discussions of the importance of allocation of seats on governance bodies primarily consider the amount of business representation required. Twenty years ago, most decisions were taken by IT without consulting anyone in other parts of the company. In the 1990s and 2000s, by contrast, the focus was on bringing business representatives into the decision-making process to ensure outcomes were shaped and delivered in a way that fulfilled the original business demand (Centre, 2011). The current prevailing opinion is that the business should take at least 50% of the seats on decision-making boards to properly reflect requirements and ensure the business understands the IT-related challenges. It is clear that many authors reject the need for numerous governance bodies, because today's teams are increasingly integrated with each other, and decisions are taken without having to prepare for official decision committee meetings (Pang, 2014). Many of the snippets argue that only selected committees are necessary and the remaining decisions should be taken in the respective teams – assuming they have the necessary decision-making authority. This is another key point outlined by various authors (Centre, 2011; Raj et al., 2013; Rohloff, 2008; Simonsson et al., 2010). Because Governance had the most text snippets associated with it, it seems to be a key factor in the digital age. If Governance is considered alongside Process Automation, Team Structures, Speed of Delivery and Informal Processes, it is clear that decision-making in the digital age differs radically from decision-making in the legacy environment. It is faster, less hierarchical, organised along decentralised lines and governed by fewer decision-making bodies and process definitions.

4.4 INTERPRETATION AND DISCUSSION

A total of 23 sub-categories were derived from the QCA in the seven categories. The Pareto Principle (Kiremire, 2011) was applied to the baseline of the 820 codes to identify the most important codes in the different categories.

Table 16: Pareto Analysis of QCA Codes shows the full results of the analysis (100%). The first eight category/code combinations were defined as the primary categories of the QCA. An additional 10%, up to 90% of cumulative value, has been

taken into consideration to include results at the borderline in the subsequent quantitative analysis conducted for this dissertation. The aim was to test at the borderline whether the quantitative research shows some of the values to belong to the ITODF, even though they were not in the 80%.

#	Category/Code	Number of Text Snippets	% of Total	Cumulative
1	Processes/Governance	166	20%	20%
2	Strategy/Speeds of Delivery	140	17%	37%
3	Strategy/Information	125	15%	53%
4	Processes/Informal Processes	92	11%	64%
5	People/Shift to Soft Skills	68	8%	72%
6	People/Sourcing	36	4%	77%
7	Processes/Process Automation	32	4%	79%
8	Structure/Decentralised Decision-Making	26	3%	84%
9	Structure/Team Autonomy	25	3%	87%
10	Structure/Visionary Leadership	24	3%	90%
11	Structure/Distribution of Power Across the Hierarchy	13	2%	91%
12	Strategy/Role Clarity	11	1%	93%
13	People	11	1%	94%
14	Rewards/Training	9	1%	95%
15	Structure/Division of Labour	9	1%	96%
16	Rewards/IT Device Decision	6	1%	97%
17	Structure/Shape of the Organisation	5	1%	97%

#	Category/Code	Number of Text Snippets	% of Total	Cumulative
18	Structure	5	1%	98%
19	Strategy/Goals and Objectives	5	1%	99%
20	Structure/Size	4	0%	99%
21	Rewards/Job Challenge	4	0%	100%
22	Rewards	3	0%	100%
23	Rewards/Recognition Systems	1	0%	100%
		820	**100%**	**100%**

Table 16: Pareto Analysis of QCA Codes

The codes with a dark grey background are the primary codes; those with a lighter grey background are the secondary codes; and the codes in grey font have been removed from the equation at this point of the dissertation.

Consideration of the primary categories shows that eight sub-categories are associated with only four categories. Another IT organisation expert was consulted to select which of the double counts should be raised from the sub-category level to the category level to reflect the number of associated text snippets and thus the importance to the ITODF developed in this dissertation.

Category	Sub-Category	Expert 1	Expert 2
Processes	Governance	X	X
	Informal Processes		
	Process Automation		
Strategy	Speeds of Delivery		
	Information	X	X
People	Shift to Soft Skills		
	Sourcing	X	X

Table 17: QCA Code to Category Promotion

Cohen's kappa (Cohen, 1960) was used to confirm objectivity and inter-coder reliability. The respective recommended minimum values were exceeded, verifying the reliability and objectivity of the coding instrument.

The following section presents the organisational categories (from here onwards referred to as 'dimensions') derived from the QCA. The discussion builds on the six initial categories of the QCA plus the additional three categories 'Governance' and 'Sourcing' and 'Information' derived in the QCA coding (see section 4.3). Each of these dimensions is described, and the reasons for its selection or deselection are given.

4.4.1 Strategy

The QCA confirmed a claim presented in the first chapter of this dissertation: namely, that the IT function is currently at a tipping point and that a new approach to IT organisation design is required that mirrors the future demands of digitisation (Mbuba & Wang, 2014; Rahimi et al., 2014). Business units can purchase most standard IT services from external providers, leaving difficult-to-manage services to the internal IT organisation. Harris et al. and Moreno-Vozmediano et al. (J. Harris et al., 2012; Moreno-Vozmediano et al., 2011) highlight this behaviour when they point out that many employees will in future turn to the cloud before approaching their internal IT organisation. Against this background, IT organisations must adopt a strategy of positioning themselves as business enablers rather than support functions (Ashurst et al., 2012; Jablokow et al., 2010; Winter et al., 2014). A quote from one CIO cited in the literature sums up this point neatly: 'We need to get business to see that IT development is an enabler, not a barrier' (J. Harris et al., 2012). Kappelman et al. (Kappelman et al., 2014) emphasise a similar aspect, using the term 'business/IT alignment'. They state that this is increasingly becoming the critical area in which IT organisations must improve if they want to be seen as business enablers. Van den Hooff and de Winter (van den Hooff & de Winter, 2011) illustrate how the active involvement of business will help to develop business's interest in IT, thus strengthening alignment with IT. The authors go on to establish a link to agile development methods. These strengthen the ties between both parties because interaction becomes much more intense than in a normal Waterfall or V-Model development cycle (Ashurst et al., 2012; Roh, Hong, & Min, 2014; Vlietland & van Vliet, 2015) if the internal IT organisation can transform itself into a driver of competitive advantage for the business. This positive outlook is supported by another study, which shows IT organisations will shift their focus to business productivity in the next few years (Kappelman et al., 2014; Luftman & Ben-Zvi, 2011).

The QCA shows that IT organisations need to operate at a minimum of two speeds – corresponding to the agile and traditional demands placed on IT organisations. To avoid becoming irrelevant to the business, an IT strategy needs to take these two different speeds into account.

Another topic that is very often discussed in the literature considered by this dissertation is the IT sourcing strategy (Tsai et al., 2013) not to be confused with the Sourcing dimension discussed later in this section. Some authors recommend building a strategic supplier base, but caution against falling into the trap of outsourcing no matter what (Kaiser & Buxmann, 2012). The authors recommend evaluating the 'trade-off between production costs and coordination or transaction costs'. Costa et al. (Costa et al., 2013) concur with this argument and state that 'outsourcing is neither good nor bad in itself. The results from an outsource contract will depend on how the organisations minimize the risks and manage the contract'. This contention is also supported by Kim et al. (Y. J. Kim et al., 2013) and is given further weight by another research paper, which evaluates the trend towards outsourcing IT staff (Han & Mithas, 2013). The paper shows, for example, that outsourcing of IT staff in Asian countries skyrocketed from <0.5% in 2010 to 5.5% in 2011. This development was motivated by a desire not only to reduce costs, but also to fill skills gaps that organisations are unable to fill themselves (Luftman et al., 2013).

4.4.2 Structure

Structure is a dimension that almost every IT practitioner is aware of because discussions of organisation design generally revolve exclusively around the topic of structure. Some authors go so far as to claim that organisation design is virtually identical with structure (Mintzberg, 1980). However, other researchers have shown that this is now no longer the case (Waterman et al., 1980). While structure remains important, organisation design goes far beyond this dimension.

The main topics discussed in this dimension are the difference between decentralisation and centralisation, as well as the span of control and the division of labour. The article base revealed different opinions on whether digital trends force IT organisations to adopt a centralised or decentralised structure. In their analysis of a number of companies, Kaiser and Buxmann (Kaiser & Buxmann, 2012) found that strategic supplier management should be centralised to discover contractual synergies. By contrast, operational supplier management is mainly decentralised because it involves interacting with suppliers on a day-to-day basis. In addition, Kaiser & Buxmann (2012) recommend a structure that separates development-orientated suppliers and infrastructure suppliers, because the sources of work and contractual bases of these two groups differ significantly. According to Kappelman et al. (Kappelman et al., 2014), decentralisation versus centralisation is no longer a question of either/or. Rather, the key issue is to distinguish the aspects that save money (and should be centralised) from the functions that add value to the business (and should be decentralised). The authors support their findings with additional research results that show a steady decline in exclusively centralised or decentralised IT organisations. This underpins their view that a federated organisational structure is the key to overall success. In addition, structure can help to bridge the gap between business and IT, thus becoming a business enabler rather than an obstacle. Jablokow et al. (Jablokow et al., 2010) suggest a 'balanced function matrix structure from the IT perspective, with IT staff reporting to both the business units and the IT hierarchy'. However, this aspect must be carefully thought through. Other basic literature on organisation design states that reporting lines connecting business and IT need to be wisely established and incentivised to achieve the necessary behaviour (J. W. Boudreau, 2004; J. Harris et al., 2012; Walsh et al., 2010).

The digital age also brings new collaboration tools and process automation, such as robotic process automation (RPA). These new technologies facilitate decentralisation of IT functions thanks to the seamless flow of information from one point to another (E. A. Fang et al., 2013). Additionally, process automation is another way to decentralise activities which would generally be handled centrally (Willcocks et al., 2017). Moreover, when coupled with analytics algorithms and social media applications within an organisation, technologies like the cloud enable decentralisation of IT personnel, greatly increasing the focus on virtual teams. As regards the specialisation of the IT organisation, (E. A. Fang et al., 2013) see the degree of such specialisation as unrelated to any digital trend. Instead, the important factor here is the size of the overall IT organisation: the smaller the IT organisation, the less specialised the IT personnel and vice versa.

Finally, one paper examines how digital capabilities can best be built into the organisational structure (Soda & Zaheer, 2012). The authors suggest informal structures for incorporating innovation capabilities into the organisation. By contrast, other authors argue that a specific organisational unit, what this dissertation calls an 'innovation centre of excellence (ICoE)', should be established (Menguc & Auh, 2010).

4.4.3 Governance

There are basically two opinions regarding governance among the researchers. One side of the debate argues that a laissez-faire approach, involving virtually no governance, is the right way to handle the new requirements (J. Harris et al., 2012; Nolan, 2012). The other extreme argues that authoritarian governance is needed to manage this highly agile environment (Y. J. Kim et al., 2013; Pang, 2014; Winkler & Brown, 2013). Simonsson et al. (Simonsson et al., 2010) support the latter contention, arguing that authoritarian IT governance enhances alignment between business and IT. Based on the research for this dissertation, what can be said with certainty is that there is considerable scope for research into the topic of governance. The research results presented in chapter 0 show that the QCA hits were associated with governance and with other key elements. Therefore, governance is one of the dimensions that must be incorporated in the IT organisation design framework.

4.4.4 Processes

Processes describe the way decisions are made within an organisation, the way information flows and how the organisation collaborates (Kates & Galbraith, 2010). Linking the findings of the Strategy dimension to process requirements rapidly leads to demand for processes that standardise business/IT alignment and supplier management to ensure a streamlined and effective way of working within the IT function (Dhaliwal et al., 2011; Teo & Bhattacherjee, 2014; van den Hooff & de Winter, 2011). The ladder aspect (effective supplier management) is emphasised by Kaiser & Buxmann (2012), who state that supplier management is becoming a key enabling process in strengthening quality of service, resulting in higher business satisfaction. But there are two sides to supplier management: suppliers also have needs that must be fulfilled if they are to deliver the promised quality of service. One of the main requirements here is adaptation of standard IT service management processes (Arcilla et al., 2013; Orta et al., 2014; Ozen et al., 2013; Schmidtmann, 2010).

Another focus in the literature is on the processes for supply and demand controlling. Pay-as-you-go payment schemes introduce considerable complexity in this area and must be carefully monitored (J. Harris et al., 2012). However, this calls not only for standardised and scalable processes, but also for close interaction between the IT organisation and the controlling department (Choudhary & Vithayathil, 2013; Costa et al., 2013). The discussion of these controlling processes also raises the question of whether a profit-centre or cost-centre approach is preferable. Costa et al. (Costa et al., 2013) argue that a cost-centre approach is appropriate for commodity services while a profit-centre approach should be used for differentiating services. Although other researchers support this position, the author of this study believes it is advisable to include the increased complexity of the charge-back model in the business case.

The literature also shows knowledge management and collaboration to be hot topics. Over the past ten years, these have been highlighted as drivers of competitive advantage and are now essential for survival. If organisations, especially IT organisations, cannot establish a consistent and concise knowledge management framework, they will soon be out of business (Bjørn-Andersen & Raymond, 2014; Cross & Gray, 2013; Girdauskiene & Savanevicvciene, 2012; Ozen et al., 2013; Spraggon & Bodolica, 2012). Another opinion is presented by (Birnholtz, Dixon, & Hancock, 2012; Cross et al., 2010), who argue that, while knowledge-sharing processes may support information exchange, they cannot be expected to solve every communication issue. According to the authors, what is needed is a 'practice-based perspective' built on a 'just-do-it' attitude on the part of the IT staff. Additionally, process automation was coded in the QCA as part of the process dimension. However, it became clear that the automation aspect of the processes is more of a sourcing aspect, with commodity processes being seen as a means of reducing process costs through automation. This is generally considered to be a sourcing rather than process topic, because the corresponding services are mainly purchased from external suppliers (Lacity et al., 2015; Willcocks et al., 2015). Process Automation is therefore examined under the Sourcing dimension instead of Processes in this dissertation. Finally, innovation is another important topic. Here, some authors argue that a strict and streamlined process is needed while others require only the necessary instruments to be in place (e.g. tools, meeting structures) (Khanagha et al., 2013). The innovation process must be linked with the Governance dimension described in the Structure dimension.

4.4.5 Rewards

The Rewards category concerns how goals are used to shape behaviour and how organisations recognise individuals' performance (Kates & Galbraith, 2010). Although the literature includes a few paragraphs that address the changing requirements of reward systems, it was surprising to find that only one real design implication could be drawn from the article base. The corresponding design criterion is that IT managers should consider the technical equipment IT employees can use and give them the freedom to use their own devices to perform their work (Aminzadeh et al., 2014; Thomson, 2012). Because only 23 text snippets were found, Rewards may seem unimportant. However, the comparatively low number of text snippets raises the question of whether rewards is an issue that IT organisations must address. It could be assumed that this is a matter for the overarching organisation. Further research into these aspects would be necessary to understand whether rewards are shaped entirely at corporate level, eliminating the need for functional sub-organisations to provide specific answers to this issue. For the purposes of the research in this dissertation, rewards is no longer considered a critical dimension for the ITODF.

4.4.6 People

The People dimension is defined as the skills base an IT organisation requires and how IT staff are trained to acquire those skills.

With regard to the specific capabilities needed in the digital world, Jablokow et al. (Jablokow et al., 2010) consider problem-solving to be one of the most strategically important skills that organisations must acquire. They argue that, as outsourcing becomes increasingly prevalent, the importance of operational activities decreases, and the focus shifts to managerial capabilities, particularly in problem-solving. Even more significant is their statement that hard skills, in areas such as hardware and software maintenance, and updates, are becoming obsolete (A. Lin & Chen, 2012; Ozen et al., 2013). A different aspect, but one with similar implications, is the digital workforce (Cross & Gray, 2013). IT managers need to understand that the generation of employees now entering the workplace has opinions and attitudes towards their work environment that differ from any preceding generation (Hopkins, 2013). IT organisation design must incorporate these changes. It must also include an approach to establishing the various capabilities that is aligned with the attitudes of the new generation of employees.

The skill sets required within an IT organisation were another prominent aspect throughout the analysis of the article base. ‘Product breadth competency, new business development competency, innovation adaptability competency and organisational learning competency’ are the capabilities that were derived from a study focusing on a number of IT organisations (Goswami & Mathew, 2011). These skills can either be provided via training or brought into the organisation through recruiting activities. As upskilling is generally less expensive than hiring, the IT workforce can gain the above competencies if IT staff are willing to be trained. Bucic & Ngo (2013) present another approach to acquiring the necessary skills – alliance learning. This involves cooperating on innovation with other organisations and is already used in the automotive industry, where BMW and Mercedes, for example, develop new engine technologies collaboratively, although they compete with each other in the same market (Elvers & hoon Song, 2014).

In view of the digital trends described in this dissertation, it can be assumed that an increasing number of business functions will turn to the cloud to purchase their own IT services (Moreno-Vozmediano et al., 2011). As pointed out in the Strategy dimension above, while IT organisations can minimise this effect by having a well-positioned value proposition, they will not be able to eliminate it entirely. It is therefore critical to equip IT personnel with the right skills for tackling security (Luftman et al., 2013; Zimski, 2011) and data and compliance issues that might arise as a result of uncontrolled purchasing on part of the business (Carcary, 2012; Costa et al., 2013; Cudanov, Jasko, & Jevtic, 2009; J. Harris et al., 2012; Kaiser & Buxmann, 2012; Small, 2013; Spraggon & Bodolica, 2012).

Some authors give examples of new roles incorporating the required capabilities. These roles can pertain to the issues mentioned above or to others – for example, big data (the role of the data scientists) (Agarwal et al., 2013; Demirkan & Delen, 2013; Elragal, 2014) or communication (Holzmann & Spiegler, 2011; Levine & Prietula, 2012; Oliveira & Welch, 2013; Palacios-Marqués, Soto-Acosta, & Merigó, 2015). In this context, some authors recommend a completely new set of organisational roles (Belkadi, Bonjour, Camargo, Troussier, & Eynard, 2013) while others evaluate new forms of behaviour that IT staff must cultivate (Birnholtz et al., 2012; van den Hooff & de Winter, 2011). Birnholtz et al. (Birnholtz et al., 2012) trace problems with the relationship between business and IT to a more fundamental issue – an unwillingness to share knowledge.

However, moving into the digital age also brings other challenges. Not only are different skill sets and new roles required (Jahn et al., 2012); governance mechanisms must also be adjusted (Heier et al., 2012; Raj et al., 2013; Weill & Woerner, 2013). In addition, closer supplier contacts require IT staff to be deployed worldwide. These requirements must also be incorporated into IT organisation design in a digital age. The literature examined for this dissertation does not provide solutions to these issues. It does, however, suggest a potential approach based on developing the necessary skills. Attracting new talent is another topic that must be considered in this context. Legacy technologies not only fall short of the performance requirements of today's business, they also fail to satisfy IT employees' desire for state-of-the-art technology (J. Harris et al., 2012; Rai, 2012). Outdated technologies could therefore negatively affect companies' efforts to attract new employees in today's ongoing 'war for talent'.

4.4.7 Information

The Information dimension, also referred to as 'big data' or simply 'data' in some publications (Davenport & Dyché, 2013), is identified in many papers (see Table 10:) as a key element in 'business enablement'. This term generally refers to the ability to derive information from a pool of data that can be used in various business functions to influence decision-making. There are already examples where information has been integrated into an automated decision-making process, making human interaction completely redundant (Yoo, Boland Jr, Lyytinen, & Majchrzak, 2012). While one might assume this is an obvious element that should be incorporated into every organisation, it must be managed wisely, according to the literature. Some authors argue that dedicated roles for 'information architects' and 'data scientists' are the correct approach (Davenport & Patil, 2012). Others think an organisational function would be sufficient to incorporate the necessary responsibilities into the company (McAfee & Brynjolfsson, 2012). Although these two positions differ in that one emphasises individual roles while the other focuses on functional responsibility, they share a common denominator: namely, the principle that some form of documented and visible responsibility for information is needed to ensure existing company data is used in a structured and targeted manner to create business impact. Properly used data generates information, and properly applied information creates a clear competitive advantage, delivering tangible outcomes in the form of revenue increases or cost reductions – what some authors refer to as 'data monetization' (Baden-Fuller & Haefliger, 2013). Consequently, this dissertation assumes that the validity of the Information dimension can be tested by evaluating the importance of two dedicated roles (information architect and data scientist).

4.4.8 Sourcing

Sourcing strategies aim not only to reduce costs but also to fill any skills gaps that organisations cannot fill themselves. In the qualitative content analysis, it became apparent that sourcing is very often discussed across the different areas of an IT organisation model. Some authors even take the skills gap argument a step further and talk about externalising a competitive advantage (Dawson, 2003), although others do not share this view (Barton & Court, 2012). However, the number of hits in the research model applied in this context means that the sourcing dimension must also be considered not at the coding level but at the dimension level when designing an IT organisation design framework (ITODF). Sourcing is therefore examined in the quantitative research that follows the qualitative analysis. As stated above under the Processes dimension, the Process Automation aspect has been moved into the dimension Sourcing to reflect the strong linkage of Process Automation and Sourcing in the papers analysed. Process Automation was predominantly discussed for commodity services that can either be handled by cheap labour sourced from an external supplier or by robots, which are also primarily sourced by external suppliers (Willcocks et al., 2015). One final point that should be mentioned here is that most of the articles considered in the analysis mention the historical shift to outsourcing, then to offshoring and nearshoring, and, most recently, back to insourcing in selected capability areas (Teo & Bhattacherjee, 2014). The research for this dissertation will therefore focus on recent trends in sourcing, specifically examining where sourcing makes sense and whether outsourcing is still seen as a viable tool in a digital world.

4.4.9 Summary

The findings in the Strategy dimension reveal two aspects that IT organisations must incorporate into their value proposition. First, these organisations must be able to position themselves as business enablers rather than as a support function (Ashurst et al., 2012; Jablokow et al., 2010; Winter et al., 2014). Many authors identify business/IT alignment as a key requirement of the IT function. To put it simply, the business must feel confident about approaching the IT function about any IT-related matter. Second, as a growing portion of IT operations is handled by external vendors, professional supplier management is becoming mission critical. Cloud computing is just one driver of these developments. According to the literature, supplier management should be supported by a professional IT controlling function that ensures consistent quality of service with competitive pricing structures.

The Structure dimension yielded three distinct aspects. The first is centralisation/decentralisation. The IT function should be structured using a federated approach, with the standardised functions in a centralised organisation and the business-enabling functions in a decentralised organisation. The second area is IT governance. Here, the literature contains two conflicting points of view, with some authors arguing that governance must be authoritarian and others claiming that only laissez-faire governance can succeed. The third area focuses on incorporating innovation and concerns how IT organisations can integrate innovative thinking while simultaneously running legacy environments. Although the literature does provide some advice on mastering this challenge, further research is needed to gain a more holistic view of this area.

The findings in the Process dimension consistently supported those of the Strategy dimension. The literature calls for a structured business/IT alignment process focusing on two aspects. First, a process should be established, with clearly defined responsibilities, to allow structured problem-solving between business and IT. Second, there should be agile collaboration between business and IT, providing more interaction points between the two parties. Another finding is that a standardised IT service management framework must be implemented to optimise interaction with the range of external partners and secure the best prices. According to the literature, most external vendors can offer these prices only if their standard processes are understood and integrated with the IT organisation.

The topic of Rewards played a relatively minor role in the literature analysed. It is therefore assumed that rewards are a matter for organisations as a whole rather than specifically for the IT function and, as such, should be excluded from a holistic IT organisation design framework. Further research into these aspects is required to understand whether rewards are shaped purely at corporate level.

Finally, the People dimension revealed many different aspects, which can be classified in three areas. First, external suppliers are now handling a growing number of operational activities that were formerly the responsibility of the IT workforce. This calls for an IT workforce that focuses on managerial rather than on operational tasks. In addition, the digital trend requires the IT workforce to develop a new skill set in response to issues relating to security, compliance and information strategy. Finally, the generation of 'digital natives' is changing the way people interact within the organisation. This trend must be anticipated by the IT organisation and incorporated into the organisation's DNA. However, the literature also showed that there are currently no design recommendations on how to achieve this.

The results of the qualitative content analysis using Galbraith's Star Model helped to initially structure the ITODF. Four dimensions of the star model are also applicable to the ITODF (Strategy, Structure, Processes and People), one was removed (Rewards) and three others were added (Governance, Information and Sourcing). These newly added dimensions should be researched further to determine their validity and that of the existing dimensions. This is illustrated by a range of papers within the research scope (Costa et al., 2013; Johnson et al., 2013; Kaiser & Buxmann, 2012; Luftman et al., 2013; Roh et al., 2014).

By bringing together relevant articles representing different points of view, the qualitative content analysis described above is a first step towards gaining a general understanding of IT strategy and organisation design in the digital age. It has yielded an initial IT organisation design framework with a set of dimensions that can be used to understand the implications of the digital age. However, this framework must be developed further and scrutinised by a wide range of IT professionals. To provide an even stronger basis for the initial IT organisation design framework, additional research into sourcing and governance is required. Furthermore, a set of hypotheses must be developed for validation by means of a quantitative analysis involving IT executives and practitioners.

Paper ID	Strategy	Structure	Governance	Processes
1				
2				X
3				
4			X	X
5	X			
6	X			
7		X		
8	X			

Paper ID	Strategy	Structure	Governance	Processes
9	X	X		
10				X
11		X		
12				
13				
14	X			
15				X
16				
17	X	X		
18				
19				X
20			X	
21				
22	X		X	
23		X	X	
24			X	X
25				X
26		X	X	
27	X			X
28				
29			X	X
30	X	X		X
31	X		X	
32	X	X		X
33	X	X		X
34	X	X	X	X
35		X		
36		X		
37	X	X	X	
38		X		
39	X	X	X	
40	X			
41			X	X
42				X
43	X		X	X
44			X	X
45			X	

Paper ID	Strategy	Structure	Governance	Processes
46				
47	X		X	
48		X		X
49			X	X
50		X		
51			X	X

Table 18: QCA Results for Strategy, Structure, Governance and Processes

Paper ID	Rewards	People	Information	Sourcing
1		X	X	
2				
3		X		X
4				
5			X	X
6				
7				X
8				
9			X	X
10				
11				X
12		X		
13		X	X	X
14			X	
15		X		X
16				X
17			X	
18		X		
19		X		X
20		X		
21	X		X	
22				
23			X	X
24				
25				
26			X	
27				

Paper ID	Rewards	People	Information	Sourcing
28		X	X	X
29				
30			X	X
31			X	
32		X	X	
33		X		
34		X	X	X
35				
36			X	X
37		X		
38			X	X
39	X	X	X	
40				
41			X	
42				
43			X	
44				
45		X		X
46		X	X	
47		X		
48				X
49		X	X	
50	X			
51				X

Table 19: QCA Paper Overview

As highlighted at the beginning of this section, Governance, Information and Sourcing have been moved from code level to category level because of the number of associated text snippets and the key messages that these text snippets had in relation to the category in which they were found. For all three (Governance, Information and Sourcing), it became obvious that while these codes initially related to their respective categories, their central concepts could not be linked to the category. Instead, these concepts were linked to an autonomous construct, which had to be taken one level higher and treated at category and not at code level. In addition, Rewards was dismissed as a category because of a minimum number of codes associated with the category. The next section highlights the initial ITODF defined as part of the QCA results outlined and discussed above.

4.5 INITIAL ITODF

The research results of the qualitative content analysis enable an initial visual representation of the framework to be created (see Figure 17).

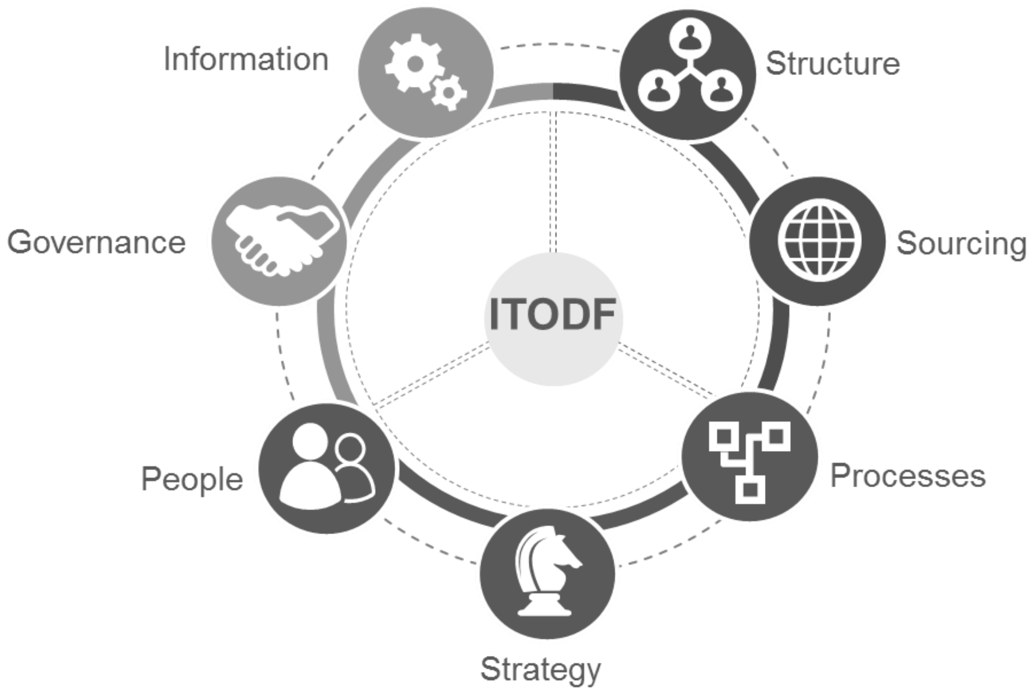

Figure 17: Initial ITODF

On the basis of this framework, the seven dimensions derived in the QCA will be tested in a quantitative analysis using a Likert scale from 1 to 6. The first hypothesis, which is intended to state the importance of the different dimensions, concerns the significance of the participants' responses. Significant differences (i.e. where answers given for all dimensions are higher than the mean of the scale) are expected to confirm the dimensions. Therefore, the first hypothesis of this dissertation is as follows:

Hypothesis 1: All dimensions show a significant difference from the mean of the scale (3.5).

The framework comprises the seven dimensions derived from the qualitative content analysis and has a predefined grouping, which the author of this dissertation mapped to it based on expert interview sessions with three IT organisation design experts. Each of these experts mapped the different categories subjectively onto different groups. The guidance given to the experts was that they would be able to create no more than three clusters. The results were evaluated using weighted Cohen's kappa (Cohen, 1960) of κ_w=0.714 to ensure reliability and objectivity and exceeded the necessary thresholds. This is a good inter-rater agreement and can therefore be taken as a representative evaluation of the model structure.

Dimension/Expert	Expert 1	Expert 2	Expert 3
Strategy	1	1	1
Structure	2	2	2
Governance	3	3	3
Process	1	2	1
People	1	1	3
Information	3	3	3
Sourcing	2	2	2

Table 20: ITODF Dimension Cluster Results

The results show that the three experts clustered the identified dimensions as follows:

1. Strategy, Processes and People in cluster 1,
2. Structure and Sourcing in cluster 2 and
3. Information and Governance in cluster 3

These three clusters were then put into relationships with each other. The aim here was to better understand the interdependencies between the clusters when it comes to successfully designing an IT organisation.

Cluster 1 establishes a relationship between Strategy, Processes and People. In this dissertation, the Strategy dimension has been defined as the driver of competitive advantage for the business. This advantage is primarily achieved by means of different speeds of response to business demand, depending on complexity, time-to-market requirements and interdependencies with other parts of the organisation. The results of the qualitative content analysis show that various researchers suggest responding to business requirements at different speeds (Vlietland & van Vliet, 2015; Wilson & Carmenza, 2015). In the quantitative research of this dissertation, two speeds are defined – 'agile' and 'traditional'. In other words, business demands that require rapid turnaround times are categorised as agile, and the remaining (typically more complex and interdependent) business requirements are defined as traditional (Horlach et al., 2016). The QCA reveals that the issue of innovation and maintenance/operations processes tends to revolve around the question of where an IT organisation can best handle its processes in these two areas. The literature examined in the qualitative research contained a variety of opinions on how innovation decisions should be taken. One side argues that this has been part of the CIO's decision-making authority for years (Orta et al., 2014). Others strongly advocate the view that any decisions on innovation should be taken by the business (Provost & Fawcett, 2013) with a clearly defined and documented value case. This value case should illustrate not only the forecast costs for running the project, but also the top-line or bottom-line effects that the project outcomes will deliver to the corporation. When it comes to maintenance and operations processes, most of the papers analysed agree that this is clearly the responsibility of the CIO or any other departmental head within the IT organisation. The only alignment required in this area of the decision-making processes is with the finance department and relates to how those costs develop over the years and where changes are anticipated. Additionally, the third dimension in cluster 1 is the People dimension. The qualitative results in this dimension primarily suggest that the capabilities someone must to bring to the table in today's digital world are not necessarily hard functional skills but rather soft skills and industry experience (De Leon, Lavelle, & Cantrell, 2012; Santos, 2011). This demand for soft skills, when put into context with the first hypothesis on Strategy and Processes, results in an amendment to this hypothesis: not only do standardised processes correlate positively with Strategy; people equipped with soft rather than hard skills do so, too. Consequently, the second hypothesis comprises two sub-hypotheses.

Hypothesis 2a: Strategy correlates positively with People

Hypothesis 2b: Strategy correlates positively with Processes

Cluster 2 establishes a close relationship between Structure and Sourcing. Structure describes how personnel are organised in departments within an IT organisation, while the Sourcing dimension covers how IT services are developed – internally or externally, onshore or offshore. These services are either developed inside the organisation as part of the internal headcount or they are purchased as managed services or as managed capacity (Jackson, 2011). The results of the qualitative research suggest that, to best align with the different natures of their business requirements, IT organisations in a digital age should have separate departments for agile demands and traditional demands (Aghina, De Smet, Muratka, & Collins, 2015). How these departments are structured has been the subject of considerable discussion. Some authors argue that a basic virtual organisation focusing on agile demands is sufficient to properly handle these requests, as opposed to traditional demands. Other authors argue that a fully-fledged department is required, with reporting structures that ensure the team works homogeneously on both agile and traditional demands (Ashurst et al., 2012). The first group of authors also argued that, by separating the two demand types, each department can optimise itself and thus enhance the business/IT relationship. Having derived this position for the Structure dimension, the position for the Sourcing dimension is about using outsourcing with offshoring and/or nearshoring approaches to most effectively bring in knowledge that would help to build sustainable competitive advantage. A range of papers analysed in this QCA suggest that sourcing not only gives the IT organisation an opportunity to scale capacity quickly and easily, but also fills digital capability gaps that would otherwise require a time-consuming recruiting process. The ladder process is very challenging, especially for incumbents like Fortune 500 companies, because young professionals and millennials are more likely to accept a job offer from a start-up or a younger company (De Leon et al., 2012). The overlap between these two dimensions yields the following hypothesis, which has been designed for testing in the quantitative research:

Hypothesis 3: Structure correlates positively with Sourcing.

Cluster 3 connects Information and Governance. These dimensions have been put into an interrelationship because they centre on the question of how information management is best governed in an IT organisation. The information dimension considers how the organisation deals with the volume of data it has generated in the past and continues to generate daily. It also focuses on the question of whether this data is monetised in the form information to generate bottom-line or top-line impact for the business. The 'Governance' dimension suggests that rapid decision-making is promoted by less hierarchical organisational structures or the complete absence of hierarchies (McChrystal, 2013; Soda & Zaheer, 2012). Both dimensions are very closely related insofar as decision-making must be handled by individuals and not by complex managerial hierarchies. Information and insight are therefore very important. The detailed information that can be derived from the data provides a basis that allows these individuals to make better decisions. As a result, the two variables in relationship yield in the following hypothesis:

Hypothesis 4: Information correlates positively with Governance.

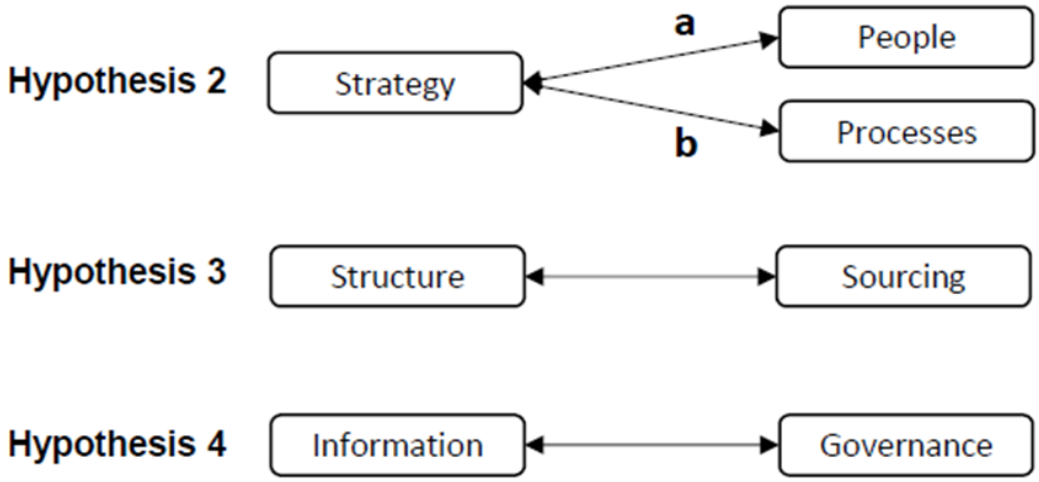

Figure 18: Interrelationships between ITODF Dimensions

Figure 18 shows the three hypotheses (Hypothesis 2 to Hypothesis 4) derived from the QCA in a relationship diagram. Hypothesis 1 in a generic hypothesis and does not relate to relationships. The hypotheses have been tested in quantitative research involving IT executives, IT leaders and IT employees from around the world. The group approached comprised Fortune 500 companies. Only IT practitioners were invited to participate in the survey to ensure that the respondents have a relationship to the overall topic, thus ensuring an expert view on the validation of the initial ITODF.

5 REFINED ITODF – QUANTITATIVE RESEARCH

5.1 OBJECTIVES AND SCOPE

The starting point for the quantitative analysis in this dissertation is the ITODF consisting of the seven dimensions: Strategy, Structure, Governance, Processes, People, Information and Sourcing. The purpose of the quantitative research is to empirically confirm or falsify the ITODF developed up to this point. To achieve this, a questionnaire was developed to survey IT experts and discover how they rated the seven dimensions. To distinguish opinions and identify differences related to industry, culture, role and company size, respondents were chosen from several industries and various countries, with different levels of responsibilities and from companies of different sizes. These differences were also used to identify patterns in the responses and any associated implications for the use of the ITODF. The aim was to confirm and group all seven dimensions, thereby simplifying the model and making it easier to apply in practice.

The quantitative research was designed to enable experts to rate statements derived from the qualitative research and relating to the main findings of the seven dimensions. The research design started with the seven ITODF dimensions identified in the QCA and the 10 codes associated with those dimensions.

#	Dimension	Code	Code Description
1	Strategy	Speeds of Delivery with Value Focus	Different speeds of delivery for agile and traditional business demands with a clear focus on value add
2	Structure	Decentralised Decision-Making	Decentralised structures to enable quicker decision-making
3	Structure	Team Autonomy	Team autonomy to enable quicker decision-making
4	Structure	Visionary Leadership	Visionary leadership to lead the IT organisation to success
5	Governance	Hierarchies	Lean hierarchies for more agility

#	Dimension	Code	Code Description
6	Processes	Informal Processes	Informal processes enable quicker decision-making
7	People	Soft Skills	Shift away from hard skills to soft skills
8	Information	Roles	Two dedicated roles for managing information properly
9	Sourcing	Commodity Sourcing	Commodity capabilities to be sourced from external suppliers
10	Sourcing	Process Automation	Process automation for standardised processes that can be sourced externally

Table 21: ITODF Dimension and Code Matrix

Using expert judgements has the considerable advantage of lowering costs. Once a group of appropriate experts has been identified, the results of the study can be easily interpreted. Finding the representative group of appropriate experts for the study can be relatively easy when the experts to be surveyed all belong to specific organisations, positions or parties. This also eliminates the need for extensive explanations of the topic under consideration because this knowledge can safely be assumed. Ray (1999) and Bakker et al. (2015) investigated the use of expert surveys and developed the Chapel Hill expert survey (CHES) as an instrument for gaining greater insight into the various stances of different respondents. For the purposes of this dissertation, a dedicated survey was created to assess the relevance and relative importance of the initial dimensions and confirm the statements derived during the qualitative research, as well as the hypotheses presented in the preceding chapter.

5.2 PARTICIPANTS

This section explains how the representative group for empirical testing of the ITODF was identified. As already mentioned, finding the representative group is fundamental when using expert judgements. The expert-judgement method has proven successful in many studies focusing on various issues (Pinkham et al., 2014; Rabiser, Grünbacher, & Dhungana, 2010; Ray, 1999). In this dissertation, it is used to gain the best possible insight into experts’ opinions on the importance of the different organisational dimensions derived in the initial ITODF. The opinions of the experts are then used to confirm or falsify the statements and hypotheses identified as part of the initial ITODF.

The first step in the quantitative study was to determine the required sample size. The ideal respondent group of the sample was defined as 1) IT executives, 2) IT management personnel and 3) other IT employees, all grouped under the term 'IT practitioners'. The aim of focussing on these three groups was to deliver a variety of insights into the IT experts' views on the ITODF and on different positions within the IT organisation. It was decided to include Fortune 500 companies in the sample because they not only have well-established expertise in IT organisation design, but are also of a certain size. As a result, the research presented in this dissertation should be most relevant for large conglomerates rather than SMEs or start-ups. It is the author's belief that only large enterprises require an ITODF. By contrast, SMEs and start-ups generally prefer to use an unstructured, less formalised process to achieve their goals.

The sample size was defined by conducting an a priori power analysis in G*Power (free software for computing power analyses). This determines the number of participants needed to achieve results with a moderate effect. To define the sample size, a balance must be found between the following numeric criteria:

Element	Definition
α	Type I error: rejection of a true null hypothesis
β	Type II error: acceptance of a false null hypothesis
$1\text{-}\beta$	Power: the ability to detect the size of what the study is looking for
d	Effect size (formula: $d = \frac{\mu - \mu 0}{\sigma}$): represents how strong the effects are in the real world d= 0.2 (small effect), d= 0.5 (medium effect), d= 0.8 (large effect)

Table 22: Sample Size Elements

The prior analysis, as its name suggests, is defined when planning the study design. This entails performing some research to gain an indication of the results that can be expected. The effect size, type I error (α) and power (1-β) must then be specified to calculate the sample size with G*Power.

Research on calculating sample sizes shows that smaller effect sizes demand a larger sample (Kadam & Bhalerao, 2010). Because this confirmatory research is also intended to examine smaller effects, the effect size was set at 0.2. Additionally, an α-error of 5% and power of 0.95 were set for the power analysis. This yields a minimum sample size of 272. The overall response rate was 423, of which 20 responses were categorised as unusable because they were only partially completed.

5.3 RESEARCH APPROACH

The research instrument used to test the ITODF developed in the preceding chapter was a questionnaire covering the seven dimensions. This was developed to survey experts on their attitudes towards the various dimensions of the ITODF.

The questionnaire was the result of a series of activities aimed at defining questions that confirm/falsify the statements and hypotheses. It was designed to be completed in no more than 20 minutes. While the initial version contained 42 questions, the final version comprised just ten. This reduction in scope was the outcome of an initial review by an experienced researcher as well as a test run involving experts with knowledge of the research. Feedback on the initial version considered the approach to be completely viable in terms of asking multiple questions on one research variable (dimension of the ITODF). However, the large number of questions was judged to be unfeasible in view of the time constraints on the respondent group. As the respondent group mainly consists of IT practitioners – ranging from operational IT staff to senior IT executives (such as CIOs and CTOs), all the reviewers limited the number of questions to a maximum of ten. The final version of the questionnaire was then retested with another group of practitioners and received very positive feedback. The alignment of the questionnaire with the statistical research tools was also reviewed by the experts, ensuring that the questionnaire had full statistical approval.

The following sub-sections explain the various statements (items) put forward for evaluation by the IT practitioners and the reasoning behind using those statements to test the hypotheses.

5.3.1 Strategy

The goal of the item for the Strategy dimension was to test whether practitioners confirm that an IT organisation in the digital age needs to handle business demands differently depending on whether they relate to a newly designed business requirement with no clear description (agile) or to legacy business systems (traditional). The questionnaire also tested the importance of backlog prioritisation with a documented value case, where the business needs to show the overall business impact of a request – either on the top line (revenue growth) or the bottom line (cost reduction). Both statements were positioned autonomously to gain better insight from both angles. The following statements were used to solicit feedback on these points:

Statement 1 [item #1]: 'IT strategy needs to handle agile and traditional business demands differently.'

Statement 2 [item #2]: 'Business needs to prioritise IT backlog with clear value case documentation.'

5.3.2 Structure

The question on the Structure dimension tested the finding of the qualitative research that suggested decentralised structures are a success factor for digital IT organisations, especially when it comes to fast, efficient decision-making. According to the QCA described in chapter 0, decentralised structures allow decisions to be taken at the location where questions arise, instead of having to forward issues to other parts of the organisation, through hierarchies and across geographical boundaries. This makes for much faster and more successful decision-making. Additionally, team autonomy was derived as a code attached to the dimension structure. Both were combined in one statement, to test the combination of two directly. This was done because the author assumes that the two are strongly related to each other. The Structure dimension also includes the visionary leadership code associated with it, which was deliberately put further down the questionnaire to give readers time to think before responding to that question. In view of this, the questionnaire polled the IT practitioners on their opinion of decentralised structures and team autonomy and the importance of these factors for a successful IT organisation design framework. The following statement was presented to respondents:

Statement 3 [item #3]: 'Decentralised structures and team autonomy are key success factors.'

5.3.3 Governance

In addition to decentralised structures and team autonomy in the Structure dimension, the findings of the Governance dimension suggest that very lean or even non-existent hierarchies enable extremely rapid decision-making and facilitate the knowledge sharing required to take successful decisions. Against this background, the respondents were requested to give their view on the fourth statement:

Statement 4 [item #4]: 'Lean decision hierarchies are becoming key to organisational agility and facilitate necessary knowledge sharing and faster decision-making.'

The element relating to knowledge sharing was deliberately made the main statement in order to incorporate some comparatively minor aspects of the QCA. This was done purely as a result of feedback received during the questionnaire trials, where respondents mentioned that there was no reasoning concerning the compensation of the leaner hierarchies. This was therefore added to the statement to enhance the quality of responses in the questionnaire.

5.3.4 Processes

The Process dimension was tested with a focus on how stringently a process must be defined and, conversely, on the perceived importance of Informal Processes. The past 10 to 15 years were characterised by process definition right down to the activity level (Bergfors & Lager, 2011). According to the QCA, the degree of process definition is less important, and informal ways of communicating and proceeding are much more common. It could even be said that too much definition is a constraint on innovative thinking (Nambisan et al., 2017). If processes are less stringent, providing only guidance but not very detailed activity definitions, employees have the freedom to complete their activities even more successfully. The following statement was therefore tested with the IT practitioners in the quantitative questionnaire:

Statement 5 [item #5]: 'IT processes are less stringent and process compliance is seen as less of a priority'

5.3.5 People

The People dimension comprises many different aspects. However, the initial quantitative research revealed that one central aspect is the relative unimportance of hard skills in a digital world as opposed to the old world. The statement tested with the IT practitioners was therefore designed to gain an understanding of whether the respondents agree that IT employees in a digital world need industry skills and soft skills but not hard skills. This assumption is based mainly on the idea that the role of IT workers is moving away from 'doing work' to 'coordinating work'. Another code that was integrated in the People dimension was the postponed code from the Structure dimension regarding Visionary Leadership. This involves the type of leadership required to put an ITODF into practice in a digitised world. As pointed out earlier, operational leadership is less important than visionary leadership when it comes to managing organisations that not only have to deliver at different speeds, but also have considerably more decentralised decision-making authority. To reflect this, the questionnaire included a statement on leadership attitude. The following statements were evaluated as part of the quantitative research:

Statement 6 [item #6]: 'IT employees do not need hard IT capabilities but rather coordinating capabilities that ensure concise management of external suppliers.'

Statement 7 [item #7]: 'The future IT department head needs to be a visionary.'

5.3.6 Information

Researchers argue that information did not really play a vital role during the past 10 years but is now becoming increasingly important (Davenport & Dyché, 2013). In this context, the research for this dissertation found that a dedicated set of roles reflects the importance of the Information dimension in an IT organisation design framework. The qualitative analysis identified two specific roles as success critical – the information architect and the data scientist. These were tested in the quantitative questionnaire, which asked IT practitioners to what extent they agreed with the following statements:

Statement 8 [item #8]: 'Only a dedicated information architect role ensures that data structures are designed to lead to information.'

Statement 9 [item #9]: 'Only a dedicated data scientist role ensures that the existing data is explored in a structured way.'

5.3.7 Sourcing

Sourcing was the final dimension tested in the quantitative questionnaire. The main aspect of this question related to the criteria on which sourcing decisions are based. According to the literature analysed in the quantitative research, sourcing strategies (especially outsourcing with offshoring and nearshoring) are used when services do not provide differentiation and can therefore be purchased from a partner specialising in the particular task. Furthermore, the QCA found that support for process automation is also sourced from external partners because this eliminates the need to develop the required skills in house. To reflect these points, the following statement was tested in the quantitative research:

Statement 10 [item #10]: 'Sourcing approach strongly influences speed of delivery, especially by providing skills on demand and offering automation of processes with tools like robotic process automation (RPA).'

5.4 RESEARCH TOOLS

The following table illustrates the mapping of the different statements derived in section 5.3 and the QCA codes summarised in Table 21. The mapping was swapped for a number of reasons that are explained in section 5.3. Table 23 outlines the mapping to make it easier to follow in the next section.

Statement in Section 5.3	Code #
1	1
2	1
3	2,3
4	5
5	6
6	7
7	4
8	8
9	8
10	9,10

Table 23: Mapping of Questionnaire Statements to QCA Sub-Categories

The different statements were then transferred into an online questionnaire, which was sent out to selected IT practitioners. The following section explains the research tool and how it was applied in this dissertation.

5.4.1 ONLINE QUESTIONNAIRE

A total of 423 responses were gathered. Of these, 20 were marked as 'unusable' as they did not contain a full set of answers to all the questions and were saved by the respondent during the completion process, but not finalised. Consequently, the sample comprises a total of 403 respondents (76.2% male) from five different countries: 110 from Europe, 100 from North America, 191 from the APAC region. Two locations were not displayed in the data set. Of these respondents, 179 were C-level executives, 150 were IT managers and 74 were other IT employees. Additionally, 365 of the respondents worked full-time and 38 were self-employed. Most of the participants in this study were aged between 31 and 40 (162) and between 41 and 50 (89). There were also 30 people over 60 years old. The communication, media and technology industry (117) was one of the main areas in which the respondents work. 226 participants have been working in an IT organisation for more 10 years, 158 for between 3 and 10 years and only 19 for less than 3 years. The headquarters of the respondents' companies are located on different continents, with the majority (166) being in the Asia/Pacific area.

The questionnaire used was designed to identify IT practitioners' attitudes towards the ITODF applicable in a digitised world. As described above, the seven dimensions examined in the qualitative study were used to create the questionnaire, which consisted of ten main questions. These are shown in Table 24: Participants were asked to respond by rating their agreement or disagreement with the different statements. The question 'How strongly would you agree/disagree with the following statement?' is the core of the survey. Participants responded using a six-point Likert-type scale ranging from 1 = *strongly disagree* to 6 = *strongly agree*. This answer format means that high scores represent high consent. The uneven number of answering options was used to avoid tendencies towards the centre. In addition, the items are all worded as positive statements.

Statement #	Statement
1	IT strategy needs to handle agile and traditional business demands differently.
2	Business needs to prioritise IT backlog with clear value case documentation.
3	Decentralised structures and team autonomy are key success factors.
4	Lean decision hierarchies are becoming key to organisational agility and facilitate necessary knowledge sharing and faster decision-making.
5	IT processes are less stringent and process compliance is seen as less of a priority.
6	IT employees do not need hard IT capabilities but rather coordinating capabilities that ensure concise management of external suppliers.
7	The future IT department head needs to be a visionary.
8	Only a dedicated information architect role ensures that data structures are designed to lead to information.
9	Only a dedicated data scientist role ensures that the existing data is explored in a structured way.
10	Sourcing approach strongly influences speed of delivery, especially by providing skills on demand and offering automation of processes with tools like robotic process automation (RPA).

Table 24: Survey Instrument

Some of the dimensions derived from the qualitative analysis comprise two items while others have only one. In the former case, the two items were combined to yield a single score for the dimension, calculated as the mean of both items.

The author assumed that the participants would need some introductory guidance on the overall goal of the survey. This input was provided in the form of the following introduction intended to focus participants' thinking:

> 'One key concept of this survey is the understanding of two different speeds of business demands: 1) Traditional demand: business demand that requires considerable upfront analysis and design before being implemented 2) Agile demand: business demand that requires day-to-day interactions between business/IT and is collaboratively implemented'

A table of definitions was used to illustrate the two different types of IT demand and provide participants with relevant insight – see Table 25, adapted from (Horlach et al., 2016).

Traditional IT [Demand] #	Dimension	Agile IT [Demand]
Stability	*Goal*	Agility & speed
IT-centric	*Culture*	Business-centric
Remote from customer	*Customer proximity*	Close to customer
Performance and security improvement	*Trigger*	Short term market trends
Performance of services	*Value*	Business moments, customer branding
Security and reliability	*Focus of services*	Innovation
Waterfall development	*Approach*	Iterative, agile development
Systems of records	*Applications*	Systems of engagement
Slow	*Speed of service delivery*	Fast

Table 25: Characteristics of Traditional and Agile IT (Horlach et al., 2016)

The study opened with some demographic questions. Respondents were asked to specify their gender, age, company and employee function. These were followed by screening questions designed to exclude participants who did not meet the study's requirements. To ensure a clear distinction between full-time equivalents/self-employed persons and part-time staff, participants were also asked to indicate whether they were full-time equivalents or self-employed. Next came the questionnaire containing the ten core questions. This was supplemented by a final open (commentary) question on important factors in IT organisation design not covered in the questionnaire or on which the participants wished to expand on their responses.

5.4.2 Reliability Analysis

The statistical analysis started with a reliability analysis. This involved checking the item selectivity, as well as difficulty and homogeneity (Rasch, Kubinger, & Yanagida, 2011). Analysis of this kind is used to detect irregularities in the data set and evaluate the quality of items. The reliability identifies the accuracy of the measuring instrument. The measuring statistic used to check the selectivity of items was Cronbach's alpha (Cronbach, 1951). This involves observing correlations of single items with the total scale to determine whether items measure different aspects of the overall model. The correlation value should at least be above 0.8. The difficulty of every item is measured by the statistical mean. If this lies within a twenty percent range of the whole scale, it is considered viable (Symonds, 1929). The values for the means below 2.2 and above 4.8 are critical because they show that the wording of items is either too easy or too difficult to understand. Homogeneity within the item structure is determined by the average intercorrelation of items. Homogeneity is therefore the counterpart of difficulty because while items should differ from each other in some way, they must still be connected in terms of their content in a correlation.

5.4.3 Mean – *T*-test

After the structure of the items had been checked, analytical tests were performed on the data. Because one of the main goals of this research is to confirm the seven dimensions examined in the qualitative study, the data for the dimension questions was evaluated using the statistical means. Because the mean of the scale used is 3.5, a cut-off value was employed to confirm or reject the dimensions. According to the literature examined for the *t*-test (Lewis-Beck, 1995), important dimensions should be rated with high scores in the survey. Consequently, all statistical mean values were expected to be above the 3.5 line. A dimension is statistically confirmed when the statistical mean value is significantly higher than the cut-off value of 3.5.

5.4.4 ANOVA

Analysis of variance (ANOVA) is used to determine differences between extraneous variables. The statistical mean values of the identified groups (in this case, geography, role within the company, industry and size of the company) were compared to enable results to be transferred from the sample to specific populations. Because the design of the present study includes only dependent variables, *multivariate* analysis of variance (*MANOVA*) was used to also identify interactional effects between dimensions (Field, 2013). This multivariate method is generally deployed when more than one dependent variable is included in the analysis. Before the ANOVA or MANOVA method is used, it is necessary to first check the assumptions presented earlier. Various tests were conducted to examine fulfilment of these requirements. Because different statistical characteristics can be used to present and interpret results, it was decided to employ the Pillai-Bartlett trace (V) as the criterion for accepting or rejecting the null hypothesis. This null hypothesis states that no differences are found between the variables. The sum of the proportion of explained variance on the discriminant function is tested using Pillai-Bartlett's trace. Testing is therefore performed to determine whether the statistical mean values in the identified groups (geography, role within the company, industry and size of the company) are the same across the seven dimensions. If a large amount of variance is attributable to the independent variable, this suggests that there is an effect from the extraneous variable and that groups differ in their mean values. This test statistic (Pillai-Bartlett trace) is especially useful when assumptions are violated, because it is very robust and not closely linked to assumptions about the normal distribution (Pillai, 1985). This notwithstanding, the F distribution is often used to interpret the MANOVA output (Bartlett, Simonite, Westcott, & Taylor, 2000). The Pillai-Bartlett trace is more of an indicator for rejecting the null hypothesis when a small p-value occurs.

5.4.5 Correlation

The test of correlation between variables is used to determine connective structures within the ITODF. When variables (in this case, the dimensions) are highly correlated, they have a similar answer structure. Here, no consideration is given to causal relations because these are of comparatively little interest in this research. For the model structure, it was decided that a general relation was more important. The most commonly used correlation statistics are Pearson's correlation and Spearman's rank correlation. Pearson's correlation requires a normal distribution, whereas Spearman's is also appropriate for ordinal variables (Cortinhas & Black, 2014). The research for this dissertation applied Spearman's rank correlation.

A cut-off value was selected to distinguish between confirmation and rejection of a hypothesis. According to the definition given by Cohen (1992), a high correlation starts at $|r| = 0.5$. This value was used to distinguish confirmation and rejection of hypotheses concerning the connection of dimensions.

5.4.6 Hierarchical Cluster Analysis

The hierarchical cluster analysis also uses the correlation values identified as part of the Spearman's rank correlation (Köhn & Hubert, 2006). But it did not apply a cut-off value. Spearman's rank correlation values were simply used to find the dimensions that have the greatest similarities to each other.

5.4.7 Open Question

Qualitative analysis of the additional open question ('What have we not asked you about IT organisation design in the digital age that you think is important?') helped to find additional criteria that might have been disregarded or overlooked in the qualitative content analysis. The open question can identify not only new dimensions for the ITODF but also factors that influence the existing dimensions of the initial ITODF. Answers were therefore collected and organised so that repeated statements could be counted and the value of additional dimensions determined.

5.5 DATA ANALYSIS

5.5.1 Online Questionnaire

All data was gathered using an online survey. A total of 403 participants provided completed data sets with no irregularities. The following section describes the data set and provides more specific analyses of the data gathered. This involves the application of the different analyses outlined in the section above this section.

The description of the data set gives an overview of the values for the sample. The invited IT practitioners were asked to evaluate the statements shown to them to provide the necessary data set (Table 26: Description Statistics of Dimensions). The data set was used to validate the dimensions of the initial ITODF and to confirm/falsify the hypotheses using the statistical tools and methodologies.

Dimension	N	Mean	Standard Deviation (SD)	Min	Max
Strategy	403	4.10	1.12	1	6
Structure	403	4.50	1.25	1	6
Governance	403	4.19	1.41	1	6
Processes	403	3.96	1.46	1	6
People	403	3.54	1.63	1	6
Sourcing	403	4.00	1.55	1	6
Information	403	3.98	1.30	1	6

Table 26: Description Statistics of Dimensions

5.5.2 Reliability Analysis

The reliability analysis aimed at defining the selectivity of items was performed using Cronbach's alpha. The scale reaches a reliability of α=.855. All correlation values of items with the sum of the remaining items apart from Q7 were found to be above the line of 0.5, proving internal consistency to be regular for all items (see Appendices for all detailed statistical research results). This means that *Question 7* did not fulfil the criteria for selectivity of items. To determine the difficulty of the items, the means were considered. One item was found to have a higher mean than the defined twenty percent of the scale. With a mean of M=4.96, item seven (Q7: 'The future IT department head needs to be a visionary') was identified as being above the critical value of 4.80. This means the wording of one question was very easy and that most people answered with a very high score. The item involved is a comparatively general statement that people easily agree with. Because the same item also failed to fulfil the criteria for selectivity of items, it was decided to remove it from further analyses. All the other items were found to be in the defined twenty percent range.

5.5.3 Mean – *T*-test

The statistical mean values of the answers for the seven dimensions were calculated so that they could be compared to a cut-off value. This value was chosen by taking the mean of the scale. On a Likert scale from 1 (strongly disagree) to 6 (strongly agree), the general mean is $M = 3.5$. The t-test showed that the IT practitioners surveyed considered all the dimensions to be very important. Table 27 shows that all dimensions are above the cut-off.

Dimension	Mean (SD)	*T*-Value	Significance
Strategy	4.10 (1.12)	10.682	<.001
Structure	4.50 (1.25)	16.163	<.001
Governance	4.19 (1.41)	9.769	<.001
Processes	3.96 (1.46)	6.245	<.001
People	3.54 (1.63)	0.475	.635
Sourcing	4.00 (1.55)	6.482	<.001
Information	3.98 (1.30)	7.445	<.001

Table 27: *T*-test Results

The *t*-test for one sample was used to check whether the means are significantly higher than the cut-off value of 3.5. As stated in the first hypothesis (H1: All dimensions show a significant difference from the mean of the scale), a high value for the dimension would verify it. If a dimension falls below a significance level of 5%, there is no verification that the dimension should be included in the ITODF.

The *t*-test shows highly significant results for six of the seven dimensions. Only the People dimension did not differ significantly from the defined cut-off value (M=3.54, $t(303)$= 0.475, p= .635). Consequently, the People dimension was removed from the further analyses, which focused on a model comprising the remaining six dimensions: Strategy, Structure, Governance, Processes, Sourcing and Information.

5.5.4 ANOVA

The ANOVA focused primarily on geography, roles within the company, the industry in which the company operates and the size of the company. These aspects were chosen to identify cultural and organisational differences that could have an impact on the structure of the ITODF. The analysis included the seven dimensions as the dependent variables measured in the survey. The dimensions were compared for each extraneous variable. The method of univariate ANOVA can use multiple independent variables. However, multivariate ANOVA must be used if multiple dependent variables are to be included in the analysis. Before conducting the specific analysis, it is necessary to check the important assumptions presented earlier in the section 2.6.2:

1. Randomness and level of presentation: data should be randomly sampled and presented at an interval level.
2. Independence: residuals should be statistically independent.
3. Homogeneity of covariance matrices
4. Multivariate normality

To determine the randomness of the data, the scores of answers were observed and no structures were found. Answers were distributed randomly, and almost every score on the scale was picked as an answer. Additionally, the Likert scale ensured data was presented at an interval level. To confirm the independence of residuals, data per independent variable was plotted in scatterplots (see Appendix). Subjects were properly randomised in order to ensure these plots show randomly distributed residuals. However, this was not totally confirmed in the plots. Only the variable industry showed no systematic pattern when residuals were plotted against predicted values. However, the attribution of participants to the survey was randomised. The homogeneity of covariance was tested using Box's test (Box & Cox, 1964). Results of all Box's tests, including all independent variables (geography, roles, industry and size), are significant, showing that the assumption was not met. This means that the covariances are not homogeneous. Because Box's test is known to be highly sensitive to large samples, the violation of this assumption was taken into consideration, but was not decisive. Levene's test was conducted to test the homogeneity of variance. This test remains robust when there is no normal distribution. Because the results are not significant at a level of 1%, they show the variances to be homogeneous. The assumption for the ANOVA was thus met and meant that the assumption for the MANOVA was met. The assumption that the residuals have multivariate normality can be tested by determining univariate normality for each dependent variable. None of the dimensions met this condition of the Kolmogorov-Smirnov test (K-S test) because the test statistic was significant for all items. After much thought about how to proceed following violation of these assumptions, it was decided to keep the MANOVA as the standard method because it is a very robust metric. Research has also dealt with these violation issues. Thus, violation of the multivariate normality assumption has only a limited impact on the test statistics (Everitt, 1979). Researches by Olson (1974) and Hakstian, Roed, & Lind (1979) have shown that an effect of heterogeneous covariance matrices is very small when the groups' size do not differ. Sheehan-Holt (1998) found Pillai's trace to be the one being most robust to violations of assumptions. Therefore, the Pillai's trace test statistic is chosen to evaluate results. Finch (2005) tested the parametric MANOVA against the non-parametric alternative. The general conclusion is as follows: 'for the most part, the relative performance of both the parametric and non-parametric statistics for MANOVA is consistent regardless of the number of groups'. He also examined whether violation of the multivariate normality and the homogeneity of covariance matrices assumptions result in slightly higher type I error values and increased power compared to the non-parametric method and when the sample size of groups is equal. The next section therefore presents the various results for the extraneous variables separately.

5.5.4.1 Geography

The MANOVA determined highly significant differences between the five countries surveyed in all dimensions. Separate ANOVAs per dimension were therefore conducted (Table 28: Illustration of ANOVA by Means (Geography)). The means show that answers from APAC countries differ significantly from those from other countries, with people from APAC areas giving higher ratings in their answers. If this geography is removed from the subset, the only significant differences are for the Information dimension. This is attributable to the much lower means for answers given by North American employees. The significance rating of the Information items is considerably lower for North American participants, while the significance rating of all dimensions is considerably higher in APAC countries than in all other countries tested. A significant effect of the company's geography was discovered and found to be very small ($V = 0.097$, $p <$ .009; partial $\eta^2 = .032$). 3.2% of variance can be explained by the geography variable.

Dimension	**F (4, 397)**	**Significance**
Strategy	4.363	.005
Structure	3.754	.011
Governance	2.888	.035

Dimension	F (4, 397)	Significance
Processes	7.222	<.001
People	2.975	.032
Sourcing	3.978	.008
Information	9.348	<.001

Table 28: Illustration of ANOVA by Means (Geography)

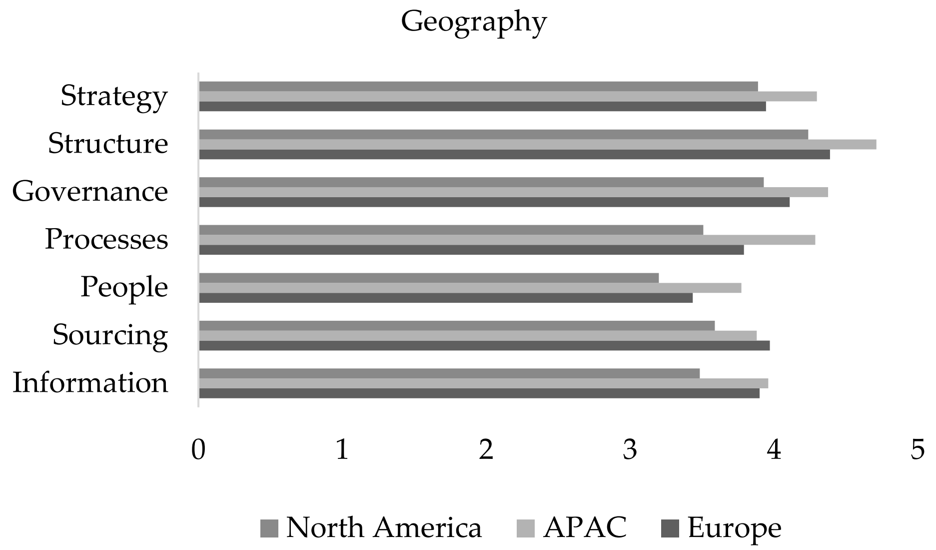

Figure 19: Illustration of ANOVA by Means – Geography

5.5.4.2 Role

A MANOVA to test whether the role within the company has an impact on the ranking of the dimensions resulted in six dimensions being significantly different at the 5% significance level. Strategy, Structure, Governance, Processes, Sourcing and Information differ depending on the participants' role within their company. The suggested dimensions of an ITODF are significantly more important to executives than to non-executives. This means executives gave higher ratings for all the items provided. While the overall result of the MANOVA shows roles to have a non-significant impact (V =0.057, p= .028; partial η^2 = .028), a difference was found between the roles for individual dimensions discovered in separate ANOVAs per dimension (Table 29: Results from ANOVA (Employee's Role)).

Dimension	F (2, 400)	Significance
Strategy	5.008	.007
Structure	3.482	.032
Governance	5.501	.004
Processes	3.500	.031
People	1.597	.204
Sourcing	5.008	.015
Information	8.224	<.001

Table 29: Results from ANOVA (Employee's Role)

Figure 20: Illustration of ANOVA by Means – Roles

5.5.4.3 Industry

According to the results of separate ANOVAs per dimension, there is a significant difference between the industries in the Structure dimension. As shown in **Error! Reference source not found.**, no other significant differences were found, n or was an overall significant effect between the dimensions and the independent variable identified (V =0.285, p= .241; partial η^2 = .041).

Dimension	F (15, 387)	Significance
Strategy	0.886	.580
Structure	2.176	.007
Governance	1.660	.057
Processes	1.092	.362
People	0.631	.850
Sourcing	1.400	.144
Information	0.886	.580

Table 30: Results from ANOVA (Industry)

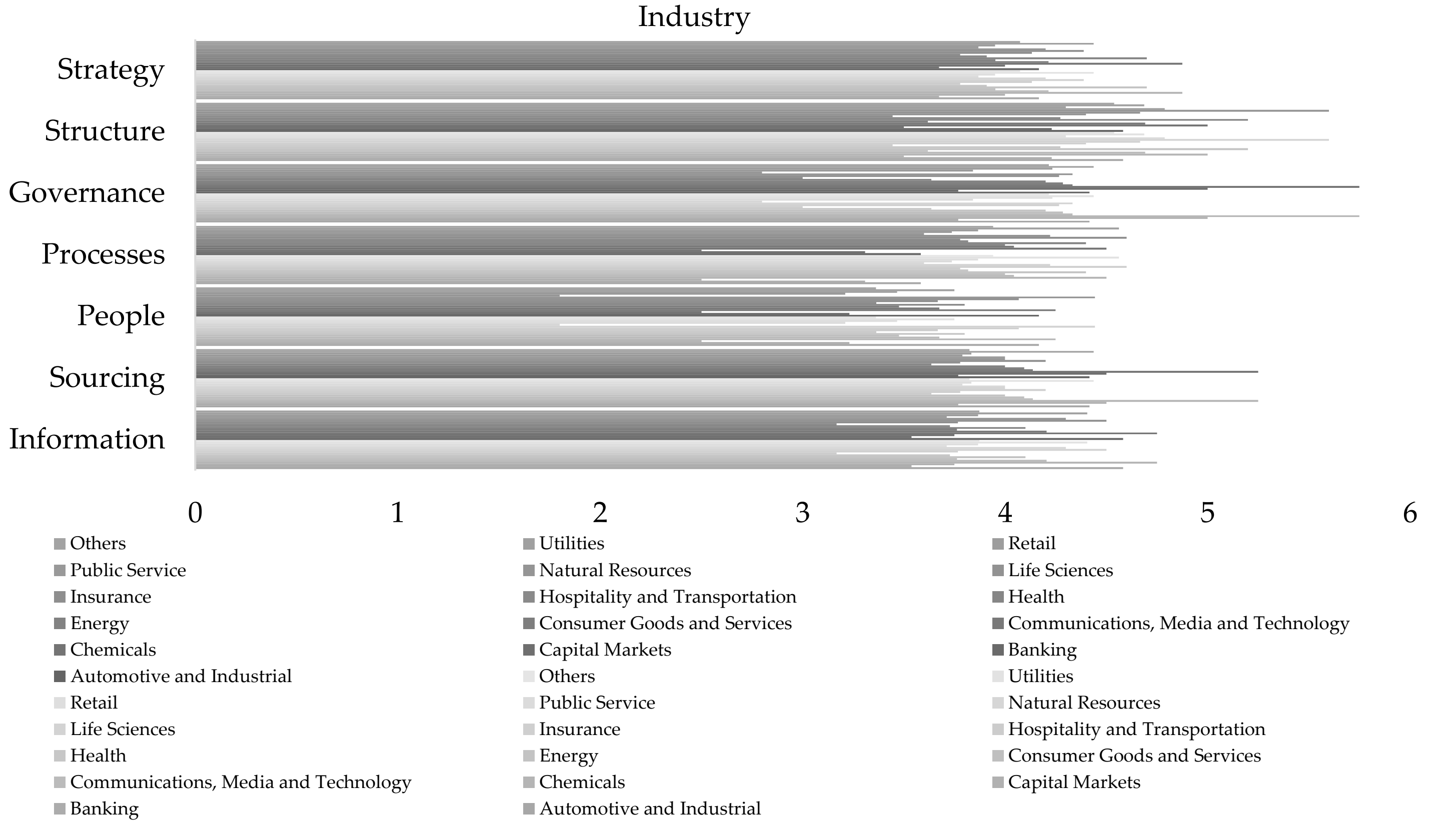

Figure 21: Illustration of ANOVA by Means – Industries

5.5.4.4 Size

The size of the company measured by revenue was also tested and found to be significantly dependent in all dimensions (Table 31: Results from ANOVA (Size)). The means of the different industries reveal that the larger the company, the more important the criteria covered by the dimension. Accordingly, the mean is higher if a company has more revenue. An overall effect was identified between the dimensions and the size ($V = 0.183$, $p < .001$; partial $\eta^2 = .061$). This effect is very small: 6.1% of the variance can be explained by this combination.

Dimension	**F (3, 399)**	**Significance**
Strategy	5.209	.002
Structure	3.568	.014
Governance	4.146	.007
Processes	9.498	<.001
People	15.479	<.001
Sourcing	11.505	<.001
Information	13.842	<.001

Table 31: Results from ANOVA (Size)

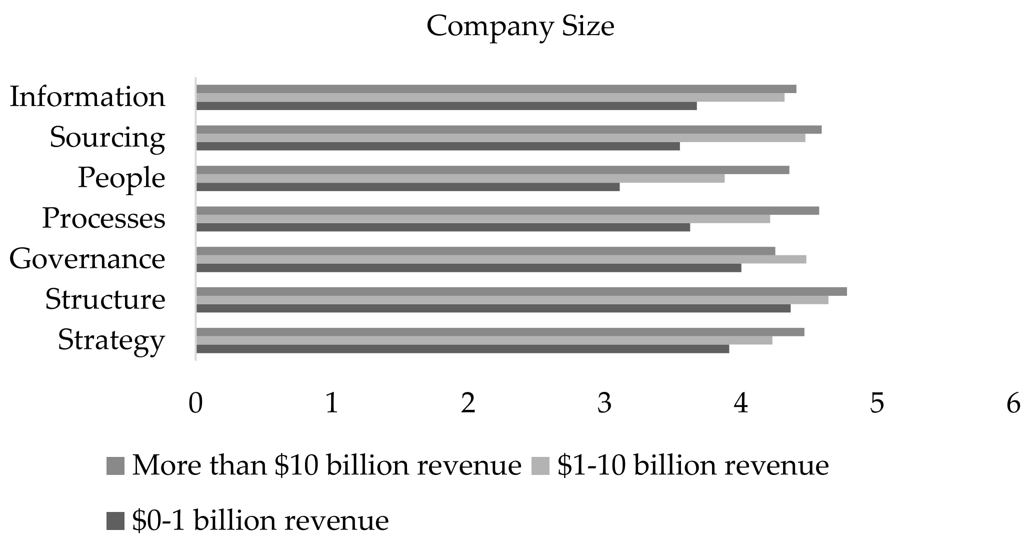

Figure 22: Illustration of ANOVA by Means – Company sizes

Additionally, the location of the head office was tested. A significant impact was observed in the dimensions of Strategy ($F(4, 398)=3.792$, $p= .005$), Processes ($F(4, 398)=5.730$, $p< .001$), Information ($F(4, 398)=4.692$, $p= .001$) and Sourcing ($F(4, 398)=2.992$, $p= .019$). The means reveal that participants from the Asia/Pacific region ranked all these dimensions higher than respondents from other regions surveyed (Europe and North America/Canada).

Because there were some doubts about the violation of assumptions concerning the calculation of MANOVA, the non-parametric alternative was also conducted. Results were compared and slight differences in the level of significance were found. Those variations do not lead to differences in interpretation. The non-parametric values were mostly even more significant than the parametric test results.

5.5.5 Correlation

A correlation was used to provide information on the three stated hypotheses (H2a and b, H3 and H4). The expected close relationships between dimensions were checked by examining similar answer structures. Before the decision was taken on the type of correlation that could be used, the Kolmogorov-Smirnov test (K-S test) of normality was conducted. This yielded significant results for all dimensions, showing that the data gathered is not normally distributed. As normality was not given in the data set, Spearman's correlation was used because it does not require this assumption. Pearson's correlation would not be sufficiently stable with failure to comply with the assumption. The following results (Table 32: Correlations of the Hypotheses. ** $p < .001$) were identified for the correlations between the dimensions stated in the hypotheses. All these results were found to be significant at a level of 1%.

Dimension 1	Dimension 2	Spearman's Correlation
Strategy	People	.500**
Strategy	Processes	.637**
Structure	Sourcing	.359**
Information	Governance	.535**

Table 32: Correlations of the Hypotheses. ** $p < .001$

5.5.6 Hierarchical Cluster Analysis

Hierarchical cluster analysis was used to identify an internal structure of the model. The centroid-linkage method was used to compare the means of the different dimensions. The correlation coefficient was chosen as the criterion for combining dimensions in one sub-dimension: the higher the correlation, the closer the dimensions, making them more likely to be combined in a substructure (also see Appendices for further information). At this level, all correlations between dimensions were observed to yield a cluster structure within the ITODF model. *Figure 23: Hierarchical Cluster Analysis Result Tree* shows how the analysis clusters the dimensions. Because the People dimension was excluded by the *t*-test analysis, the six dimensions were clustered in three clusters each comprising two dimensions. In the first clustering stage, the Strategy and Processes dimensions were combined. Next, the Governance and Information dimensions were clustered with a high correlation (Cohen, 1992). Finally, the two remaining dimensions, Sourcing and Structure, were combined in the third cluster.

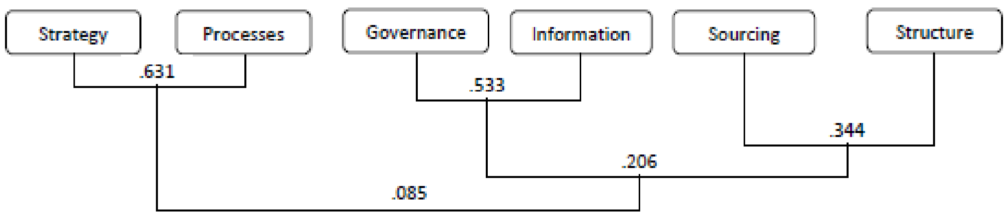

Figure 23: Hierarchical Cluster Analysis Result Tree

5.5.7 Analysis of the Open Question

An optional qualitative question was appended to the survey with the aim of gaining additional insight into participants' main interests regarding the challenge of IT integration. Input that did not make sense (31 answers) or that was considered irrelevant to the topic (12 answers) was removed. 85 respondents provided interesting and relevant input in response to the question. The most common answers and the number of times they occurred are presented in the following table.

What have we not asked you about IT organisation design in the digital age that you think is important?	
IT/data security	25
Cloud computing/big data/Internet of things/data analytics	10
Implementation thoughts	5
IT knowledge	5
Agility/flexibility	4
Design	4
People skills	3
Collaboration help	3
Customer presentation	3

Table 33: Answers to Open Question

5.6 INTERPRETATION AND DISCUSSION

Now that the results identified by the data analysis have been presented, it is necessary to discuss them in a broader perspective. Each of the hypotheses is discussed separately to first consider the meaning in isolation, before a summary section brings the hypotheses back together in the overall context of the refinement of the initial ITODF.

5.6.1 Refined Dimensions of the ITODF

The first hypothesis (H1: All dimensions show a significant difference from the mean of the scale (3.5)) was not confirmed. Although all means were found to be above the 3.5 line, none of them differs significantly from that value. However, this still shows that IT practitioners generally considered all the aspects included in the dimensions to be important for IT organisation design. In addition, the *t*-test provided more information on the statistical importance of the results. This test was significant for six of the seven dimensions so that the quantitative analysis confirmed these six dimensions but not the People dimension.

Strategy

The Strategy dimension concerning the different paces that organisations must focus on was highly significant and is therefore a confirmed dimension in the IT organisation design framework.

Structure

Decentralisation of operational IT tasks is part of the Structure dimension and has also been shown to be very significantly larger than the statistical mean value of the scale, resulting in the second confirmed dimension of the ITODF.

Governance

The Governance dimension is another dimension that was tested and confirmed. The significant difference of the statistical mean value from the cut-off value is the basis for the confirmation of the dimension. The main aspect of this dimension is the change to the decision-making processes aimed at developing leaner hierarchies within the IT organisation.

Processes

The Processes dimension was also confirmed by the high significance of its statistical mean value in comparison to the defined cut-off value. The confirmation of the process dimension leads to the implication that less structured processes are requested within an IT framework. IT organisations should focus more on high-level process design and leave the rest up to the individuals performing the processes.

Information

The Information dimension includes new dedicated roles within the company. These are designed to define new responsibilities and more explicit requirements. This dimension was significantly higher than the statistical mean value of the scale and was therefore confirmed.

Sourcing

The sourcing dimension entails not only allocating work to other locations and external providers, but also to machines or robots, such as robotic process automation (RPA). The question of whether to handle all work in house or to allocate specific tasks to external partners, or to technological solutions was also confirmed in the empirical data.

People

The statement on the People dimension assumed that hard skills are no longer necessary as most services are sourced via external vendors. This was clearly falsified from a significance point of view, with the dimension falling below the significance level of 1%. Consequently, People cannot be regarded as a dimension equivalent to the other confirmed dimensions. However, even if they do not constitute a self-contained dimension, people remain a very important element as each of the confirmed dimensions has implications for the employees within the company. Results lead to restructuring the framework. The statistical falsification of the People dimension will be visualised later in this dissertation.

To summarise: the confirmatory study confirmed six of the seven organisational dimensions initially marked as relevant for a generic ITODF in a digitised world.

5.6.2 Differences in Location, Role, Industry and Size

Additional analyses were conducted to determine the extraneous influences that affect the ITODF dimensions. The identification of patterns within the data reveals how IT practitioners are prioritising this topic in general and in the different dimensions tested in this study in particular. The results of this part of the research reveal differences in geography, the role of employees within the company, the industry segment in which the company operates and the size of the company measured by revenue.

Geographic Location

Analysis of the mean for the geography of participants showed significant differences. Three geographical areas –Europe, North America and the APAC region – were included in this analysis. The post-hoc test identified APAC countries as the geography with the highest ratings for all dimensions. Performing an additional analysis, excluding the APAC region, results in one or more significant differences in location for the Information dimension.

Here, North American employees provided answers with significantly lower ratings than the remaining three countries. APAC IT employees consider the ITODF dimensions to be necessary when integrating IT into the business structure. Highlighting India as the largest IT nation within the APAC area, Chandavarkar (2002) examined some aspects that are specifically relevant to Indian IT practitioners. The author emphasises that for Indian employees discipline and structured everyday life is very important. The research results and the secondary research of Chandavarkar (2002) support the conclusion that Indian IT practitioners in general regard a framework as very helpful for the creation of their work environment. The use of such a framework within IT would provide a basis for their preferred working culture. This also explains why APAC IT employees ranked the dimension Structure the highest.

Additionally, the location of the respondents' head office was reviewed to determine whether geographical and related cultural implications have an impact on the evaluation of the dimensions. Because participants from the Asia/Pacific region gave significantly higher ratings for the Governance, Information and Sourcing dimensions, an effect was identified. This shows that the geography in which the IT practitioner operates has an impact on how dimensions are perceived. The companies in the Asia/Pacific region seem to share the same similarities as highlighted above in connection with the Indian culture and work environment. In the Governance dimension, the aspect of lean hierarchies within the organisation is particularly critical for the Asia/Pacific culture.

Role within the Company

The role of the respondents within their companies is another factor that influences evaluation of the dimensions. In the Strategy, Governance and

Information dimensions, significant differences were found between the responses of executives and those of other IT employees.

This is not merely a terminological point: by definition, a CIO ranks higher than an IT employee, as he or she is at a higher level of the company hierarchy. This result is seen across all six dimensions of the ITODF. The reasoning behind this ranking pattern is that management directly benefits from the business success. A framework like the ITODF can result in management anticipating benefits from a clearly structured IT organisation (Galliers & Leidner, 2014).

The Strategy dimension has revealed that executives adopt a more strategic mindset regarding IT organisation design. The statistical mean value revealed by the empirical results was higher for executives than for the other two groups. This shows that executives have adapted their thinking to accommodate the different speeds necessary to successfully manage an IT organisation – traditional demand and more agile demand. This differentiates them from the other two groups, who tend to focus more on their current working process.

The Governance dimension shows that the business is putting executives under constant pressure to rapidly create innovations. Executives confirm that decisions must be taken at the locations where business operations are executed. If companies are to innovate, they require extremely rapid decision-making, and decisions must be taken where the business operations are handled.

The Information dimension focuses on actions aimed at gaining a better understanding of how data must be analysed and how information is drawn from this data. For this dimension, executives rank dedicated roles higher than the other two groups, who do not see the need for them. The conclusion can also be drawn that IT executives take the data monetisation aspect into consideration more as they are constantly urged by the business to find new sources of revenue or alternative ways to make use of the terabytes of data within their company (Iansiti & Lakhani, 2014).

When it came to the Structure, Processes and Sourcing dimensions, there were no significant differences between the three roles analysed. It could be argued that these dimensions are more visible to employees in terms of their implications for the IT organisation relating to changes due to digital trends. Structural and processes-related developments within a company are affecting the 'Operating

Core' introduced by Mintzberg & others (1979) which works directly with the organisation's products. As it was examined by (Schmidt, 2006), the decentralised structure and looser standardisation of processes therefore produces the organisations' business value.

Industry of the Company

Analysis of the industry in which the company operates did not yield significant results. However, one slight difference was found between the 'consumer goods' and 'services and communication, media and technology' industries in the Structure dimension. Because a total of 16 industries were distinguished, this result is virtually negligible. One explanation for this slight difference might be the disparity in how IT is used in the two industries. While communication, media and technology is comparatively advanced in IT integration and execution, consumer goods and services lack such sophisticated technology and the associated knowledge. However, when all the remaining industries are considered, several seem to have even less IT support than the consumer goods and services sector. This shows that the result cannot be explained by a discrepancy in IT knowledge and provides strong confirmation that the framework developed in this dissertation is generic, industry-agnostic and can be applied across industries.

The industry agnostic nature of the model has the benefit of enabling further research to gather key performance indicators (KPIs) ...(KPIs) of practical application of the model. These KPI's can be used in comparisons across different industries. The results would support to continuous improvement of the framework, especially as regards practical implications, because best practices from one industry could be applied to others.

Size of the Company

The size of the organisation was also found to have a significant effect on the answer structure of five of the six dimensions. As the size of an organisation was defined by its annual revenue, a distinction was made between small ($0–1 billion), medium ($1–10 billion) and big (more than $10 billion). The results of this research show that big companies rate the Strategy, Processes, Sourcing and Information dimensions significantly higher than small companies. Small companies do not see frameworks and a structured approach to organisation design as necessary. This is mainly attributable to the start-up mentality, which involves everyone doing everything, but which considers structures and exhaustive documentation superfluous (Gumpert & Stevenson, 1985). Even if big companies want to work in an agile manner, they require a structured approach while maintaining the legacy arm of their traditional business model (Baden-Fuller & Haefliger, 2013). At start-ups or small family-owned businesses, the benefits of a standardised process structure do not justify the effort required. As a result, companies of this kind did not evaluate this dimension as highly as the bigger organisations. The latter group still requires highly sophisticated and clearly defined communication structures and processes. Sourcing becomes important when companies expand, making it necessary to adopt this approach. While small organisations also have outsourcing instances, the larger these instances become, the greater is the degree of standardisation required. This explains the higher rating of the Sourcing dimensions by big companies compared to smaller ones.

Similarly, the greater the volume of data involved in a company's business, the more important it becomes to establish dedicated roles in the Information dimension. The comparatively small volume of data at small companies does not require special handling and analysis. Bigger companies therefore focus on the Information dimension more than smaller organisations do. Although the ANOVA showed a significant difference between the groups in the Structure dimension, the post-hoc test did not find significant differences between the means of the groups. The general point here is that the lack of demonstrable differences within the Structure dimension shows that all types of organisations believe in decentralised decision-making, close to their business operations.

The Governance dimension shows a different distribution of responses depending on the size of the organisation. Compared to big and small enterprises, medium-sized companies have a greater preference for lean hierarchies. The small companies surveyed are also often family owned and take a traditional approach to business. This means that decisions affecting the company are usually taken by the owner alone, without consulting others. By contrast, big companies tend to hesitate because their established way of working requires managers and long-term employees to be involved in decision-making (Eisenhardt & Zbaracki, 1992).

People are permitted to take decisions on the basis of their work experience and not their decision-making skills. This goes hand in hand with clearly defined hierarchies within big companies. By contrast, barriers to implementing lean hierarchies designed to foster innovation appear to be comparatively low for medium-size organisations. The significant difference between answers in the Governance dimension leads to the conclusion that medium-sized companies are more willing to create a lean hierarchy infrastructure within their organisation.

Before discussing the results derived from the correlation analysis, it is necessary to briefly explain why a set cut-off value was defined. This value was specified to evaluate and differentiate connections between the dimensions. It was chosen as a critical indicator of high correlations between variables. There has been a great deal of discussion on how to interpret the correlation coefficient. As described earlier, the author opted for the older definition of Pearson's correlation presented by Cohen (1992), who defined a correlation of $|r|=.10$ as small, $|r|=.30$ as medium and $|r|=.50$ as strong. This definition was adopted because the interpretation according Spearman's correlation is similar to Pearson's correlation. A cut-off value of $|r|= .50$ was chosen to examine whether the statements in the hypotheses can be verified or falsified.

In general it was proven that the different statement were answered by the different participation groups. Having said that, it proves the requirement of a generic framework outlined in section 0. A framework needs to be industry, size and geography neutral, meaning it can be applied overall. The below differences prove this, by that making it a proper generic framework.

5.6.3 Dimension Clusters

Hypotheses H2a, H2b, H3 and H4 were defined to evaluate the close relationship between selected dimensions within the initial ITODF. The following discussion takes each of the three clusters identified and examines the findings of the quantitative research.

5.6.3.1 Strategy and People

The first part of the second hypothesis (H2a: Strategy correlates positively with People) was confirmed. Although the People dimension was eliminated from the framework by the statistical significance analysis, a correlation above the cut-off value was found. This means that the assumed connection between the handling of agile and traditional business demands and the role of company employees was empirically confirmed. As stated in the literature analysed in the qualitative research, this correlation confirms that people play an important part in executing and operationalising the new strategic direction involving different speeds of delivery in an IT organisation (Cross et al., 2010; Gourévitch et al., 2012). The hypothetical positive correlation between Strategy and People also assumes that employees play a crucial role in decisions on new IT strategies. Other secondary research underscores the importance of IT employees and business employees understanding that different speeds of delivery demand different forms of collaboration (Shimel, 2016).

5.6.3.2 Strategy and Processes

The second part of the second hypothesis (H2b: Strategy correlates positively with Processes) was also confirmed. As already stated, strategy-related questions regarding different speeds of organisational operations interact with the way processes are handled.

Processes can be divided in two categories: first, commodity tasks, which require no human cognitive knowledge and can therefore be performed by machines; and second, the more innovative and creative tasks, which require a departure from standardised process management. People become more involved in their work when they have a high degree of freedom in handling their tasks. Machines, by contrast, require standardised processes if they are to do their work at all.

These two distinct process categories support the conclusion that commodity processes need to be rigorously documented and defined to enable robots or machines to perform their tasks. On the other hand, differentiating processes must be innovative and should therefore be less stringent, giving individuals the freedom to come up with innovative ideas and take proactive action to drive business outcomes.

The Strategy and Processes dimensions are therefore closely interrelated. A clear strategy is necessary to differentiate commodity from differentiating processes in accordance with the different speeds the IT organisation pursues.

5.6.3.3 *Structure and Sourcing*

The third hypothesis (H3: Structure correlates positively with Sourcing) was not confirmed by the data because the correlation fell below the cut-off value. This means that decentralising IT decision-making does not correlate with reducing costs and adding skills that are not available within the organisation. It could be argued that the structure of an IT organisation has no influence on the degree of sourcing. While structure is a predominantly internal matter, sourcing is external and involves handing over responsibility to independent instances (Mahon et al., 2011). This suggests that, while both dimensions share a similar underlying purpose, their domains appear to be different. Dhaliwal et al. (2011) mention the importance of strong partnerships outside the organisation for structural consolidation of internal IT units. Because the result of the correlation shows a highly significant effect, the statement has not been rejected completely. Further research should therefore be conducted to re-examine the relationship between the two dimensions and consider how both interact.

5.6.3.4 *Information and Governance*

The fourth hypothesis (H4: Information correlates positively with Governance) was verified by the data. Here, the ITODF was also confirmed by the empirical data. These two dimensions are mainly connected by the aspect of information management. The data that companies gather in their day-to-day business prompts the creation of dedicated roles designed to exploit the potential of that data. The Governance aspect of decision-making also plays an important role within the organisation. Bringing those two dimensions together enables reliable decisions to be reached more quickly and easily on the basis of information gathered (Davenport & Dyché, 2013). The results of the analysis confirmed that data analytics provides management with statistical implications that shed light on key managerial issues. Davenport & Dyché (2013) see big data as having the potential to trigger a management revolution by improving accuracy when it comes to supporting sustainable business growth and accelerating decision-making. Because dedicated roles have a positive effect on tasks related to information management (Ashforth & Mael, 1989), data insights offer the opportunity to enter a new era of management decisions.

The positive impact of the Governance dimension on organisational performance has also been identified (Wu, Straub, & Liang, 2015). The authors state that 'IT governance mechanisms enable IS strategic alignment, which itself increases organisational performance' (Wu et al., 2015). The information-related roles can therefore support this increase in performance by defining responsibilities and improving handling of management tasks. This aspect could be a topic for further research aimed at confirming the supporting character of information-related roles.

5.6.4 Open Questions: Interpretation and Discussion

The questionnaire also included an open question as a small-scale qualitative examination in the context of the quantitative research. The open question regarding additional aspects not covered by the survey was used to gain additional insight into respondents' attitudes towards further changes to IT and the reasons for these changes. The aim was to identify some key points that interest the employees surveyed when they think about an IT organisation framework. One critical aspect mentioned independently by various participants was IT/data security. This provides a basis for the hypothesis that agility results in a less structured work approach, which increases the likelihood of people leaving confidential information unprotected in their (physical and digital) work environment – giving hackers more opportunities to break into systems. In other words, a reduction in management of these processes leads to a higher risk of hacker attacks. The general trend towards more digitised work assistance also increases the importance of data security. When processes become automated, hackers have more opportunities to intercept information and gain direct insight into operational data. The aspect of IT security is therefore a highly relevant concern for an ITODF in a digitised world and should be researched further.

Some recently introduced IT terms were also frequently mentioned in the final part of the questionnaire. Cloud computing, big data, the Internet of Things and data analytics are becoming increasingly important for business purposes. These trends mean that IT is now involved in business decisions, resulting in new responsibilities being assigned to the department. The inclusion of those terms in the responses to the open question proves the importance of the research undertaken for this dissertation in that it supports the problem statement introduced in section 1.3 asserting the current lack of a clear framework for dealing with new technologies at a structural level.

5.6.5 People as the Common Denominator

The People dimension was an integrated part of the initial ITODF. It was removed during the first statistical evaluation in the quantitative confirmatory study. Nevertheless, it was clear throughout the discussions of the various aspects of the other dimensions, that people-related changes are always necessary when executing the implications of these dimensions.

Consider the following example: if decision-making is increasingly decentralised, bringing it closer to where companies do business, the employees involved need to have the skills required to take decisions. A typical IT employee is used to executing tasks and then reporting up the organisational ladder. If the structural changes discussed in the context of the Structure dimension (more decentralised decision-making power) are implemented, people need to be trained to take decisions.

This is just one example of the importance of people in implementing the implications of the dimensions of the ITODF. Other examples encountered in the research for this dissertation also clearly show that while the people aspect does not constitute a distinct dimension, it is an enabler of the six dimensions of the ITODF.

Throughout the discussion, there were several additional points of contact between people involved in the dimensions of the ITODF. People must work at different speeds (agile and traditional), and this entails abandoning long-established mindsets. Flexible thinking is required for some tasks. This shows that there is a clear connection between the Strategy and the People dimension. People working within companies are involved in business decisions requiring expert knowledge of key operations. In the Structure dimension, people need to understand the functional focus of their work (e.g. application development) as well as its business aspect, because these merge key operations (Peppard & Ward, 1999). Employees should be able to look beyond their specific fields. At the Structure level, they should also be able to gain insights into the function of their work in the wider context of the company's business operations. For example, people involved in day-to-day business operations could be given the opportunity to gain an understanding of overarching business processes, putting their own work into its overall context.

In the Governance dimension, lean hierarchies mean that people are required to make decisions and must therefore be trained to take on responsibilities instead of passing them on to their supervisors. This gives rise to a completely different skillset in line with to the greater demand for soft rather than hard skills. In the Processes dimension, people need to be able to work without standardised processes and clearly defined responsibilities, charting their own course to success (Mbuba & Wang, 2014). This change in process management depends on the specific tasks involved. Different tasks require employees to have different skills. As a result, the distinction between static tasks, which do not require cognitive thinking or flexibility, and innovative, creative tasks becomes important. The new possibilities offered by digitisation (e.g. artificial intelligence, robots) are another factor here. These new trends are leading to a growing number of employees being replaced by machines, which require standardised and clearly defined process structures. The remaining employees work more creatively and require less rigorously defined processes, which promote flexible working approaches that support innovation. Process aspects therefore play a crucial role in the age of digitisation, in which the IT sector is particularly influenced by new technologies (Smith & Fingar, 2003). People working in companies are affected by reorganisations. Consequently, employees need support in the form of less standardisation, whereas machines require the more standardised processes.

People also need to understand that completely new roles can be a genuine opportunity for career acceleration rather than a threat. These roles bring new responsibilities for employees and clearly defined requirements for the work itself. This does not entail more standardisation but, rather, provides employees with more generic support for their specific tasks. New possibilities fuelled by concepts such as big data or analytics can be incorporated into the everyday business of an organisation by integrating dedicated roles as a connecting strategic element.

In terms of people, the Sourcing dimension requires employees to build personal brands within the organisation. Focusing on selected capabilities, these brands are intended to ensure that employees stay ahead of the curve and avoid being replaced by less expensive offshore alternatives or even robots. While this puts employees under pressure, it also enables them to work to their full potential. The relationships between people and the other six ITODF dimensions presented above show that the People dimension has a superordinate role in the model. People are involved in the decisive steps of the remaining dimensions, which may reflect the impossibility of considering this dimension in isolation. O'Reilly, Chatman, & Caldwell (1991) stated that the person/organisation fit plays an important role when bringing together individual people and the organisational culture. Furthermore, responses to the open question at the end of the questionnaire included aspects relating not only to peoples' competencies (such as 'soft skills'), but also to cooperation between people within the company ('collaboration help'). This indicates that the issue is not just about finding the people who best fit the job and the company, but also about support with collaboration. Collaborative platforms are the focus of a great deal of research (Kumaran et al., 2001; Moser, Mordinyi, Winkler, & Biffl, 2011; Singh, Gu, & Wang, 2011) that is beyond the scope this dissertation. However, assistance with interaction should certainly be considered when people work together at disparate locations and in different time zones.

Having outlined the different examples why the People dimension is a clear enabler of the ITODF, it is also outlined as a point of further research that need to be conducted (see section 8.2)

5.7 REFINED ITODF

Other internal structures of the ITODF dimensions were analysed by the hierarchical cluster analysis, which identified a model similar to the one proposed in the qualitative research. This cluster analysis combined dimensions based on similarities and used correlation as the measurement. Because the correlation analysis merely determined the connection of dimensions stated in the hypotheses, the additional analysis including the correlation was used to paint an overall picture of the model structure. The aim was to find other dimensions that are close to each other and had not been tested up to that point. Hierarchical cluster analysis was therefore chosen to gain insight into other possible structures of the ITODF. Figure 24: Refined ITODF shows the resulting model structure. Because the People dimension was removed as an independent dimension of the model, it was also excluded from the hierarchical cluster analysis. However, nothing in the overall structure needed to be changed. The first suggested cluster, consisting of the Strategy and Processes dimensions, was also confirmed by the hierarchical cluster analysis. This is not particularly surprising because a high connection between the two dimensions had already been presented in the hypothesis confirmation. Strategy issues relating to the differences between agile and traditional business were linked with standardised processing within the organisation (Gourévitch et al., 2012). This means that more innovative IT decisions are associated with agile strategies and fewer standardised processes. By contrast, the traditional strategies relate to secure and reliable IT operations and are associated with standardised processes. In this dissertation the cluster is named Structured Agility.

The second cluster comprises the Information and Governance dimensions and is referred to as Decentralised Value Creation. As also seen in the confirmation of the fourth hypothesis, these two dimensions combine dedicated roles for better data-handling, resulting in more reliable decision-making. The third cluster, the Fluid Workforce, comprises the Structure and Sourcing dimensions. Although these two dimensions did not show a high correlation above the cut-off value in the preceding section, the cluster analysis found the highest connection between them in the clustering process. The author decided to cluster these dimensions because their connection can be explained: from a theoretical perspective, structural issues concerning definitions of hierarchies within the organisation are closely connected to the characteristics of outsourcing issues. Both dimensions of the ITODF reflect simplification of tasks and responsibilities that influence companies' effectiveness.

However, the use of the cut-off value in this dissertation should briefly be considered. It was decided above that only high correlations, as defined by Cohen (1992), confirm that dimensions are connected. Although the third hypothesis was rejected earlier, the clustering here is based on a different cut-off value. After the first two clusters were formed based on high correlations, no higher connection was found between either of the two clusters and the two remaining dimensions. The next highest similarity was found between the Structure and Sourcing dimensions, which have a medium correlation. Structure and Sourcing therefore constitute the third cluster in the model. In conclusion, Figure 24: Refined ITODF presents the refined ITODF.

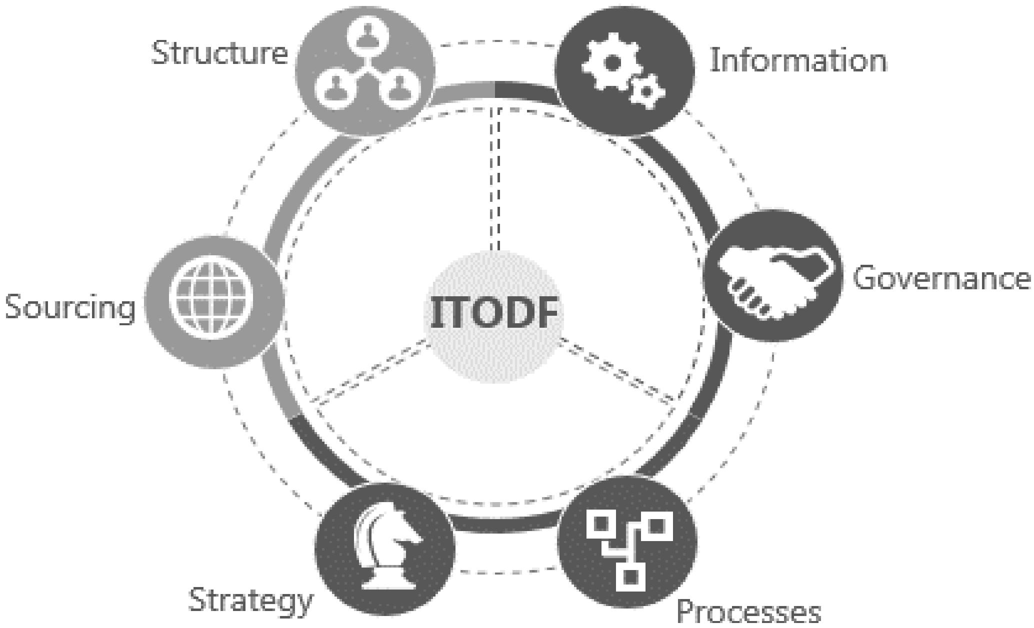

Figure 24: Refined ITODF

6 FINALISED ITODF – DISCUSSION

6.1 DIMENSION CLUSTERING

This section examines the implications of the research results across the three identified clusters and six dimensions of the final ITODF. Each cluster is broken down into its constituent organisational dimensions, and the reasons for the interrelationship are discussed with reference to the findings of the research for this dissertation. Secondary research is used to lend further weight to the conclusions presented. In addition, each subsection concludes with selected practical implications that can be implemented when designing or realigning an IT organisation for the digital age.

6.2 STRUCTURED AGILITY: STRATEGY AND PROCESSES

The term Structured Agility denotes the combination of Strategy and Processes in the final ITODF. These two dimensions have been proven to have a high correlation with each other. Regarding the Structure dimension, this dissertation has found that a successful IT organisation needs to take multiple speeds into consideration. The most important of these are high speed to meet new demands and the familiar speed of (traditional) business demands.

These findings, in conjunction with the latest thinking on a purely 'Digital Strategy', recently presented by Ross et al. (2017), underscore the need for a coherent, digitally aligned IT strategy. Ross et al. (2017) argue that a digital strategy must be blended into the IT strategy – almost to the point where they form a single common corporate strategy. If we assume that the new demands reflect the innovative side of the IT organisation and the traditional demands reflect its security-oriented and reliability-oriented side, then we can conclude that the agile IT strategy must be closely aligned with the digital strategy to ensure success – while the traditional part of the IT strategy should focus on internal efficiencies. The agile part is very important when the connected product view of Porter & Heppelmann (2014) or the Internet of Things research of Deichmann et al. (2015; 2014) put companies under pressure to design virtual products built on top of long-established physical products. In such cases, CXOs must set a clear strategic direction to provide the organisation with the necessary guidance. Based on the results of the qualitative and quantitative studies, this dissertation therefore supports the view that an IT organisation must become more agile while continuing to provide the right guidance from the top of the hierarchy (a point that remains valid, even in very less hierarchical organisations). According to Bharadwaj, El Sawy, Pavlou, & Venkatraman (2013), IT strategy (or, as they call it, 'Digital Business Strategy') should become an integrated part of the overall business strategy. In addition, Mithas & Lucas (2010) emphasise close collaboration between both elements as a prerequisite for running a successful business. If agility and blending the IT strategy into the business strategy are not high on the CXO's agenda, the company runs a very high risk of jeopardising its entire business operations. Ross et al. (2017; 2016) argue that if top management fails to appreciate this imperative, a lack of strategic guidance will end in bankruptcy because all the products of the future will be connected products, consisting of a blend of physical and virtual components. If the focus remains exclusively on the physical components, the authors consider it inevitable that a platform product will squeeze in between the physical product and the customer, while slowly making the physical product replaceable.

Regarding the Processes part of the Structured Agility cluster, the dissertation revealed that, although processes are still needed for an IT organisation to operate smoothly, they do not have to be rigorously documented and designed. IT employees require some degree of guidance in the form of a certain level of definition and documentation. However, there is also great demand for freedom to think creatively and tailor processes in line with requirements. These two aspects are particularly important not only in driving agile decision-making, but also when it comes to speed of delivery. In addition, this dissertation considered automation as a means of replacing people in some commoditised processes, leaving differentiating processes mainly to IT organisation staff. This study concludes that, especially in the Processes dimension, differentiating processes should be defined only at a high-level while standard processes should be set out in detail so that machines can handle them.

Strategy and Processes are highly interdependent when it comes to implementing the different speeds of IT delivery and the processes necessary to successfully deliver the desired results. This requires highly structured agility for standardised processes and less structured agility for differentiating processes to enable people to focus their attention on outcomes rather than the process.

6.3 DECENTRALISED VALUE CREATION: INFORMATION AND GOVERNANCE

Decentralised Value Creation is the second cluster derived in the hierarchical cluster analysis. The main outcome of the discussion of the Information dimension is that two dedicated roles – the information architect and data scientist – must be established close to business operations. Davenport & Dyché (2013) stated that the function of these roles is to ensure data is gathered, interpreted, properly summarised and visualised to create a sustainable monetisable impact. The availability of monetisable information via those two dedicated roles is increased by reducing hierarchies in the IT organisation (an aim of the Governance dimension), also enabling staff at comparatively low hierarchy levels (such as programmers) to make decisions based on concise, analysed information provided by one or both of these roles.

The key takeaway in this cluster is that the IT organisation must adopt a far more decentralised approach for non-commodity capabilities and processes. The aim here is not only to enable rapid decision-making where decisions are required, but also to provide IT staff with a complete understanding of the nature of the business. IT employees, and especially developers, must understand the full implications of the business requirements. Furthermore, they must be able to put these business requirements into context, resulting in much clearer implementation instructions and enabling faster turnaround times. In addition, close collaboration, particularly relating to digital business demands, works only if the IT and business staff on the agile development teams are at the same location and can, where necessary, directly consider the business processes and how they are executed.

The information aspect outlined above is further strengthened when both IT and business are based at the location where business is done, because they can then apply the outcomes of data analyses immediately and contribute the knowledge gained to their MVP development. It is particularly important here to reiterate the result of the quantitative confirmatory study, where respondents rated the need for the dedicated information architect and data scientist roles as very high. This result suggests that virtual roles or straightforward training for existing IT staff or business staff also needs to be supported by other initiatives. In view of this, IT leadership must consider ways of budgeting for dedicated roles in each of the decentralised developer teams. In some cases, this might require budgeting for multiple instances of the two roles.

Figure 25 shows an example of a decentralised agile IT organisation, with the data scientist and information architect connected to each of the agile developer teams. Obviously, this results in considerable overlapping of competencies. On the other hand, it also provides strong impetus for business-enabled IT products with a direct impact on the business organisation's bottom line.

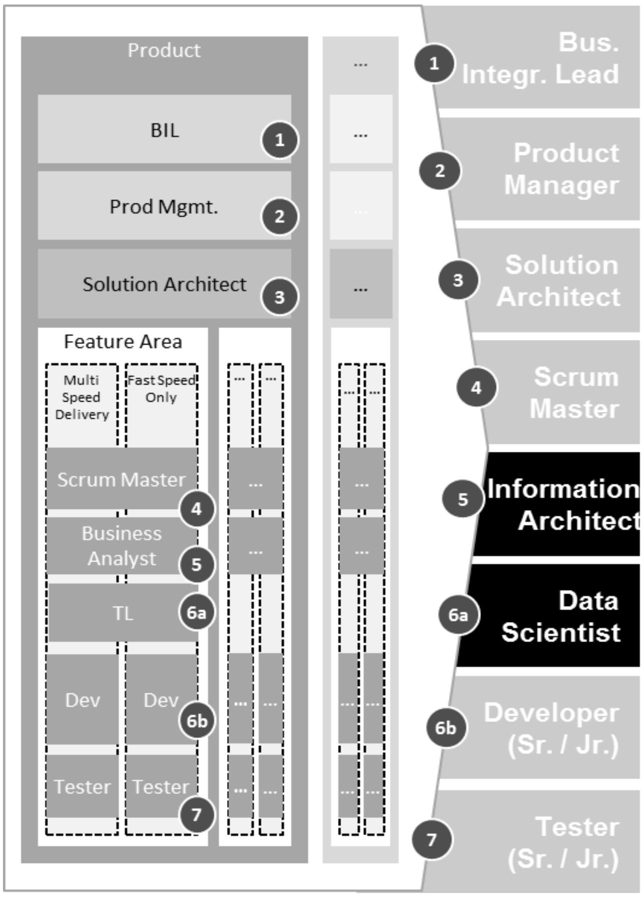

Figure 25: Agile Team with Information Architect and Data Scientist

6.4 FLUID WORKFORCE: STRUCTURE AND SOURCING

The third cluster comprises the remaining dimensions, Structure and Sourcing. The quantitative research rated decentralised structures and team autonomy as key success factors in an IT organisation design framework. When the research results were considered, and secondary research was used to amend them or back up some of the underlying hypotheses, it became apparent that IT organisations need a decentralised approach that locates their staff close to the business operations (see 'Decentralised Value Creation' above).

Approaches of this kind must take the Processes dimension into account and focus on standardisation for commodity processes, which should remain centralised. It is therefore important that IT practitioners first determine the process type involved (commodity vs. differentiation) and select the corresponding structure. This means the sourcing approach is closely linked to the Structure dimension. The most appropriate sourcing approach depends on whether the process involved is a commodity process or a differentiating process (see also the practical implications presented in section 6.7). Commodity processes are increasingly automated and performed by machines or, as was the trend in the past decade, dealt with by low-cost offshore labour. Differentiating processes, by contrast, are handled by personnel at decentralised locations.

In the digital age, the nature of a process can change from differentiating to commodity very rapidly, and companies must tap into offshore capabilities at very short notice. Moreover, technical innovations can transform other parts of the organisation from commodity to differentiation. An example of such a transformation from commodity to differentiating processes is pricing processes when an organisation changes its pricing logic from flat prices to variable prices. From the moment the organisation has to deal with the complexity of variable pricing, the variable margin calculation needs to be in place and able to calculate the margin on a given price immediately to allow a salesperson to take decisions based on this information. Consequently, this dissertation refers to a Fluid Workforce that continually shifts between internal/decentralised and central/automated, and can be sourced externally. The term 'Fluid' denotes the transition between different approaches in a very tight timeframe. Digital trends drive the fast pace of change, and an IT workforce needs to be prepared for the associated changes and able to change rapidly and flexibly.

The logic behind a Fluid movement between internal/decentralised and centralised/automated needs to become a central part of the way the organisation works. Everything is moving very rapidly and what seems stable today can be completely different tomorrow. The two dimensions of Structure and Sourcing are mission critical if companies are to be prepared for constant change.

6.5 FINAL ITODF

The clusters were the last design element that must be discussed to define the final version of the ITODF presented here. The final ITODF illustration therefore comprises the following elements:

1) Six IT organisation design dimensions and
2) Three organisational clusters

The following illustration shows the final ITODF developed in this dissertation and provides the answer to the research question posed at the beginning of this study.

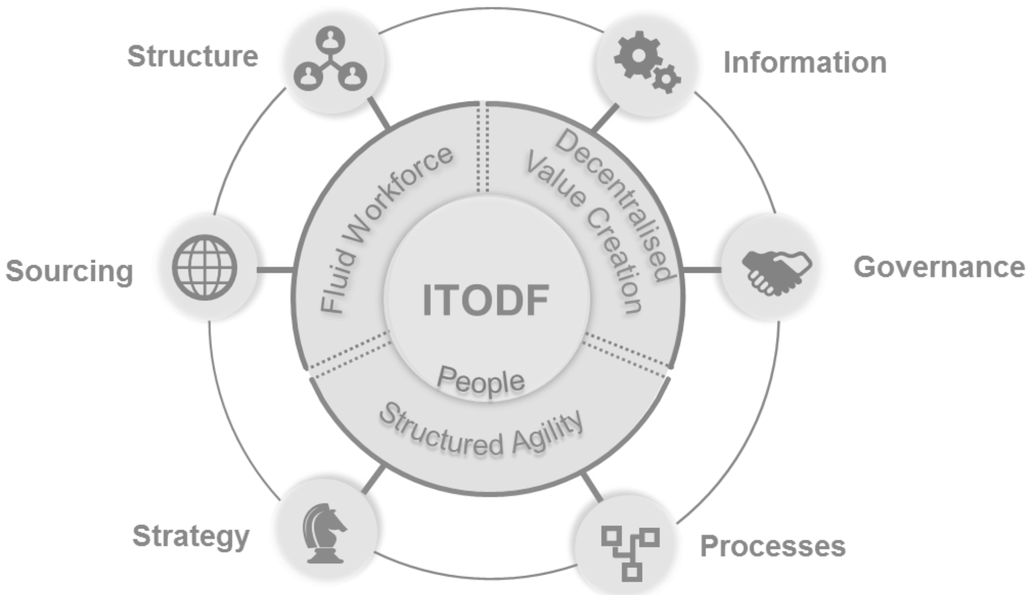

Figure 26: Final ITODF

6.6 DISCUSSION OF THE FINAL ITODF

This section examines each of the final ITODF dimensions in greater detail, focusing on the points initially examined in the QCA and those confirmed in the confirmatory study. The following considerations are intended to provide supporting material for the ITODF clusters discussed in section 6.5 above.

6.6.1 Strategy

The QCA revealed that IT organisations that fail to adapt to the different speeds that business demands of them will become irrelevant. This finding is supported by the latest research, which includes examples of business demands that are already fulfilled outside the internal IT organisation because the business has direct contact with external IT providers. While the QCA also discussed other areas of relevance, including leadership, role clarity and goals and objectives (see Table 14), it ranked Speed of Delivery with a defined Value Contribution sub-category highest.

The confirmatory study confirmed the statements on Speed of Delivery and Value Contribution, thereby deriving the first ITODF dimension.

One research result that became increasingly clear was that the two speeds derived from the QCA and tested in the questionnaire are not enough. The secondary research often discusses a greater number of speeds or uses the two speeds with different sub-speeds, with different personnel working at different speeds depending on their role, even within the same developer team. In view of this, the Limitations section of this dissertation considers potential for further research in this field.

6.6.2 Structure

When it comes to organisation design, Structure is usually the predominant dimension. However, this was not the case in the research conducted for this dissertation. The Structure dimension ranked only eighth in the QCA, where the top ten comprised 80% of all the codes assigned in the QCA (see Table 14).

However, the following codes were all given to the Structure dimension: Decentralised Decision-Making, Team Autonomy, Distribution of Power across the Hierarchy, Shape of the Organisation and Size. Decentralised Decision-Making and Team Autonomy were ranked eighth and ninth overall and were therefore included the confirmatory research.

The main outcome is that the structures of an ITODF must become more decentralised if they are to reflect the business priorities and speed of delivery. Furthermore, teams must be given much greater decision-making power and need more autonomy so that they can work as virtually independent parts of the IT organisation, giving them the speed to deliver on their promises in the digital age.

Both decentralised decision-making and team autonomy were confirmed in the confirmatory study.

6.6.3 Governance

The Governance dimension was not initially part of the dimension layer for this research. As discussed at the outset of this dissertation, the categories originally considered were provided by Galbraith's organisation design model, which does not include Governance. However, the QCA revealed 166 text snippets associated with Governance-related aspects of IT organisation design in the digital age – making this the overall highest ranking code. Governance was therefore raised from the code level to the dimension level and was subsequently used as one of the seven IT organisation dimensions.

The main aspect discussed in this dimension was the need for IT organisations to reduce or even remove hierarchies to allow fast, efficient decision-making. The dissertation concludes that a lean hierarchy is required to enable the speed of decision-making needed to respond rapidly to digital business demands, enabling IT organisations to compete with third-party players, who are now the greatest threat they face (see section 1.1).

The confirmatory study confirmed the initial statement, thus making it an integrated dimension of the ITODF.

6.6.4 Processes

The Processes dimension was based on one of Galbraith's organisational categories and had the following codes associated with it for the purposes of the QCA: Information Processes, Process Automation, and Governance (which later moved up one layer, as explained above). Automation was moved to the Sourcing dimension as it discusses only the external provision of machines for commodity processes, which is covered by the Sourcing dimension of the ITODF.

The evaluation of the Informal Processes category was an integrated part of ITODF in the initial version and included in the confirmatory research. It was confirmed by the respondents to the questionnaire in the confirmatory research.

The key message of this dimension is that an ITODF in the digital age requires well-documented commodity processes focusing on digital and traditional business demands; by contrast, to provide scope for innovative and creative thinking, little if any documentation is necessary for differentiating processes relating to digital business demands. Furthermore, less extensively documented and rigorously defined processes are especially attractive to employees from Generation Y and Generation Z, who demand the freedom to think creatively without constraint.

6.6.5 Information

Information was not one of the original organisational dimensions. However, it was promoted to the dimension level because of its association with 125 text snippets in the QCA. Most of the articles containing these text snippets state that, if applied intelligently, information becomes a critical business success factor and a source of additional revenue. The key aspect in this dimension is the need for two dedicated roles in an ITODF. One of these (information architect) connects business and IT when it comes to data insights. The other role (data scientist) is performed by internal IT experts and involves understanding where which data buckets are located and how they can be interlinked to derive untapped business insights that can be used to adapt existing business models or even create entirely new ones. While some research suggests these roles should be no more than virtual roles assumed by someone with another dedicated role, this dissertation argues that these two roles must be dedicated and, if necessary, performed in multiple ways to maximise the effectiveness of data monetisation.

Both dedicated roles were confirmed in the confirmatory study.

6.6.6 Sourcing

Sourcing was another dimension not included originally. It was subsequently derived in the People dimension, where it was associated with 36 text snippets. It was also confirmed in the confirmatory study. In addition, the Process Automation code was associated with it to reflect the importance of externally sourced machine capabilities in supporting process automation for commodity processes related to traditional business demands.

In this dissertation, Sourcing is considered critical in enabling IT organisations to scale their capabilities in line with demand in the digital age. Because of the speed of delivery and a completely new view of value contribution, where everything is handled using an MVP approach, an IT organisation's ability to scale capabilities is required to deliver its service portfolio in line with business expectations.

When it comes to sourcing, organisations therefore need a clearly defined portfolio of suppliers who can be contracted immediately, as well as a knowledge of robotic process automation (RPA), allowing automated processes to be implemented rapidly.

6.7 PRACTICAL IMPLICATIONS AND COMPLETION OF THE FRAMEWORK

This final section examines five practical implications derived from the research for this dissertation. It draws not only on the research conducted and secondary research cited, but also on experience gathered throughout the research process. The findings of this section show the scientific derivation of the ITODF but do not present all the information collected for research purposes.

6.7.1 #1 Strategy and Structure is important: hierarchies are not

The research presented in earlier chapters has shown that it is necessary to clearly define a strategic direction with a structure based on the elements relating to agile and traditional IT. The main aim of such a definition is to assure the organisation that it can rely on a certain degree of structure. However, the research also supports the contention that hierarchies tend to hamper effective and agile decision-making and should be designed as network structures that give individuals as much power as they need to take effective decisions on certain questions – in consultation within the organisation but not via defined approval processes. Because the current management of IT organisations is likely to fear losing control, practitioners will probably encounter resistance to such radical changes to the decision-making process. To avoid this, they should look for small-scale projects that can be isolated but are strategically relevant to the organisation. It is recommended that practitioners then use a 'minimal viable product' (MVP) approach (Anderson, Lim, & Joglekar, 2017) to release the first deliverables of the product to be created as early as possible. Another very important aspect here is that the deliverable be a real product – not just code or an application. Practitioners must ensure that the MVP fully meets the expectations of the requestor (the business employee who creates bottom-line or top-line impact with the product). In addition, collaboration tools become more important as the importance of hierarchies decreases. While some might think granting decision rights at very low levels of the organisation could lead to chaos, researchers have proven that individual decision-making creates ownership, encouraging decision-makers to have their thinking validated by peers or other practitioners (McChrystal, 2013; Soda & Zaheer, 2012). This requires toolsets that enable employees to easily exchange and validate their thoughts on certain issues. Utilising knowledge exchange tools is therefore another quick win for practitioners – this is because most organisations already have tools of this kind but may not use them for low-level decision-making or peer reviews of concepts (Leidner, 1998).

As regards the structural component of this practical implication, it is advisable to have structures geared to the operating model required by the demands of agile and traditional IT. What should be avoided is the creation of two separate departments for the bi-modal IT organisation, as discussed by Horlach et al. (2016). Practitioners need to differentiate between structure in the sense of 'organisational boxes', where the agile organisation is assigned to one box and the traditional organisation to another. This should be avoided to prevent emotional friction between the modes – with one being thought of as 'cool' and the other 'old school' (Horlach et al., 2016). Instead, structure should make sure that each of the two modes has its own structural framework based on approval guidelines, policies and other structural components. The management then needs to ensure a clear process is defined that specifies when which model should be triggered. The logic that a practitioner must bear in mind is 'when to apply which speed to the organisation' and not 'which organisation needs to work with the demand'. The following quote sums up this recommendation very well:

'In my view of multi-speed IT, the entire organisation is more like the gears in a Swiss watch. Different gears of different sizes, moving at different speeds, but all of them orchestrated to mesh together like a fine timepiece.' (Shimel, 2016)

6.7.2 #2 PROCESSES ARE NECESSARY BUT SHOULD NOT BE EXAGGERATED

Processes must be taken into consideration when designing IT organisations that are fit for the digital age. However, it should again be emphasised that a clear distinction must be made between commodity and differentiating processes. Commodity processes are either outsourced or already handled by robots and machines, or soon will be. Differentiating processes are less rigorously designed, allowing sufficient freedom to innovate and providing scope for individual decision-making.

For IT practitioners, this is a very valuable insight. Whereas in the past, considerable effort was needed to document and standardise the process landscape, this is not the case in the digital age. In practice, this means that instead of further defining processes, practitioners should analyse the process landscape to discover inefficiencies due to the processes in place. The tools required to achieve this are virtually the same as those used in IT consulting over the past 10–15 years. All these tools – from IT maturity assessment through to process gap analysis – can continue to be deployed. Only the object of the exercise has changed slightly. It is recommended that practitioners use the following five steps to quickly uncover efficiencies in an IT organisation:

1. In close collaboration with the key stakeholders in business and IT, select the 10 most important processes in the IT organisation based on a standard framework like SAFe for programming or ITIL for operations

2. Send out questionnaire asking selected IT and business staff involved in each of the processes where they would map them on the 2x2 matrix illustrated in Figure 27
3. Select the commodity processes for the traditional business demand and the differentiating processes for the digital business demand as the scope for action
4. Analyse feedback on each of the processes in scope and create heatmap on efficiencies and inefficiencies on a scale between 1 and 5 (1 = low; 5 = high)
5. Define initiatives that increase the level of standardisation of the commodity processes for the traditional business demands and reduce the degree of process standardisation of the differentiating processes for the digital business demands to a bare minimum

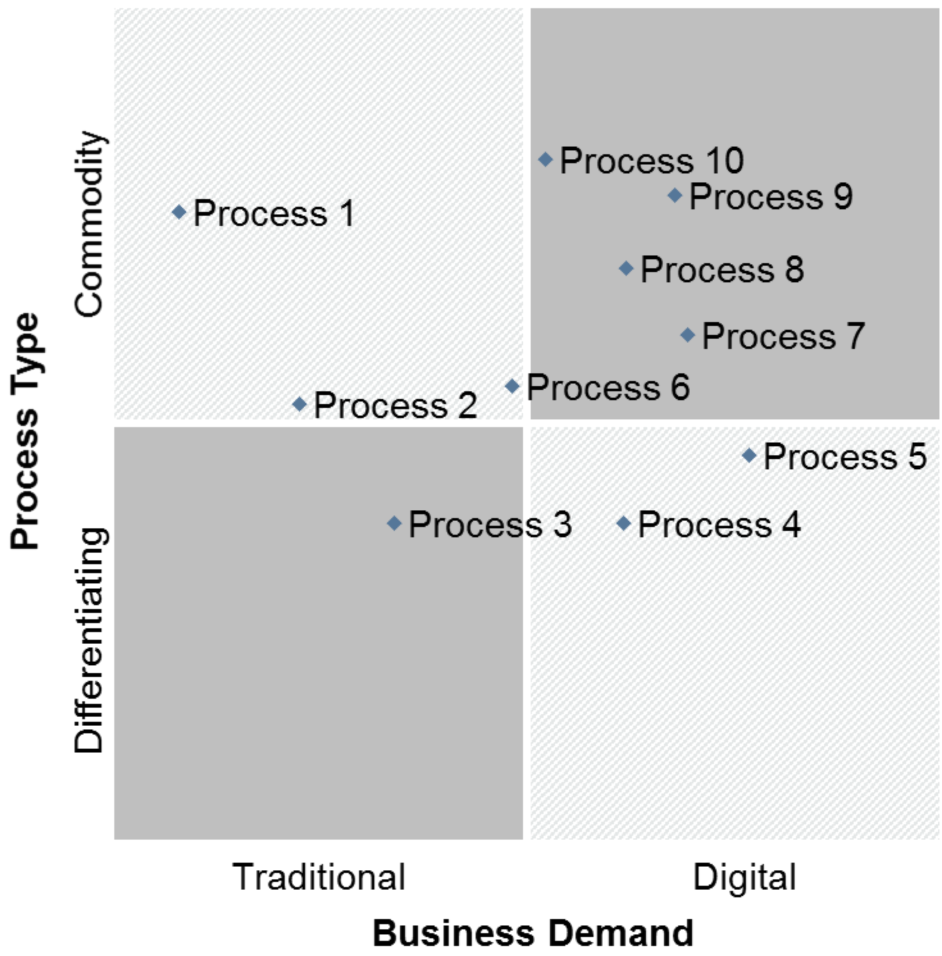

Figure 27: 2x2 Matrix – IT Process Redefinition

This matrix helps to visualise the outcome of the exercise and can also be used to pitch the scope to any decision board for further refinement.

The goal of the differentiating/digital demand cluster is to bring innovation and open thinking back into the mix, allowing a more creative environment. The five activities outlined will proactively remove process boundaries and introduce creative space for the developers, especially if an IT organisation already uses methodologies like Scrum or Iterfall. On the other hand, where processes are regarded as commodities, it is highly advisable to align the process design with robotic process automation techniques or with human resource providers that allow the processes to be either automated or out-tasked into their existing operations.

Finally, a practitioner should be fully aware that the business organisation is also enhancing its creative skills. This aspect puts the onus on the IT organisation to develop into a less structured, but more innovative and creative set-up capable of linking to the business organisation. This is also further emphasised in the literature and is outlined as a potential pitfall if not properly taken into consideration (Thomas Gumsheimer, 2016).

6.7.3 #3 Data insights are relevant only if they are monetised

Data-related roles have been proven to be a critical success factor in IT operating models for the digital age. This study focused on two such roles: the data scientist and the information architect. Combining the research for this dissertation with existing research into analytics and information insights (Davenport & Dyché, 2013) clearly indicates that these two roles and the additional emphasis placed on data and information are relevant only if the insights generated are taken to a higher organisational level and used either to drive new revenues or to reduce existing costs. This research cited shows that companies that focus on data insights should do so with the goal of monetising these insights.

The key question relating to the Information dimension of the ITODF concerned dedicated information-related roles within IT organisations. The research for this study shows that roles of this kind can bridge a company's IT and business thinking by combining data insights with business knowledge. The results of the quantitative research confirm this and have clear practical implications for the Information dimension. They imply that roles within the IT organisation must be properly defined to ensure a clear focus on data monetisation. This goes hand in hand with additional recommendations by researchers on the definition on roles (Wu et al., 2015). Properly defined roles lead to greater organisational stability and better task attribution. As the research for this dissertation examined the importance of two specific roles (information architect and data scientist), it is advisable to have a dedicated role for each with a clearly defined role objectives and role-related key performance indicators (KPIs).

The importance of these two roles centres chiefly on the process of gathering substantial volumes of data and the associated potential for deriving information to secure competitive advantages. Companies need to develop strategies that help them to progress by leveraging the latest data analysis capabilities and technologies. While this is the case, current research underlines that analytics and big data (both covered by the Information dimension in this study) are very often handled by external partners (Davenport & Dyché, 2013). This finding is in line with other researchers, who discuss the creation of expert groups (Centres of Excellence or Centres of Expertise [COEs]) in some IT organisations. However, few companies are making efforts to rethink the overall structure of IT and giving the Information dimension a properly structured organisational 'home' – for example, with clear roles.

Nair & Narayanan (2012) state that most data is unstructured and must be integrated into a carefully considered strategy. A tacit implication of the authors' results is that introducing roles within an IT organisation would provide the foundation for a profitable information system strategy. Because the quality of information also has a significant impact on customer service capabilities (Dawson, 2003), data must be processed by organisational roles that combine both business and IT thinking.

The way data and information are handled gives rise to different organisational outcomes. To transform data into business success, it is necessary to understand its complexity and relevance. As a result, decisions are no longer made according to the 'HiPPO' (the highest-paid person's opinion) principle (McAfee & Brynjolfsson, 2012), but rather according to information determined from data by the two roles discussed in this study.

A separate organisational unit for Information-related roles like those highlighted in this dissertation (data scientists and information architects) would help companies understand the complex data they gather and determine how the information derived from it can be made useful. More detailed research is needed to determine how a dedicated unit working with all the data gathered might be structured. The various technological solutions available should be considered when determining the key functions of these roles.

Another explicit finding of the research for this study is that dedicated roles are significantly more important for executives than for non-executives. This is largely attributable to the fact that the information architect provides data-based information directly to executives. While this finding supports a potential hypothesis of a dedicated role for the information architect, it does not support the potential hypothesis of a dedicated role for the data scientist. While some researchers suggest that non-executives attribute greater importance than executives to the role of data scientist, this has not been confirmed (Provost & Fawcett, 2013). Further analysis revealed that executives and IT managers rate the roles significantly higher than other IT employees. Contrary to the author's expectations, this shows that the data scientist role is critical for business and IT decision-making. Because each of the dedicated roles connects the two disciplines as a separate unit, higher positions profit more from them, partly because they support the information-sharing and decision-making process. The following deep-dive figure illustrates the impact of the two roles on the decision-making processes within an organisation. This analysis was conducted as secondary research on the data set of this dissertation (Krimpmann & Stühmeier, 2017) and has helped to better understand the importance of the Information dimension for the ITODF.

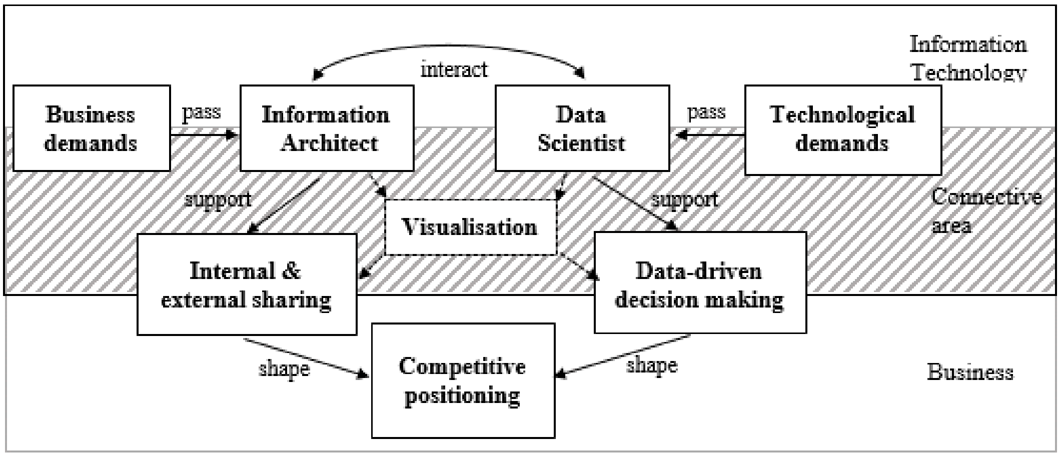

Figure 28: Information-Related Roles

Examining the importance of a dedicated organisational unit, Reich & Benbasat (2000) identified 'shared domain knowledge' as critical to the long-term alignment between IT and business executives. This underlines the importance of a separate, connecting unit that would bridge the gap between the domains by sharing knowledge. It also supports the notion that the dedicated roles attribute tasks more transparently and provide a more clearly defined way of assigning work (Ashforth & Mael, 1989). Huang, Zmud, & Price (2010) claim that IT governance benefits from executives' input aimed at strengthening the organisation's coordination between IT and business. Since executives are responsible for important business decisions, they may also want to include information that supports their choices. The research suggests that, when it comes to analytics and big data, better interaction between IT and the business, and better communication across the entire organisation are aspects that companies should work on. More research is required to identify the specific tasks assigned to the respective roles, as well as the technology that should be used and how to integrate it.

The additional study mentioned above (Krimpmann & Stühmeier, 2017) highlights visualisation as an important aspect of the two roles. Derived from the link between technological and business demands via the two roles, visualisation is critical to informed decision-making. Managers need to be able to understand patterns (information) found in the data as a basis for decisions-making. Al-Kassab, Ouertani, Schiuma, & Neely (2014) demonstrated the immense influence of information visualisation, not only on decision-making, but also on knowledge creation and as part of a communication channel. They outlined three different functions of visualising information. According to the authors, visualisation is 'a communication medium, a knowledge management means, and a decision-support instrument'. These functions would form the basis for using visualisation effectively as the connecting layer. In this dissertation, visualisation was assumed to be part of the data scientist and information architect roles. It might, however, be interesting to examine it more closely to identify the importance of visualising data within the dedicated roles. Further studies could investigate the specific workflows the two roles would deal with and create a communication concept for aligning IT and business.

Unless the patterns found in the data change business processes, monetising data is pointless. Monetisation is achieved by appropriate handling of vast data structures and can significantly impact the revenue of an organisation (Trnka, 2014). Different insights into customer information can function as unique resources from which to generate revenue. Having two dedicated positions within the company can enhance the effect of data use on overall business success. Baden-Fuller & Haefliger (2013) have presented a framework for enriching a business model with technological innovation to monetise value for the company. The present study builds on this by adding an organisational structure to the stated strategy. The two dedicated roles and the medium of visualisation offer a means of linking technology and company performance by facilitating the right business decisions when selecting technology (Baden-Fuller & Haefliger, 2013). This dissertation has therefore helped to derive and, to a certain extent, prove a practical implication for the ITODF arising from the Information dimension. This implication can, therefore, be classified as another key design principle.

6.7.4 #4 Decision-making is decentralised

During the past decade, the focus was on centralising core IT functions, including demand prioritisation, supplier relationship management and operations (Orta et al., 2014; Schmidtmann, 2010; Stantchev et al., 2013). The speed of developments in the new digital age forces organisations to make decentralised decisions and empower local practitioners, rather than imposing centralised governance on all IT employees, ultimately reducing agility.

Speed is achieved predominantly by putting less overhead into the decentralised entities and giving them the freedom to handle their own sourcing, management and decisions. Obviously, this will result in inefficiencies: for example, certain assets may be purchased twice or more (e.g. servers and sensors), or multiple entities may sign contracts with the same supplier. This implication must be operationalised wisely in conjunction with #1 because both affect the structure and processes for decentralised decision-making.

In practical terms, practitioners must analyse which IT-related decisions are currently taken at locations where no-one involved in the decisions is affected by them. This is the best starting point for uncovering decision-making inefficiencies, because the pace needed to meet digital business demands is so fast that decisions can be made only by individuals directly affected by the associated outcomes. Models like IS Lite or the CEB model do not consider this design principle as it was more critical to reach a bullet-proof decision that has been evaluated from all angles and has the blessing of the entire leadership. This is clearly no longer appropriate, and IT practitioners need to put the change into practice.

Figure 29 presents the attributes associated with decentralising decision-making. IT practitioners must be aware of these and counteract the obvious disadvantages. The following practical example shows how decentralised decision-making can result in much faster software delivery cycles but also give rise to financial inefficiencies:

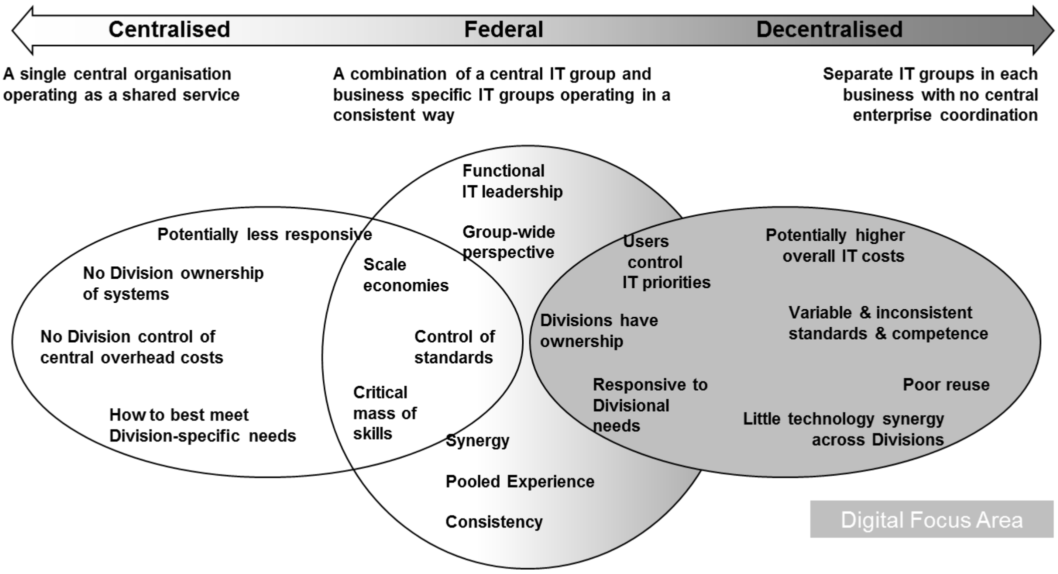

Figure 29: Decentralised Focus on IT Governance

The IT leadership of an SME decided to move from a centrally managed infrastructure provisioning team to a decentralised provisioning model where individual developer teams could independently provision IT infrastructure without having to comply with budget guidelines or gain approval within the IT organisation. Technically, the shift was from a dedicated internal server and storage environment to a remotely managed virtual private cloud set-up with Amazon Web Services (AWS). The immediate result was that complaints about provisioning timelines stopped, and the development teams were very satisfied with their freedom to deploy and retire systems depending on their business needs. Furthermore, the business also gave positive feedback as the testing environments could be deployed and made available to business testers much faster than in the past. On the downside, however, after six months of operation the IT controller recognised that IT infrastructure costs had tripled, especially for the teams using the new services from AWS. What had happened was that the different teams had stopped thinking of the environment costs and simply bought new server and storage instances without adjusting the technical architecture (e.g. there were extremely large replications between the in-house and the AWS data centres, generating very high inbound and outbound traffic costs). Moreover, none of the environments was shut down after being used. The result was a cost increase for capacity that no-one was using but that no-one was interested in optimising either. In this specific case, the CIO implemented a set of guiding principles that helped the team to optimise their use of the AWS services while also optimising the associated costs. In this example, IT developers were offered training on how to best use the AWS services. In addition, end-of-day scripts were installed that decommissioned existing test and development instances so that no costs were charged for the products. Finally, the IT architecture was optimised so that only a bare minimum of replication services was executed, significantly reducing inbound and outbound traffic.

This example shows that the agility gained by decentralised decision-making has a significant impact not only on business and IT satisfaction and cycle times, but also on the IT processes and policies that must be applied within an organisation. Therefore, where central decision authority is replaced by decentralised decision-making, IT practitioners should evaluate each aspect and must think through the potential implications of theses shifts on processes and costs.

6.7.5 #5 Sourcing does not differentiate, but automation does

One aspect of the digital era is that change is rapid and sometimes unwelcome, being driven by the actions of competitors or general industry changes. Agile IT organisations must be able to scale their capacity, as required. This is possible only with a certain degree of externally sourced capacity, which should be embedded in the operating model of every IT organisation in the digital age. The research for this dissertation has confirmed that sourcing is an important dimension of an ITODF, especially when it comes to the ability to quickly scale capacity up and down.

However, the low correlation of the Sourcing and the Structure dimensions identified in the data set – and backed up by the secondary research (see section 4.3) – reduces the importance of competitive differentiation referred to by some authors (Kaiser & Buxmann, 2012; Luzzini, Longoni, Moretto, Caniato, & Brun, 2013). The most relevant practical implication in this context concerns the ability to increase delivery capacity in a matter of a day or less. Other research results in this dissertation show that speed of delivery is an essential element of the key design dimensions: Strategy (through multiple speeds), Structure (through decentralised orientation) and Governance (through less hierarchical decision-making). It is therefore advisable to use an extended network of suppliers to ensure the delivery model includes the required capabilities. Furthermore, some authors refer to 'managed capacities' as one of the most advisable strategic set-ups (Steffen Fuchs & Shulman, 2013).

If we consider the implications of the Sourcing dimension from an IT practitioner's point of view, the suggestion is that each IT department should manage a defined supplier pool for a selected number of capabilities – depending on the degree of service coverage the respective IT organisation provides (ranging from service integration alone right through to end-to-end delivery in application development and application management). The process maturity evaluation referenced in Figure 27 is also extremely helpful here as it allows the different processes to be categorised in terms of their importance for the IT organisation. Practitioners should follow the steps below to derive a heatmap of processes for which they should prepare a supplier pool that allows them to scale their capacity up and down in the relevant areas.

1. Select the 10 most important processes in the IT organisation based on a standard framework like SAFe for programming or ITIL for operations in close collaboration with the key stakeholders in business and IT
2. Send out questionnaire asking selective IT and Business staff on each of the processes where they would map them on the 2x2 matrix illustrated in Figure 30

3. Select the commodity processes for the traditional business demand and the commodity processes for the digital business demands
4. Define the required IT staff capabilities that an external supplier would need to supply the commodity processes for the digital business demands
5. Define the required machine capabilities that an external supplier would need to supply the commodity processes for the traditional business demands
6. Run a supplier analysis on the given outputs from steps 1–5 and put together a supplier portfolio for the commodity processes for the digital business demands
7. Define a fit/gap analysis to identify where external suppliers could provide an automated alternative for running the commodity processes for the traditional business demands
8. Where gaps are identified, step 7 (a dedicated run of step 6) is also required for those capabilities

Following these eight steps allows IT practitioners to easily build a scalable model for the commodity processes within an IT organisation. Some researchers also suggest using robots to execute commodity processes for the digital business demands (Lacity et al., 2015). For the time being, however, the findings of this dissertation support the recommendation that machines should be used only in the commodity space for traditional business demands as these demands lack creative components that cannot be handled by robots.

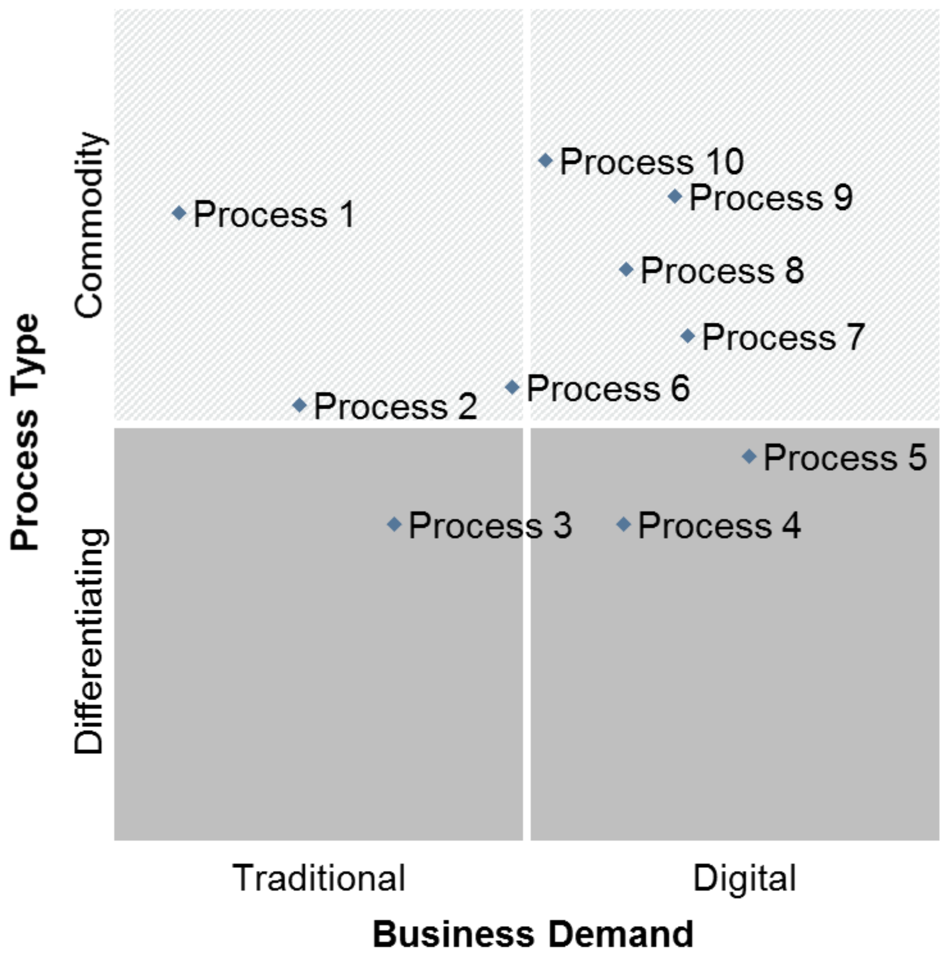

Figure 30: 2x2 Matrix – External Supplier Focus

6.8 ANSWERS TO RESEARCH QUESTION

This section reviews the four research questions which were initially raised in this dissertation (Section 1.2) and gives the answers to them based on the results in this dissertation.

RQ1: What (IT) organisation design theories and models already exist?

Six different organisation design frameworks have been identified in this dissertation. Three are overarching organisation design frameworks while three are IT organisation design frameworks.

1. McKinsey 7-S Framework
2. Burke-Litwin Model
3. Galbraith's Star Model
4. IS Success Model
5. IS LITE Model
6. World-Class IT Organisation

RQ2: What dimensions must an IT organisation design framework have in a digital world?

This dissertation has identified six dimensions that an IT organisation design framework needs to have.

1. Strategy
2. Structure
3. Governance
4. Processes
5. Information
6. Sourcing

RQ3: What determines a successful IT organisation design framework in a digitised world?

The six identified dimensions must be managed in three clusters to successfully implement the ITODF. These clusters are as follows:

1. Structured Agility
2. Decentralised Value Creation
3. Fluid Workforce

RQ4: What are the implications for using the IT organisation design framework in a practical environment?

Five practical implications have been identified in this dissertation. These are listed below:

1. #1 Strategy and Structure are important: Hierarchies are not
2. #2 Processes are necessary but should not be exaggerated
3. #3 Data Insights are relevant only if they are monetised
4. #4 Decision-making is decentralised
5. #5 Sourcing does not differentiate, but Automation does

7 LIMITATIONS

Limitations were recorded throughout the research process for this dissertation. These are presented in the following subsections.

7.1 PARTICIPANT GROUP

The survey was answered by respondents from three geographical areas. A more comprehensive design, including more countries, would have potentially helped to identify more geographical differences. While Europe, North America and the APAC region were covered, Africa and South American countries would also need to be surveyed to gain genuinely global survey results and thus a proven global ITODF.

7.2 COMPANY SIZE

The quantitative research was conducted exclusively with selected big corporations. It therefore represents only one specific group of companies and does not provide a comprehensive review of all company sizes. Because the initial survey respondents were selected from Fortune 500 corporations and slightly amended to include other companies, only very few IT practitioners from SMEs participated. The results of the study should therefore be seen primarily as an indicator for larger organisations and should be analysed further in additional research. However, because a small number of the IT practitioners surveyed work for SMEs, it was possible to examine how the IT practitioners’ rankings of the dimensions differ depending on company size.

7.3 LEVEL OF DETAIL

This dissertation has aimed to create one overall view of an IT organisation framework by analysing which dimensions are most relevant when designing an IT organisation in the digital age. The research of this dissertation picked the top areas of interest based on analysis of 51 peer-reviewed articles. In these articles, only the text snippets with 90% of the overall sum were analysed further (see Table 16). Additional research is recommended to perform detailed analysis on each of the organisational dimensions outlined here to determine whether there is further support for the topics discussed in this dissertation.

7.4 PRACTITIONER HANDBOOK

The fourth aspect into which further research is recommended concerns the practitioner tools required in practice. Primary research often cannot be utilised to its full extent because the results are too vague or too theoretical for practical application. It would therefore be advisable to perform another analysis to determine which tools should be taken into consideration by practitioners when implementing the results in a real-world setting.

8 FURTHER RESEARCH

During the research for the dissertation, several indications of directions for future research were collected.

8.1 BUSINESS RESPONDENTS

The ITODF was confirmed and developed with 403 IT practitioners. The research has shown that IT is much more becoming a critical part of the business in the digital age than it was ever before. Because only IT practitioners answered the questionnaire, further research should be conducted with a similar group of business representatives to survey their views on the different dimensions and the hypotheses developed within the scope of this dissertation.

This dissertation opened with the statement that the line between IT and business is becoming increasingly blurred and that these two areas need to collaborate far more closely if they are to avoid becoming totally disconnected from each other. If that were to occur, the result would most likely be a pure business organisation that sources IT capabilities externally and develops the required capabilities internally in the business units. This lends weight to the need for further research focusing on the same area but with a different set of respondents from a purely business background. The results of this research could then be compared with the findings of this dissertation and evaluated in a common way to determine where business and IT practitioners have different points of view on the same context.

Finally, business respondents might also provide additional insight into the different organisational dimensions defined in this dissertation. Each dimension could then be explored in greater detail, thus delivering even more insights that IT and business practitioners could apply in real-world scenarios.

8.2 PEOPLE DIMENSION

As the result of a lack of statistical evidence and the falsification of the people-related hypothesis, the People dimension was removed from the model. However, during the work on this dissertation, it became evident to the author that there are people-related implications and requirements for organisational change in all the other dimensions – a conclusion also supported by secondary research. It is therefore recommended that further research specifically examine the people-related implications for IT organisation design in the digital age.

From the qualitative and quantitative research in this dissertation, it is not entirely clear why the People-related hypothesis and the People-orientated statement were falsified. However, the secondary research analysed in the QCA and the further quantitative analysis show that all the remaining dimensions confirmed in the confirmatory research for this dissertation make reference to capabilities that must be enhanced or changed if the IT organisation to master the challenges of the digital age. The Strategy dimension requires the organisation to work at different speeds, which means that people must be more open to immediate changes on a day-to-day basis. Structure calls for much closer collaboration with the business and requires people to develop purely business-orientated skills. Governance involves people playing a much greater part in decision-making and taking on responsibilities. Information entails completely new roles with different capability requirements catalogues, which all members of staff in the organisation must work with. People need to acquire far stronger quantitative capabilities like data analytics or number analysis rather than development and administration skills. Processes will have less and less structure. While this poses considerable challenges for existing IT organisation staff, it is a key aspect for new employees from Generation Y and Generation Z. Existing staff therefore needs training – either in the form of self-study or professional courses – to cope with the transition from a highly structured environment to a very open and agile way of working. Finally, Sourcing increasingly entails people collaborating closely with machines (in the form of soft or hard robots). This also requires an ability to cope with such changes, which must be taken into consideration when designing IT organisations and hiring new employees.

All of these aspects show that additional research is needed to analyse the People dimension of the initial ITODF in more detail to review why the dimension was ruled out as part of the research conducted in this dissertation.

8.3 SECURITY

Responses to the open question requested data security as an additional dimension of the evaluated ITODF. This aspect was mentioned by IT practitioners from all participating groups and different geographical regions.

Data security becomes especially a strong risk when a growing number of business processes are automated or outsourced to external partners as the data it out of control of the organisation's human beings. Additionally, this dissertation has shown that robotic process automation is a key aspect of an ITODF in the digital age which will further strengthen the outlined risk. The more processes are completely executed by robots or systems, the higher the risk of hackers breaking into the systems and shutting down or manipulating the business processes. During the past 20 years, the threat was of a totally different type. Then, the main risk was of hackers accessing confidential data and integrating it into their data analytics. Today, the danger is that hackers can directly access the business processes that are at the heart of an organisation's business model. The following scenario is one possible example of this:

A semi-conductor company operates a fully automated production chain incorporating robots, and analytics tools for identifying potential for improvement throughout the manufacturing process. The production chain has a daily output of approximately 100,000 units. A hacker attack targets the robots and the analytics element and makes a slight, initially undetectable adjustment to the engineering plan. The final product is produced by the robots and delivered to the customer base. It is then used by customers but causes casualties because of the slight change the hackers made to the engineering plan. This example shows the scale of the potential threat and its possible effects on a large group of people, resulting even in serious injury.

In view of these dangers, the author of this dissertation strongly recommends performing detailed analysis focusing exclusively on the organisational dimension of Security. The aim here would be to understand not only the capabilities that must be established, but also the general technical and architectural conditions required to reduce the technical threat.

8.4 MORE THAN TWO SPEEDS

It became obvious while analysing the Strategy-related responses and the QCA that more than just two speeds (agile and traditional) are required. Further research should therefore examine the Strategy dimension in greater depth and determine whether there are other indications that IT organisations need to consider more than just the two speeds discussed in this dissertation.

This dissertation makes specific reference to the publication of Shimel (2016), which states that two speeds are not sufficient for an IT organisation in the digital age. Other authors have voiced the opinion that everything is returning to just one speed, and this speed is agile (Michael Grebe, 2017). The authors make a clear point that the more complexity is incorporated into IT organisations, the less effective and efficient they will become – simplification of IT is their key message.

The two different points of view and the results of this dissertation strongly support the need for additional research into the specific speeds required.

9 AFTERWORD

The author hopes that the ITODF developed in this dissertation will help practitioners to create successful IT organisation designs in the digital age. It was and remains a key objective that the results of this research be put directly put into practice to help companies to successfully manage their digital transformation.

In retrospect, the process was something of a roller-coaster ride, with various ups and downs along the way. I would like to thank my wife Verena for her constant support and day-to-day back-up along the last years, my mother Gaby for equipping me with the ability to never give up, even if it doesn’t look like it is ending successfully, my dad Alfons for looking at the bright side in life first, my sister Alexandra, that didn’t know that she was helping out by handling everything I couldn’t do, my doctoral supervisor Prof. Dr. Gonzalo Wandosell Fernández de Bobadilla and Prof. Dr. Rüdiger Buchkremer for their continuous support, especially in overcoming teething troubles with the dissertation in the early stages. Finally, a big thank-you to Philipp, Fabiola and Anna for their support throughout the journey.

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GLOSSARY

Term	Definition
Analytics	Structured and largely automated analysis of a wide range of data
Augmented reality	Enhancement of the real world by means of layering elements on top of it – for example, a heads-up display is an example of a real-world element (what the driver sees through the windscreen) with additional information displayed on the windscreen (e.g. distance to the car in front)
Business enablement	Activities that support the business in its tasks
Customer relationship management (CRM)	An organisational function that handles all customer-related requests, complaints and communications
Connected products	Explains the way a physical product is enhanced or amended with a virtual service on top of it. Airbnb is a very good example of such a connected product, where the flat is the physical product and the platform the virtual service
Connected operations	The enhancement of internal physical processes with various technologies to lift efficiencies and gather data along the process flow
Cloud computing	The use of infrastructure services (e.g. computing power) provided via a secure internet connection
Collaboration 2.0	The use of communication software to streamline collaboration (e.g. internal communication portals, Facebook)
Data monetisation	Data analysis aimed at selling information derived from the data to a third party
ERP system	Software solution for transparent management of processes within a company (ERP = enterprise resource planning)
Industry 4.0	The fourth industrial revolution, involving widespread interconnection of physical systems and machine-to-machine communication

Term	Definition
Mobile computing	The shift from stationary devices (e.g. tower computers) to portable devices that enable computing power to be used on the move
Omni-channel	Interaction between a sender and a receiver via all available communication channels
Point of sale	The time and place where retail transactions are completed.
Robotic process automation	A way of automating the process flow by means of physical or soft robots

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APPENDIX 1: QCA TEXT SNIPPETS

The following tables illustrate the output of the MAXQDA tool. Sometimes the information look like something is missing (e.g. words are cut before they properly end, words start or end with capital letters). This is the way the tool stores the information. The author has purposely not changed the information for publication.

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
1	Ubiquitous IT The case of the Boeing 787 and implications for s	Strategy\STRAT-Role Clarity	916	1361	11
2	BYOD – enabling the chaos	Strategy\STRAT-Role Clarity	1103	1356	3
3	Today's IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Role Clarity	662	880	2
4	IT Sourcing in the Cloud – Challenge or Opportunity	Strategy\STRAT-Role Clarity	468	625	2
5	Avoiding the schizophrenic IT organisation	Strategy\STRAT-Role Clarity	1157	1335	1
6	Avoiding the schizophrenic IT organisation	Strategy\STRAT-Role Clarity	1336	1533	1
7	Today's CIO needs to be the Chief Innovation Manager	Strategy\STRAT-Role Clarity	687	875	2
8	Today's CIO needs to be the Chief Innovation Manager	Strategy\STRAT-Role Clarity	1667	2025	2
9	The digital tipping point	Strategy\STRAT-Role Clarity	906	979	2
10	Two-Speed IT	Strategy\STRAT-Role Clarity	283	523	4
11	Strategic principles for competing in the digital age	Strategy\STRAT-Role Clarity	1699	1986	12
12	From data breach to information stewardship	Strategy\STRAT-Visionary Leadership	2211	2392	3
13	BYOD – enabling the chaos	Strategy\STRAT-Visionary Leadership	1968	2166	1

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
14	Today's IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Visionary Leadership	1346	1757	18
15	Today's IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Visionary Leadership	1876	2149	22
16	Today's IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Visionary Leadership	1698	1937	26
17	IT Governance, Decision-Making and IT Capabilities	Strategy\STRAT-Visionary Leadership	364	593	1
18	IT Governance, Decision-Making and IT Capabilities	Strategy\STRAT-Visionary Leadership	3531	3889	2
19	On-demand growth	Strategy\STRAT-Visionary Leadership	100	437	3
20	On-demand growth	Strategy\STRAT-Visionary Leadership	2582	3014	2
21	Exploratory Study on Alignment Between IT and Business Strategi	Strategy\STRAT-Visionary Leadership	476	847	20
22	Achieving IT-Enabled Enterprise Agility in China – An IT Organi	Strategy\STRAT-Visionary Leadership	1993	2517	3
23	Achieving IT-Enabled Enterprise Agility in China – An IT Organi	Strategy\STRAT-Visionary Leadership	2011	2099	12
24	Achieving IT-Enabled Enterprise Agility in China – An IT Organi	Strategy\STRAT-Visionary Leadership	2276	2569	12

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
25	Dieter Haban	Strategy\STRAT-Visionary Leadership	1158	1314	1
26	Dieter Haban	Strategy\STRAT-Visionary Leadership	1868	2073	3
27	CIOs should spend more time building knowledge outside the IT d	Strategy\STRAT-Visionary Leadership	2930	3278	1
28	Avoiding the schizophrenic IT organisation	Strategy\STRAT-Visionary Leadership	1336	1533	1
29	Avoiding the schizophrenic IT organisation	Strategy\STRAT-Visionary Leadership	3592	3758	1
30	Islandwide's cutting-edge IT department optimizes customer serv	Strategy\STRAT-Visionary Leadership	1347	1536	1
31	Two-Speed IT	Strategy\STRAT-Visionary Leadership	227	384	1
32	Two-Speed IT	Strategy\STRAT-Visionary Leadership	649	827	3
33	Reinventing IT to support digitization	Strategy\STRAT-Visionary Leadership	263	545	2
34	Reinventing IT to support digitization	Strategy\STRAT-Visionary Leadership	1221	1431	1
35	IT leadership from a problem-solving perspective	Strategy\STRAT-Visionary Leadership	2062	2154	7

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
36	Managing Alternative Sourcing	Strategy\STRAT-Goals and Objectives	2254	2594	2
37	Assessing and governing IT-staff behavior by performance-based	Strategy\STRAT-Goals and Objectives	422	591	1
38	Today's CIO needs to be the Chief Innovation Manager	Strategy\STRAT-Goals and Objectives	887	1007	1
39	Reinventing IT to support digitization	Strategy\STRAT-Goals and Objectives	2081	2303	1
40	Reinventing IT to support digitization	Strategy\STRAT-Goals and Objectives	2304	2436	1
41	Software as a Service Adoption – Impact on IT Workers and Funct	Strategy\STRAT-Information	5683	5942	4
42	Software as a Service Adoption – Impact on IT Workers and Funct	Strategy\STRAT-Information	89	864	5
43	Software as a Service Adoption – Impact on IT Workers and Funct	Strategy\STRAT-Information	1891	2153	3
44	Software as a Service Adoption – Impact on IT Workers and Funct	Strategy\STRAT-Information	1931	2510	4
45	An Analysis of Vendor Lock-in Problem in Cloud Storage	Strategy\STRAT-Information	1408	1970	2
46	An Analysis of Vendor Lock-in Problem in Cloud Storage	Strategy\STRAT-Information	1269	1748	1
47	The impact of Cloud Computing	Strategy\STRAT-Information	290	1715	7
48	The impact of Cloud Computing	Strategy\STRAT-Information	47	374	8

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
49	The impact of Cloud Computing	Strategy\STRAT-Information	235	1706	8
50	The impact of Cloud Computing	Strategy\STRAT-Information	38	973	9
51	The impact of Cloud Computing	Strategy\STRAT-Information	1272	1939	16
52	The impact of Cloud Computing	Strategy\STRAT-Information	276	1384	17
53	The impact of Cloud Computing	Strategy\STRAT-Information	68	343	18
54	The impact of Cloud Computing	Strategy\STRAT-Information	530	1083	18
55	The impact of Cloud Computing	Strategy\STRAT-Information	45	1019	20
56	The impact of Cloud Computing	Strategy\STRAT-Information	1815	3078	21
57	The impact of Cloud Computing	Strategy\STRAT-Information	1642	1813	21
58	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	327	470	7
59	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	5727	5913	7
60	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	5928	6126	7
61	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	2498	2706	8
62	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	1227	1285	8
63	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	3447	3780	8
64	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	5540	5754	8

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
65	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	682	881	10
66	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Information	4293	4573	10
67	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1031	1170	2
68	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1172	1458	2
69	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1223	1642	5
70	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1779	2122	5
71	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	318	835	6
72	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	2609	2900	6
73	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	481	567	7
74	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1346	1571	7
75	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	3563	3836	7

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
76	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	559	757	8
77	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1051	1191	8
78	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	592	824	8
79	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	2989	3138	8
80	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	4402	4486	8
81	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	64	212	9
82	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1755	1983	9
83	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	2426	2749	9
84	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	3835	4222	9
85	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	1638	1803	10
86	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	371	813	10

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
87	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	597	828	10
88	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	2133	2338	11
89	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Information	348	583	12
90	Mobile Cloud Computing	Strategy\STRAT-Information	3109	3281	1
91	Mobile Cloud Computing	Strategy\STRAT-Information	4815	5152	3
92	Mobile Cloud Computing	Strategy\STRAT-Information	3400	3513	8
93	Approximate Incremental Big-Data Harmonization	Strategy\STRAT-Information	1250	1584	1
94	The Collaborative Organisation – How to Make Employee Networks	Strategy\STRAT-Information	384	754	2
95	Alignment within the software development unit	Strategy\STRAT-Information	5634	5758	2
96	Developing a Framework for Maturing IT Risk Management Capabili	Strategy\STRAT-Information	420	693	4
97	Leveraging the capabilities of service-oriented decision suppor	Strategy\STRAT-Information	488	722	2
98	Leveraging the capabilities of service-oriented decision suppor	Strategy\STRAT-Information	724	961	2
99	Cloud computing as an innovation – perception, attitude and ado	Strategy\STRAT-Information	2634	2768	2

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
100	Cloud computing as an innovation – perception, attitude and ado	Strategy\STRAT-Information	1786	2069	8
101	Cloud computing as an innovation – perception, attitude and ado	Strategy\STRAT-Information	2769	2984	2
102	Leveraging the capabilities of service-oriented decision suppor	Strategy\STRAT-Information	1254	1378	1
103	Leveraging the capabilities of service-oriented decision suppor	Strategy\STRAT-Information	1732	2115	9
104	Organisational design of IT supplier relationship management	Strategy\STRAT-Information	4808	4945	8
105	Organisational design of IT supplier relationship management	Strategy\STRAT-Information	5114	5277	8
106	Organisational design of IT supplier relationship management	Strategy\STRAT-Information	4485	4633	10
107	Organisational design of IT supplier relationship management	Strategy\STRAT-Information	4634	4894	10
108	Organisational design of IT supplier relationship management	Strategy\STRAT-Information	2604	2814	11
109	Organisational design of IT supplier relationship management	Strategy\STRAT-Information	462	628	12
110	Advantages and challenges of adopting cloud computing from an e	Strategy\STRAT-Information	4962	5080	3

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
111	Ubiquitous IT The case of the Boeing 787 and implications for s	Strategy\STRAT-Information	2587	2793	1
112	Navigating the new threat landscape	Strategy\STRAT-Information	293	551	1
113	Navigating the new threat landscape	Strategy\STRAT-Information	2849	3237	1
114	Navigating the new threat landscape	Strategy\STRAT-Information	3264	3480	1
115	Navigating the new threat landscape	Strategy\STRAT-Information	3619	3910	1
116	Navigating the new threat landscape	Strategy\STRAT-Information	3483	3617	1
117	Navigating the new threat landscape	Strategy\STRAT-Information	1022	1472	3
118	Navigating the new threat landscape	Strategy\STRAT-Information	1505	1783	3
119	social-media-strategies	Strategy\STRAT-Information	1952	2202	2
120	social-media-strategies	Strategy\STRAT-Information	473	745	3
121	The impact of IT over five decades – Towards the Ambient Organiz	Strategy\STRAT-Information	5509	5823	7
122	BYOD – enabling the chaos	Strategy\STRAT-Information	3669	3913	1
123	BYOD – enabling the chaos	Strategy\STRAT-Information	460	756	3
124	BYOD – enabling the chaos	Strategy\STRAT-Information	2033	2227	4
125	Today’s IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Information	408	660	2
126	Today’s IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Information	2123	2428	5
127	Today’s IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Information	2182	2281	12

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
128	Today's IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Information	30	348	13
129	Today's IT Organisation – Delivering Security, Value and Perfor	Strategy\STRAT-Information	976	1097	22
130	Leading the Higher Education IT Organisation	Strategy\STRAT-Information	661	825	3
131	Project Management Offices in the IT Area	Strategy\STRAT-Information	4410	4670	1
132	The Discipline of Strategic IT Sourcing	Strategy\STRAT-Information	3280	3825	2
133	Managing Alternative Sourcing	Strategy\STRAT-Information	1184	1539	1
134	IT Choices and the Clouds	Strategy\STRAT-Information	4439	4781	2
135	IT Sourcing in the Cloud – Challenge or Opportunity	Strategy\STRAT-Information	627	1082	2
136	From data breach to information stewardship	Strategy\STRAT-Information	480	602	2
137	Creating IT Shared Services	Strategy\STRAT-Information	4697	5167	6
138	Assessing and governing IT-staff behavior by performance-based	Strategy\STRAT-Information	6337	6687	4
139	It is all about what we have – A discriminant analysis of organ	Strategy\STRAT-Information	1680	2230	1
140	It is all about what we have – A discriminant analysis of organ	Strategy\STRAT-Information	2478	2900	5
141	It is all about what we have – A discriminant analysis of organ	Strategy\STRAT-Information	3403	3731	5
142	Auditing the Clouds coming down to earth	Strategy\STRAT-Information	2701	2939	2
143	Business Failure, Cloud Success	Strategy\STRAT-Information	4724	5013	3
144	Business Failure, Cloud Success	Strategy\STRAT-Information	1320	1524	4

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
145	Business Failure, Cloud Success	Strategy\STRAT-Information	5340	5481	4
146	On demand growth	Strategy\STRAT-Information	145	334	4
147	On demand growth	Strategy\STRAT-Information	2443	2679	4
148	On demand growth	Strategy\STRAT-Information	2963	3124	4
149	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Information	558	783	1
150	Cloud Computing and the Power to Choose	Strategy\STRAT-Information	2047	2221	2
151	Cloud Computing and the Power to Choose	Strategy\STRAT-Information	3799	3933	9
152	Exploratory Study on Alignment Between IT and Business Strategi	Strategy\STRAT-Information	2564	2766	3
153	Exploratory Study on Alignment Between IT and Business Strategi	Strategy\STRAT-Information	101	412	3
154	Dieter Haban	Strategy\STRAT-Information	1158	1314	1
155	Tapping into Silicon Valley	Strategy\STRAT-Information	3852	3959	1
156	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Information	82	240	18
157	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Information	83	405	29
158	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Information	778	891	39
159	Business IT Fusion – Developing a Shared World View	Strategy\STRAT-Information	2139	2497	1
160	Business IT Fusion – Developing a Shared World View	Strategy\STRAT-Information	803	1216	6

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
161	The digital tipping point	Strategy\STRAT-Information	94	495	4
162	The digital tipping point	Strategy\STRAT-Information	897	1115	1
163	Seven traits of successful digital businesses	Strategy\STRAT-Information	34	319	7
164	Strategic principles for competing in the digital age	Strategy\STRAT-Information	1544	1786	10
165	Strategic principles for competing in the digital age	Strategy\STRAT-Information	428	779	11
166	IT leadership from a problem-solving perspective	Strategy\STRAT-Speeds of Delivery	25	125	9
167	IT leadership from a problem-solving perspective	Strategy\STRAT-Speeds of Delivery	1388	1618	13
168	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	1285	1510	3
169	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	496	688	4
170	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	1071	1298	4
171	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	2912	3123	4
172	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	3466	3799	4
173	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	4742	5135	4
174	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	1588	1778	5

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
175	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	3343	3737	5
176	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	4428	4616	5
177	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	1386	1785	6
178	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	2895	3222	6
179	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	5323	5544	6
180	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	2085	2356	7
181	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	2498	2706	8
182	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	1227	1285	8
183	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	5540	5754	8
184	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	2786	3178	9
185	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	1174	1419	12

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
186	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	3755	3875	12
187	Key information technology and management issues 2012–2013 – an	Strategy\STRAT-Speeds of Delivery	2539	2826	13
188	IT leadership from a problem-solving perspective	Strategy\STRAT-Speeds of Delivery	569	621	7
189	Evaluation Criteria for Cloud Services	Strategy\STRAT-Speeds of Delivery	3702	3961	2
190	Evaluation Criteria for Cloud Services	Strategy\STRAT-Speeds of Delivery	4047	4174	2
191	Evaluation Criteria for Cloud Services	Strategy\STRAT-Speeds of Delivery	4324	4566	2
192	Evaluation Criteria for Cloud Services	Strategy\STRAT-Speeds of Delivery	780	1026	3
193	Evaluation Criteria for Cloud Services	Strategy\STRAT-Speeds of Delivery	1355	1762	4
194	Assessing Organisational Learning in IT organisations	Strategy\STRAT-Speeds of Delivery	577	841	1
195	Assessing Organisational Learning in IT organisations	Strategy\STRAT-Speeds of Delivery	887	1189	2
196	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	2113	2211	6

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
197	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	3337	3501	6
198	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	2354	2545	7
199	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	314	451	9
200	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	1725	1823	11
201	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	2957	3057	11
202	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	3490	3616	11
203	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Strategy\STRAT-Speeds of Delivery	2026	2321	4
204	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	193	546	1
205	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	548	917	1
206	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	2162	2450	1
207	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	2766	2915	1

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
208	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	3580	3799	1
209	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	4342	4478	1
210	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	4737	4817	6
211	Multicloud Deployment of Computing Clusters for Loosely Coupled	Strategy\STRAT-Speeds of Delivery	2452	2765	1
212	Mobile Cloud Computing	Strategy\STRAT-Speeds of Delivery	330	516	1
213	Mobile Cloud Computing	Strategy\STRAT-Speeds of Delivery	3109	3281	1
214	Mobile Cloud Computing	Strategy\STRAT-Speeds of Delivery	4813	5109	9
215	Mobile Cloud Computing	Strategy\STRAT-Speeds of Delivery	4460	4853	4
216	Alignment within the software development unit	Strategy\STRAT-Speeds of Delivery	1019	1234	1
217	Alignment within the software development unit	Strategy\STRAT-Speeds of Delivery	661	796	3
218	Alignment within the software development unit	Strategy\STRAT-Speeds of Delivery	799	877	3

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219	Alignment within the software development unit	Strategy\STRAT-Speeds of Delivery	882	1376	12
220	IT Project Portfolio Governance – The Emerging Operation Manage	Strategy\STRAT-Speeds of Delivery	101	378	1
221	Developing a Framework for Maturing IT Risk Management Capabili	Strategy\STRAT-Speeds of Delivery	3030	3532	1
222	Developing a Framework for Maturing IT Risk Management Capabili	Strategy\STRAT-Speeds of Delivery	724	825	1
223	Leveraging the capabilities of service-oriented decision suppor	Strategy\STRAT-Speeds of Delivery	1670	2130	1
224	Cloud computing as an innovation – perception, attitude and ado	Strategy\STRAT-Speeds of Delivery	3889	4120	2
225	Cloud computing as an innovation – perception, attitude and ado	Strategy\STRAT-Speeds of Delivery	3176	3330	3
226	Organisational design of IT supplier relationship management	Strategy\STRAT-Speeds of Delivery	2426	2668	1
227	Advantages and challenges of adopting cloud computing from an e	Strategy\STRAT-Speeds of Delivery	322	564	2
228	Advantages and challenges of adopting cloud computing from an e	Strategy\STRAT-Speeds of Delivery	2104	2320	2
229	Advantages and challenges of adopting cloud computing from an e	Strategy\STRAT-Speeds of Delivery	2504	2999	2

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230	Advantages and challenges of adopting cloud computing from an e	Strategy\STRAT-Speeds of Delivery	2121	2506	3
231	Advantages and challenges of adopting cloud computing from an e	Strategy\STRAT-Speeds of Delivery	1347	1681	4
232	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	2450	2689	1
233	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	1762	1901	3
234	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	1905	2114	3
235	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	72	225	4
236	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	231	304	4
237	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	312	412	4
238	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	89	177	7
239	ERP and big Data – The Inept Couple	Strategy\STRAT-Speeds of Delivery	416	647	4
240	social-media-strategies	Strategy\STRAT-Speeds of Delivery	2668	2982	1

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241	Knowledge transfer and utilization in IT outsourcing partnershi	Strategy\STRAT-Speeds of Delivery	1290	1552	1
242	Knowledge transfer and utilization in IT outsourcing partnershi	Strategy\STRAT-Speeds of Delivery	2453	2701	1
243	Knowledge transfer and utilization in IT outsourcing partnershi	Strategy\STRAT-Speeds of Delivery	2300	2631	7
244	BYOD – enabling the chaos	Strategy\STRAT-Speeds of Delivery	1758	1966	1
245	IT Organisations Increase Reliance on Project Management	Strategy\STRAT-Speeds of Delivery	1042	1240	1
246	Network Support Staff Under Pressure	Strategy\STRAT-Speeds of Delivery	888	1223	7
247	IT governance and being lean	Strategy\STRAT-Speeds of Delivery	61	219	2
248	The Cloud as an IT Sourcing Strategy	Strategy\STRAT-Speeds of Delivery	2996	3244	2
249	The Cloud as an IT Sourcing Strategy	Strategy\STRAT-Speeds of Delivery	3568	3849	2
250	The Discipline of Strategic IT Sourcing	Strategy\STRAT-Speeds of Delivery	2282	2713	1
251	The Discipline of Strategic IT Sourcing	Strategy\STRAT-Speeds of Delivery	1820	2185	3

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253	IT Sourcing Decisions – A Calculus of Risk and Reward	Strategy\STRAT-Speeds of Delivery	2649	2831	1
254	IT Sourcing Decisions – A Calculus of Risk and Reward	Strategy\STRAT-Speeds of Delivery	2834	2940	1
255	IT Sourcing Decisions – A Calculus of Risk and Reward	Strategy\STRAT-Speeds of Delivery	2941	3079	1
256	IT Sourcing Decisions – A Calculus of Risk and Reward	Strategy\STRAT-Speeds of Delivery	3081	3518	1
257	Managing Alternative Sourcing	Strategy\STRAT-Speeds of Delivery	4839	5224	1
258	Managing Alternative Sourcing	Strategy\STRAT-Speeds of Delivery	3950	4100	1
259	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	2175	2656	1
260	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	1492	1742	2
261	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	1747	1968	2
262	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	2107	2285	2

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263	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	2825	2958	2
264	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	2962	3006	2
265	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	3010	3152	2
266	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	3441	3596	2
267	IT Choices and the Clouds	Strategy\STRAT-Speeds of Delivery	3240	3362	2
268	IT Sourcing in the Cloud – Challenge or Opportunity	Strategy\STRAT-Speeds of Delivery	151	500	1
269	Creating IT Shared Services	Strategy\STRAT-Speeds of Delivery	453	877	2
270	Creating IT Shared Services	Strategy\STRAT-Speeds of Delivery	4330	4609	9
271	It is all about what we have – A discriminant analysis of organ	Strategy\STRAT-Speeds of Delivery	2902	3240	5
272	Auditing the Clouds coming down to earth	Strategy\STRAT-Speeds of Delivery	257	472	1
273	Business Failure, Cloud Success	Strategy\STRAT-Speeds of Delivery	291	488	4

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274	Business Failure, Cloud Success	Strategy\STRAT-Speeds of Delivery	5483	5756	4
275	On demand growth	Strategy\STRAT-Speeds of Delivery	1702	1890	2
276	On demand growth	Strategy\STRAT-Speeds of Delivery	1657	1828	3
277	On demand growth	Strategy\STRAT-Speeds of Delivery	3236	3487	3
278	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	1907	2080	2
279	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	2220	2382	2
280	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	717	930	3
281	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	1786	2033	3
282	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	2035	2299	3
283	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	2301	2547	3
284	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	2674	2889	3

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285	A community cloud can help CUs improve productivity and reduce	Strategy\STRAT-Speeds of Delivery	2675	2860	2
286	Cloud Computing and the Power to Choose	Strategy\STRAT-Speeds of Delivery	1814	2042	2
287	Cloud Computing and the Power to Choose	Strategy\STRAT-Speeds of Delivery	2824	3064	9
288	Tapping into Silicon Valley	Strategy\STRAT-Speeds of Delivery	1417	1688	1
289	Today's CIO needs to be the Chief Innovation Manager	Strategy\STRAT-Speeds of Delivery	3398	3742	2
290	Islandwide's cutting-edge IT department optimizes customer serv	Strategy\STRAT-Speeds of Delivery	2665	2912	1
291	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Speeds of Delivery	922	1250	18
292	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Speeds of Delivery	2347	2465	22
293	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Speeds of Delivery	3347	3703	23
294	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Speeds of Delivery	458	737	30
295	High Performers in IT – Defined by Digital reviewed by The IT r	Strategy\STRAT-Speeds of Delivery	44	188	31

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297	Governance Framework for Cloud Computing	Strategy\STRAT-Speeds of Delivery	1067	1224	5
298	Governance Framework for Cloud Computing	Strategy\STRAT-Speeds of Delivery	1229	1326	5
299	Governance Framework for Cloud Computing	Strategy\STRAT-Speeds of Delivery	1681	1863	5
300	Governance Framework for Cloud Computing	Strategy\STRAT-Speeds of Delivery	2245	2375	5
301	The digital tipping point	Strategy\STRAT-Speeds of Delivery	84	398	2
302	Ten IT-enabled business trends for the decade ahead	Strategy\STRAT-Speeds of Delivery	425	727	2
303	Ten IT-enabled business trends for the decade ahead	Strategy\STRAT-Speeds of Delivery	3	97	5
304	Ten IT-enabled business trends for the decade ahead	Strategy\STRAT-Speeds of Delivery	1349	1586	13
305	Strategic principles for competing in the digital age	Strategy\STRAT-Speeds of Delivery	34	405	5
306	Alignment within the software development unit	Structure	4419	4620	12
307	Alignment within the software development unit	Structure	6370	6675	12
308	Avoiding the schizophrenic IT organisation	Structure	2196	2552	1

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309	Avoiding the schizophrenic IT organisation	Structure	2554	2932	1
310	The digital tipping point	Structure	1126	1512	6
311	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	1401	1596	2
312	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	1636	1853	2
313	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	196	409	6
314	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	1060	1170	2
315	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	2403	2653	7
316	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	1689	1819	9
317	Us and them – a social capital perspective on the relationship	Structure\STRU-Team Autonomy	5349	5593	2
318	Us and them – a social capital perspective on the relationship	Structure\STRU-Team Autonomy	104	302	3
319	Us and them – a social capital perspective on the relationship	Structure\STRU-Team Autonomy	2074	2268	11
320	Us and them – a social cpaital perspective on the relationship	Structure\STRU-Team Autonomy	961	1098	2

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321	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Team Autonomy	2767	3055	3
322	Alignment within the software development unit	Structure\STRU-Team Autonomy	3104	3362	2
323	Alignment within the software development unit	Structure\STRU-Team Autonomy	6410	6691	2
324	Alignment within the software development unit	Structure\STRU-Team Autonomy	6370	6675	12
325	Ubiquitous IT The case of the Boeing 787 and implications for s	Structure\STRU-Team Autonomy	424	722	11
326	IT Governance, Decision-Making and IT Capabilities	Structure\STRU-Team Autonomy	50	343	6
327	Avoiding the schizophrenic IT organisation	Structure\STRU-Team Autonomy	1441	1714	2
328	High Performers in IT – Defined by Digital reviewed by The IT r	Structure\STRU-Team Autonomy	22	116	20
329	High Performers in IT – Defined by Digital reviewed by The IT r	Structure\STRU-Team Autonomy	730	1134	34
330	Governance Framework for Cloud Computing	Structure\STRU-Team Autonomy	2057	2240	5
331	Two-Speed IT	Structure\STRU-Team Autonomy	3075	3163	3

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332	Ten IT-enabled business trends for the decade ahead	Structure\STRU-Team Autonomy	1591	1785	1
333	Ten IT-enabled business trends for the decade ahead	Structure\STRU-Team Autonomy	30	182	3
334	Strategic principles for competing in the digital age	Structure\STRU-Team Autonomy	1425	1900	2
335	The Digital Natives, and You	Structure\STRU-Team Autonomy	1250	1507	2
336	Network Support Staff Under Pressure	Structure\STRU-Size	465	820	1
337	Network Support Staff Under Pressure	Structure\STRU-Size	2210	2341	2
338	Network Support Staff Under Pressure	Structure\STRU-Size	1635	1848	4
339	Strategic principles for competing in the digital age	Structure\STRU-Size	2054	2228	6
340	IT leadership from a problem-solving perspective	Structure\STRU-Decentral Decision-Making	4843	5034	7
341	Navigating the new threat landscape	Structure\STRU-Decentral Decision-Making	99	268	3
342	IT Organisations Increase Reliance on Project Management	Structure\STRU-Decentral Decision-Making	451	765	1
343	IT Organisations Increase Reliance on Project Management	Structure\STRU-Decentral Decision-Making	802	921	5
344	IT Organisations Increase Reliance on Project Management	Structure\STRU-Decentral Decision-Making	1505	1755	6

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345	IT Organisations Increase Reliance on Project Management	Structure\STRU-Decentral Decision-Making	1758	2047	6
346	Project Management Offices in the IT Area	Structure\STRU-Decentral Decision-Making	1799	2307	1
347	Project Management Offices in the IT Area	Structure\STRU-Decentral Decision-Making	66	339	3
348	Towards a governance framework for chains of Scrum teams	Structure\STRU-Decentral Decision-Making	3059	3440	1
349	Towards a governance framework for chains of Scrum teams	Structure\STRU-Decentral Decision-Making	3758	3923	1
350	Towards a governance framework for chains of Scrum teams	Structure\STRU-Decentral Decision-Making	20	233	2
351	Creating IT Shared Services	Structure\STRU-Decentral Decision-Making	4330	4609	9
352	Dieter Haban	Structure\STRU-Decentral Decision-Making	910	1092	2
353	High Performers in IT – Defined by Digital reviewed by The IT r	Structure\STRU-Decentral Decision-Making	330	430	14
354	Two-Speed IT	Structure\STRU-Decentral Decision-Making	913	1115	2
355	Two-Speed IT	Structure\STRU-Decentral Decision-Making	1892	2066	2

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356	Two-Speed IT	Structure\STRU-Decentral Decision-Making	2242	2482	2
357	Two-Speed IT	Structure\STRU-Decentral Decision-Making	721	1005	1
358	Reinventing IT to support digitization	Structure\STRU-Decentral Decision-Making	749	1089	1
359	Reinventing IT to support digitization	Structure\STRU-Decentral Decision-Making	1265	1484	3
360	Reinventing IT to support digitization	Structure\STRU-Decentral Decision-Making	1338	1655	4
361	Reinventing IT to support digitization	Structure\STRU-Decentral Decision-Making	787	1043	2
362	Seven traits of successful digital businesses	Structure\STRU-Decentral Decision-Making	736	982	4
363	Seven traits of successful digital businesses	Structure\STRU-Decentral Decision-Making	983	1340	4
364	Strategic principles for competing in the digital age	Structure\STRU-Decentral Decision-Making	520	815	12
365	Strategic principles for competing in the digital age	Structure\STRU-Decentral Decision-Making	880	1179	9
366	How Many Chiefs does an IT Organisation Need	Structure\STRU-Shape of the Organisation	273	526	1

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367	How Many Chiefs does an IT Organisation Need	Structure\STRU-Shape of the Organisation	1640	1917	2
368	How Many Chiefs does an IT Organisation Need	Structure\STRU-Shape of the Organisation	568	849	5
369	How Many Chiefs does an IT Organisation Need	Structure\STRU-Shape of the Organisation	851	1240	5
370	IT Organisations Increase Reliance on Project Management	Structure\STRU-Shape of the Organisation	1079	1303	4
371	Key information technology and management issues 2012–2013 – an	Structure\STRU-Distribution of Power Across the Hierarchy	1190	1603	11
372	Key information technology and management issues 2012–2013 – an	Structure\STRU-Distribution of Power Across the Hierarchy	3343	3737	5
373	Alignment within the software development unit	Structure\STRU-Distribution of Power Across the Hierarchy	4967	5245	12
374	IT Project Portfolio Governance – The Emerging Operation Manage	Structure\STRU-Distribution of Power Across the Hierarchy	1237	1421	1
375	Organisational design of IT supplier relationship management	Structure\STRU-Distribution of Power Across the Hierarchy	1799	2119	11

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376	Organisational design of IT supplier relationship management	Structure\STRU-Distribution of Power Across the Hierarchy	2123	2234	11
377	Organisational design of IT supplier relationship management	Structure\STRU-Distribution of Power Across the Hierarchy	2238	2352	11
378	Ubiquitous IT The case of the Boeing 787 and implications for s	Structure\STRU-Distribution of Power Across the Hierarchy	2331	2872	5
379	social-media-strategies	Structure\STRU-Distribution of Power Across the Hierarchy	2984	3162	1
380	Governing Web 2.0	Structure\STRU-Distribution of Power Across the Hierarchy	416	700	1
381	Two-Speed IT	Structure\STRU-Distribution of Power Across the Hierarchy	2989	3073	3
382	Two-Speed IT	Structure\STRU-Distribution of Power Across the Hierarchy	3075	3163	3

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383	Ten IT-enabled business trends for the decade ahead	Structure\STRU-Distribution of Power Across the Hierarchy	2538	2697	12
384	The Collaborative Organisation – How to Make Employee Networks	Structure\STRU-Division of Labor	1716	1902	3
385	Alignment within the software development unit	Structure\STRU-Division of Labor	6410	6691	2
386	IT Organisations Increase Reliance on Project Management	Structure\STRU-Division of Labor	402	755	6
387	Auditing the Clouds coming down to earth	Structure\STRU-Division of Labor	830	1243	2
388	Auditing the Clouds coming down to earth	Structure\STRU-Division of Labor	1578	1970	2
389	Dieter Haban	Structure\STRU-Division of Labor	1051	1256	3
390	Avoiding the schizophrenic IT organisation	Structure\STRU-Division of Labor	1441	1714	2
391	Two-Speed IT	Structure\STRU-Division of Labor	1452	1804	2
392	Reinventing IT to support digitization	Structure\STRU-Division of Labor	546	792	5
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395	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Processes\PROC-Process Automation	1031	1170	2
396	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	3519	3895	10
397	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	50	418	11
398	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	3764	4178	11
399	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	104	302	3
400	The Collaborative Organisation – How to Make Employee Networks	Processes\PROC-Process Automation	1242	1402	2
401	The Collaborative Organisation – How to Make Employee Networks	Processes\PROC-Process Automation	2767	3055	3
402	The Collaborative Organisation – How to Make Employee Networks	Processes\PROC-Process Automation	2014	2263	9
403	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	5677	6025	10
404	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	1232	1593	11

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405	Us and them – a social capital perspective on the relationship	Processes\PROC-Process Automation	2074	2268	11
406	Alignment within the software development unit	Processes\PROC-Process Automation	3104	3362	2
407	Alignment within the software development unit	Processes\PROC-Process Automation	882	1376	12
408	Alignment within the software development unit	Processes\PROC-Process Automation	1492	1646	12
409	Alignment within the software development unit	Processes\PROC-Process Automation	4419	4620	12
410	social-media-strategies	Processes\PROC-Process Automation	2668	2982	1
411	Today’s IT Organisation – Delivering Security, Value and Perfor	Processes\PROC-Process Automation	992	1423	26
412	Leading the Higher Education IT Organisation	Processes\PROC-Process Automation	914	1122	4
413	IT Governance, Decision-Making and IT Capabilities	Processes\PROC-Process Automation	50	343	6
414	Governing Web 2.0	Processes\PROC-Process Automation	416	700	1
415	High Performers in IT – Defined by Digital reviewed by The IT r	Processes\PROC-Process Automation	22	116	20

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416	Business IT Fusion – Developing a Shared World View	Processes\PROC-Process Automation	4143	4540	1
417	Business IT Fusion – Developing a Shared World View	Processes\PROC-Process Automation	3377	3724	1
418	Governance Framework for Cloud Computing	Processes\PROC-Process Automation	1331	1565	5
419	Governance Framework for Cloud Computing	Processes\PROC-Process Automation	2057	2240	5
420	Two-Speed IT	Processes\PROC-Process Automation	3075	3163	3
421	Two-Speed IT	Processes\PROC-Process Automation	1607	1774	4
422	Ten IT-enabled business trends for the decade ahead	Processes\PROC-Process Automation	1591	1785	1
423	Strategic principles for competing in the digital age	Processes\PROC-Process Automation	1425	1900	2
424	The Digital Natives, and You	Processes\PROC-Process Automation	814	1106	2
425	Software as a Service Adoption – Impact on IT Workers and Funct	Processes\PROC-Informal Processes	1158	1887	3
426	The impact of Cloud Computing	Processes\PROC-Informal Processes	839	1088	4

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428	Software as a Service Adoption – Impact on IT Workers and Funct	Processes\PROC-Informal Processes	858	1353	1
429	Software as a Service Adoption – Impact on IT Workers and Funct	Processes\PROC-Informal Processes	769	1269	8
430	Software as a Service Adoption – Impact on IT Workers and Funct	Processes\PROC-Informal Processes	3168	3532	8
431	Software as a Service Adoption – Impact on IT Workers and Funct	Processes\PROC-Informal Processes	4004	5160	8
432	Assessing Organisational Learning in IT organisations	Processes\PROC-Informal Processes	3819	4459	1
433	IT leadership from a problem solving perspective	Processes\PROC-Informal Processes	2522	2807	9
434	Simulation of ITSM processes as training tool set	Processes\PROC-Informal Processes	1646	1840	1
435	Simulation of ITSM processes as training tool set	Processes\PROC-Informal Processes	796	921	5
436	Evaluation Criteria for Cloud Services	Processes\PROC-Informal Processes	3434	3689	3
437	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Processes\PROC-Informal Processes	711	883	4

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438	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	Processes\PROC-Informal Processes	3918	4125	11
439	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	254	534	1
440	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	535	726	1
441	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	1250	1584	1
442	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	2653	2807	1
443	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	2898	3368	1
444	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	3793	3921	1
445	Approximate Incremental Big-Data Harmonization	Processes\PROC-Informal Processes	1491	1795	8
446	Us and them – a social capital perspective on the relationship	Processes\PROC-Informal Processes	3519	3895	10
447	Alignment within the software development unit	Processes\PROC-Informal Processes	5003	5144	2
448	Alignment within the software development unit	Processes\PROC-Informal Processes	5680	5962	12

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450	IT Project Portfolio Governance – The Emerging Operation Manage	Processes\PROC-Informal Processes	840	1050	1
451	Leveraging the capabilities of service-oriented decision suppor	Processes\PROC-Informal Processes	2509	2795	1
452	Cloud computing as an innovation – perception, attitude and ado	Processes\PROC-Informal Processes	3600	3890	2
453	Organisational design of IT supplier relationship management	Processes\PROC-Informal Processes	314	512	2
454	Advantages and challenges of adopting cloud computing from an e	Processes\PROC-Informal Processes	4962	5080	3
455	ERP and big Data – The Inept Couple	Processes\PROC-Informal Processes	471	647	4
456	social-media-strategies	Processes\PROC-Informal Processes	2402	2849	3
457	From data breach to information stewardship	Processes\PROC-Informal Processes	4846	5092	3
458	From data breach to information stewardship	Processes\PROC-Informal Processes	4490	4846	3
459	Assessing and governing IT-staff behavior by performance-based	Processes\PROC-Informal Processes	4221	4518	4

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462	BYOD – enabling the chaos	Processes\PROC-Informal Processes	2764	2987	4
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722	Tapping into Silicon Valley	People\PEO-Shift to Soft Skills	2859	3224	1
723	Business IT Fusion – Developing a Shared World View	People\PEO-Shift to Soft Skills	2967	3172	1
724	The digital tipping point	People\PEO-Shift to Soft Skills	397	638	7
725	Two-Speed IT	People\PEO-Shift to Soft Skills	913	1115	2
726	Two-Speed IT	People\PEO-Shift to Soft Skills	2709	3019	2
727	Two-Speed IT	People\PEO-Shift to Soft Skills	37	271	3
728	Two-Speed IT	People\PEO-Shift to Soft Skills	2548	2690	4
729	Ten IT-enabled business trends for the decade ahead	People\PEO-Shift to Soft Skills	1647	2191	12

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
730	Reinventing IT to support digitization	People\PEO-Shift to Soft Skills	1489	1604	3
731	Seven traits of successful digital businesses	People\PEO-Shift to Soft Skills	1511	1858	2
732	Strategic principles for competing in the digital age	People\PEO-Shift to Soft Skills	1603	1904	6
733	Assessing Organisational Learning in IT organisations	People\PEO-Shift to Soft Skills	577	841	1
734	Simulation of ITSM processes as training tool set	People\PEO-Shift to Soft Skills	1361	1644	1
735	Us and them – a social capital perspective on the relationship	People\PEO-Shift to Soft Skills	5349	5593	2
736	The Collaborative Organisation – How to Make Employee Networks	People\PEO-Shift to Soft Skills	1242	1402	2
737	The Collaborative Organisation – How to Make Employee Networks	People\PEO-Shift to Soft Skills	1716	1902	3
738	Us and them – a social capital perspective on the relationship	People\PEO-Shift to Soft Skills	2365	2549	6
739	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	3181	3418	4
740	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	3514	3851	4

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
741	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	1161	1411	11
742	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	1725	1823	11
743	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	2133	2187	11
744	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	3852	4033	4
745	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	1046	1143	7
746	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	1824	2000	11
747	IT-consumerization-when-gadgets-turn-into-enterprise-it-tools	People\PEO-Shift to Soft Skills	710	773	12
748	The Collaborative Organisation – How to Make Employee Networks	People\PEO-Shift to Soft Skills	2674	2940	6
749	Alignment within the software development unit	People\PEO-Shift to Soft Skills	2173	2494	12
750	Alignment within the software development unit	People\PEO-Shift to Soft Skills	6370	6675	12
751	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Shift to Soft Skills	380	624	1

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
752	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Shift to Soft Skills	219	534	3
753	Cloud computing as an innovation – perception, attitude and ado	People\PEO-Shift to Soft Skills	6402	6684	2
754	Cloud computing as an innovation – perception, attitude and ado	People\PEO-Shift to Soft Skills	3638	3870	5
755	Leveraging the capabilities of service-oriented decision suppor	People\PEO-Shift to Soft Skills	3690	4047	3
756	Organisational design of IT supplier relationship management	People\PEO-Shift to Soft Skills	912	1123	2
757	Advantages and challenges of adopting cloud computing from an e	People\PEO-Shift to Soft Skills	2403	2517	5
758	From data breach to information stewardship	People\PEO-Shift to Soft Skills	5574	5866	3
759	Today's IT Organisation – Delivering Security, Value and Perfor	People\PEO-Shift to Soft Skills	29	420	6
760	Today's IT Organisation – Delivering Security, Value and Perfor	People\PEO-Shift to Soft Skills	1766	1917	15
761	Today's IT Organisation – Delivering Security, Value and Perfor	People\PEO-Shift to Soft Skills	1185	1379	5
762	Today's IT Organisation – Delivering Security, Value and Perfor	People\PEO-Shift to Soft Skills	1668	1868	5

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
763	Leading the Higher Education IT Organisation	People\PEO-Shift to Soft Skills	3576	3785	2
764	Leading the Higher Education IT Organisation	People\PEO-Shift to Soft Skills	4271	4470	2
765	Leading the Higher Education IT Organisation	People\PEO-Shift to Soft Skills	2813	3047	3
766	IT Organisations Increase Reliance on Project Management	People\PEO-Shift to Soft Skills	451	765	1
767	IT Organisations Increase Reliance on Project Management	People\PEO-Shift to Soft Skills	2246	2429	8
768	Network Support Staff Under Pressure	People\PEO-Shift to Soft Skills	262	464	1
769	The Cloud as an IT Sourcing Strategy	People\PEO-Shift to Soft Skills	214	485	3
770	IT Sourcing Decisions – A Calculus of Risk and Reward	People\PEO-Shift to Soft Skills	3298	3461	2
771	Managing Alternative Sourcing	People\PEO-Shift to Soft Skills	3981	4234	2
772	Governing Web 2.0	People\PEO-Shift to Soft Skills	4631	4940	6
773	It is all about what we have – A discriminant analysis of organ	People\PEO-Shift to Soft Skills	5483	5992	2

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
774	Cloud Computing and the Power to Choose	People\PEO-Shift to Soft Skills	704	1139	6
775	Exploratory Study on Alignment Between IT and Business Strategi	People\PEO-Shift to Soft Skills	2206	2573	18
776	Achieving IT-Enabled Enterprise Agility in China – An IT Organi	People\PEO-Shift to Soft Skills	1694	1947	12
777	IT Career Development of the Future	People\PEO-Shift to Soft Skills	751	945	1
778	Dieter Haban	People\PEO-Shift to Soft Skills	364	565	2
779	Dieter Haban	People\PEO-Shift to Soft Skills	696	801	3
780	Avoiding the schizophrenic IT organisation	People\PEO-Shift to Soft Skills	2196	2552	1
781	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Shift to Soft Skills	337	537	33
782	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Shift to Soft Skills	487	728	34
783	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Shift to Soft Skills	1350	1504	34
784	Ten IT-enabled business trends for the decade ahead	People\PEO-Shift to Soft Skills	1233	1628	7

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
785	Alignment within the software development unit	People\PEO-Sourcing	2438	2630	2
786	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	2380	2727	1
787	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	2732	2928	1
788	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	70	316	2
789	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	321	501	2
790	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	506	801	2
791	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	807	989	2
792	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	1005	1418	2
793	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	1424	1642	2
794	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	1648	1736	2
795	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	1742	1876	2
796	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	1892	2031	2

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
797	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	2036	2237	2
798	IT Project Portfolio Governance – The Emerging Operation Manage	People\PEO-Sourcing	2243	2507	2
799	Advantages and challenges of adopting cloud computing from an e	People\PEO-Sourcing	3156	3450	5
800	Organisational Learning & Work Engagement – Study of an IT Orga	People\PEO-Sourcing	1961	2056	2
801	IT Governance, Decision-Making and IT Capabilities	People\PEO-Sourcing	1148	1433	1
802	IT Sourcing Decisions – A Calculus of Risk and Reward	People\PEO-Sourcing	3463	3646	2
803	Managing Alternative Sourcing	People\PEO-Sourcing	4205	4311	1
804	Managing Alternative Sourcing	People\PEO-Sourcing	4467	4718	1
805	Managing Alternative Sourcing	People\PEO-Sourcing	3274	3535	2
806	Managing Alternative Sourcing	People\PEO-Sourcing	3536	3675	2
807	Getting the Big IT Picture	People\PEO-Sourcing	594	907	1
808	Cloud Computing and the Power to Choose	People\PEO-Sourcing	2644	2854	2
809	CIOs should spend more time building knowledge outside the IT d	People\PEO-Sourcing	1177	1404	1
810	CIOs should spend more time building knowledge outside the IT d	People\PEO-Sourcing	2242	2624	1
811	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Sourcing	1758	1801	34

ID	Paper Name (shortened title only)	Sub-Category	Begin	End	Page
812	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Sourcing	1803	1849	34
813	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Sourcing	1851	1879	34
814	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Sourcing	1881	1944	34
815	High Performers in IT – Defined by Digital reviewed by The IT r	People\PEO-Sourcing	1946	1975	34
816	IT leadership from a problem-solving perspective	People\PEO-Sourcing	4230	4400	7
817	IT leadership from a problem-solving perspective	People\PEO-Sourcing	1533	1769	8
818	IT leadership from a problem-solving perspective	People\PEO-Sourcing	2163	2318	8
819	IT leadership from a problem-solving perspective	People\PEO-Sourcing	2662	2773	8
820	IT leadership from a problem-solving perspective	People\PEO-Sourcing	2368	2468	13

Table 34: Overview of Text Snippets

APPENDIX 2: ONLINE QUESTIONNAIRE

What determines a successful IT organisation in the digital age?

Dear respondent,

New digital requirements have resulted in business requesting for quick, breakthrough innovation – what we refer to as agile IT demands. Digital products require fast-paced, agile development methodologies and pro-active involvement of the IT-organization along the entire product life cycle.

If today's IT organisations do not adapt their organisational design to the new agile IT demands they will become obsolete as business units will build up own digital capabilities.

To avoid this, IT organisations need to adjust their organizational design framework to the agile IT demand while simultaneously still supporting the traditional IT demand

This survey is built to evaluate a set of statements that have been derived from a qualitative content analysis conducted as part of the dissertation. You have been identified as an expert in the field of IT organisation design and we would like to take your experience on board to confirm or falsify the derived statements.

Please take around 15 minutes to think through the statements and mark the responses of your choice.

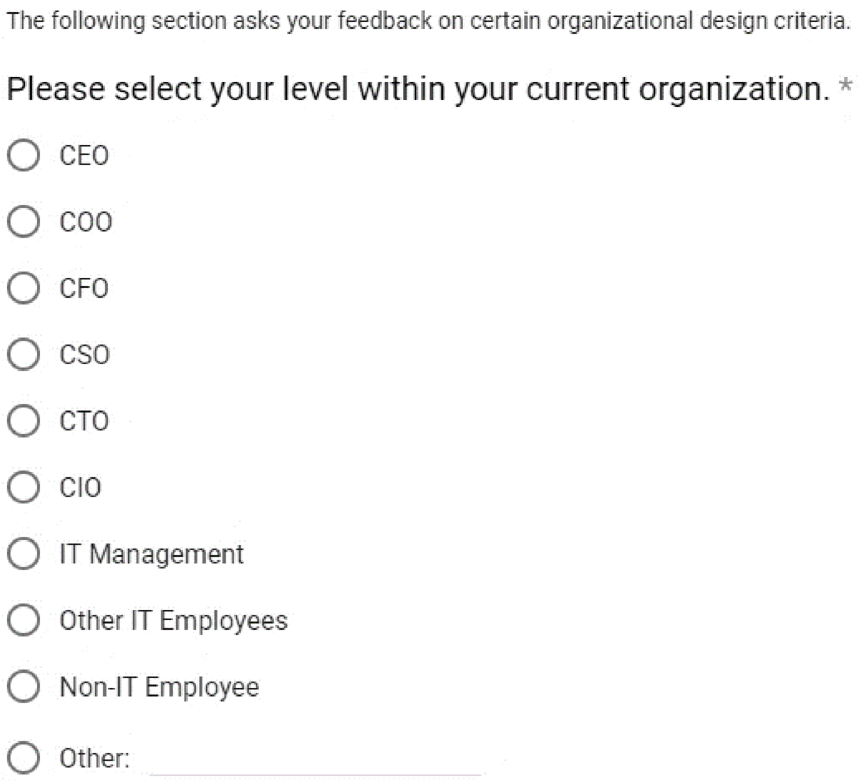
Definition wise we would like to give you the following guidance how we separate between the 'Traditional IT' and the 'Agile IT':

Thank you very much.

Traditional IT vs. Agile IT

Traditional IT [Demand]	**Dimension**	**Agile IT [Demand]**
Stability	*Goal*	Agility & speed
IT-centric	*Culture*	Business-centric
Remote from customer	*Customer proximity*	Close to customer
Performance and security improvement	*Trigger*	Short-term market trends
Performance of services	*Value*	Business moments, customer branding
Security and reliability	*Focus of services*	Innovation
Waterfall development	*Approach*	Iterative, agile development
Systems of records	*Applications*	Systems of engagement
Slow	*Speed of service delivery*	Fast

Figure 31: Cover Letter for Online Questionnaire



The following section asks your feedback on certain organizational design criteria.

Please select your level within your current organization. *

- CEO
- COO
- CFO
- CSO
- CTO
- CIO
- IT Management
- Other IT Employees
- Non-IT Employee
- Other:

Figure 32: Online Questionnaire – Page 1

Please select industry in which your organization resides *

- ○ Public Services
- ○ Insurance
- ○ Energy
- ○ Chemicals
- ○ Automotive and Industrial
- ○ Utilities
- ○ Natural Resources
- ○ Hospitality and Transportation
- ○ Consumer Goods and Services
- ○ Capital Markets
- ○ Retail
- ○ Life Sciences
- ○ Health
- ○ Communication, Media & Technology
- ○ Banking

Figure 33: Online Questionnaire – Page 2

Please indicate the average annual revenue of your organization *

- ○ $0 – 1 billion revenue
- ○ $1 – 10 billion revenue
- ○ More than $10 billion revenue

Please select the degree to how much you agree with the following statements about an IT organisation that is ready for the digital age.

IT strategy needs to handle agile and traditional business demands differently *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Business needs to prioritise IT backlog with clear value case documentation. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Decentralised structures and team autonomy are key success factors. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Figure 34: Online Questionnaire – Page 3

Lean decision hierarchies are becoming key to organisational agility and facilitate necessary knowledge sharing and faster decision-making. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

IT processes are less stringent and process compliance is seen as less of a priority. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

IT employees do not need hard IT capabilities but rather coordinating capabilities that ensure concise management of external suppliers. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Figure 35: Online Questionnaire – Page 4

The future IT department head needs to be a visionary. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Only a dedicated information architect role ensures that data structures are designed to lead to information. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Only a dedicated data scientist role ensures that the existing data is explored in a structured way. *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

Figure 36: Online Questionnaire – Page 5

Sourcing approach strongly influences speed of delivery, especially by providing skills on demand and offering automation of processes with tools like robotic process automation (RPA). *

	1	2	3	4	5	6	
Strongly disagree	○	○	○	○	○	○	Strongly agree

What have we not asked you about in this survey that you think is important? [You are welcome to note up to three areas. Each response is limited to 250 characters. This question is optional.] *

Your answer

Figure 37: Online Questionnaire – Page 6

APPENDIX 3: DESCRIPTION OF THE ENTIRE DATA SET

Countries	Europe	NA	APAC	Not displayed				
	110	100	191	2				
Gender	Male	Female						
	307	96						
Age	18-30	31-40	41-50	51-60	>60			
	52	162	89	69	31			
Occupation	Employed full-time	Self-employed						
	365	38						
Position	C-Level-Executive	IT management	Other IT					
	179	150	74					
Industry	Automotive & Industrial	Banking	Capital Markets	Chemicals	Communication, Media & Technology	Consumer Goods & Services	Energy	Health
	12	26	2	4	117	21	5	11
	Hospitality & Transport	Insurance	Life Science	Natural Resources	Public Service	Retail	Utilities	Others
	9	15	9	5	19	30	16	102
Working years	< 3 years	3-10 years	> 10 years					

	19	158	226					
Headquarters	Asia/Pacific	Europe	North America & Canada	Central & South America	Others			
	166	114	115	3	5			
Revenue	$0-1 billion	$1- 10 billion	More than $10 billion					
	197	135	59					

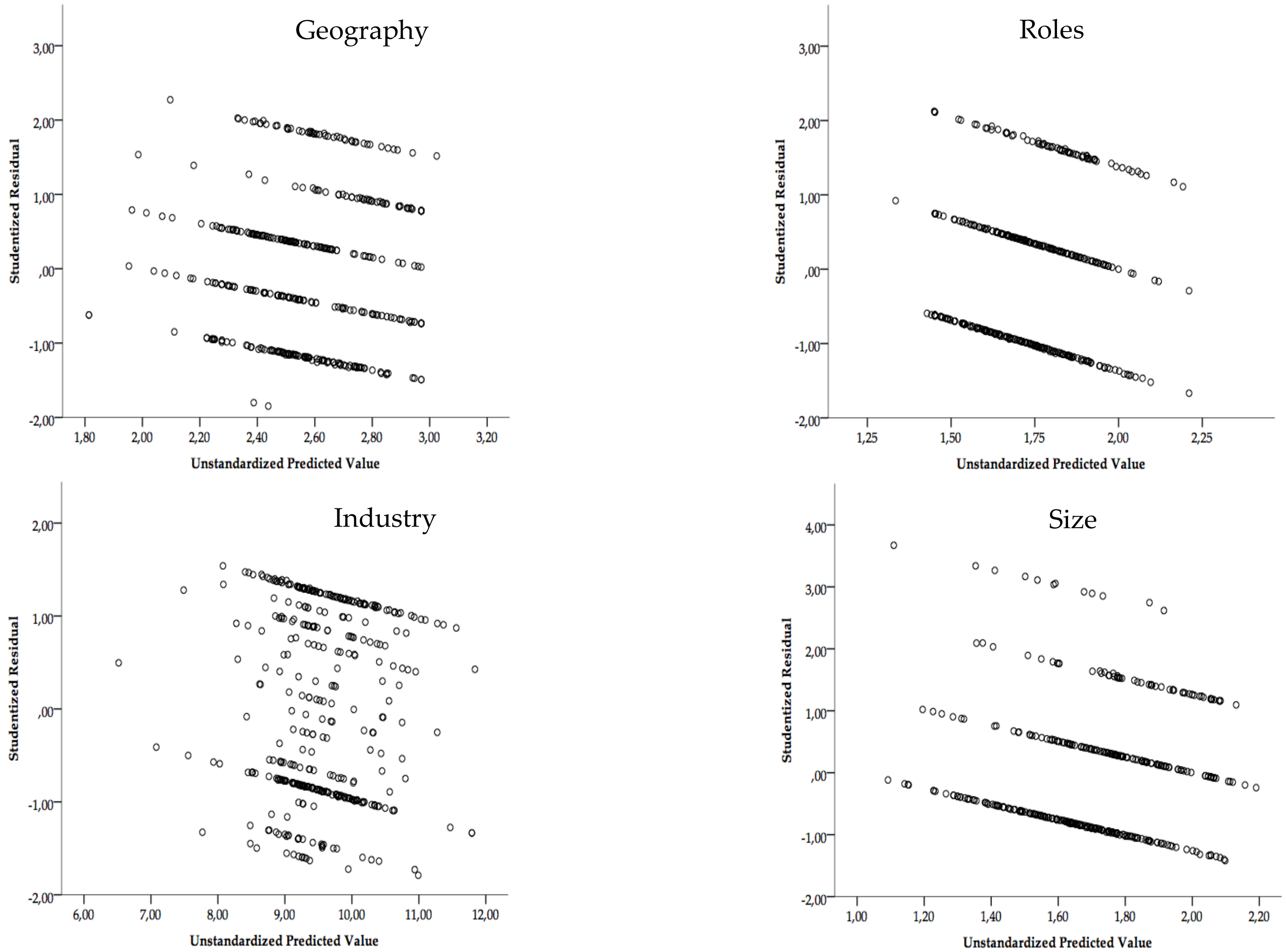
Table 35: Data Set Description

APPENDIX 4: RESULTS RELIABILITY ANALYSIS

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Item Correlation with Total Sum	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 1	36.79	73.53	.53	.39	.84
Item 2	37.34	70.82	.58	.44	.84
Item 3	37.61	72.14	.50	.35	.85
Item 4	37.76	69.69	.55	.39	.84
Item 5	36.79	74.20	.54	.38	.84
Item 6	37.21	70.71	.64	.53	.84
Item 7	37.41	68.54	.68	.57	.83
Item 8	36.34	77.29	.47	.33	.85
Item 9	37.11	70.99	.60	.38	.84
Item 10	37.30	70.35	.56	.34	.84

Table 36: Reliability Analysis Results

APPENDIX 5: SCATTERPLOTS OF RESIDUAL VERSUS PREDICTED VALUE



APPENDIX 6: MANOVA STATISTICS

Geography

Dimension	Kruskal-Wallis Test Significance
Strategy	.008
Structure	.002
Governance	.025
Processes	<.001
People	.028
Sourcing	.008
Information	<.001

Table 37: MANOVA Statistics Results on Geography

Employee’s roles

Dimension	Kruskal-Wallis Test Significance
Strategy	.006
Structure	.043
Governance	.006
Processes	.022
People	.164
Sourcing	.030
Information	<.001

Table 38: MANOVA Statistics Results on Employee's Role

Industry

Dimension	Kruskal-Wallis Test Significance
Strategy	.626
Structure	.025
Governance	.101
Processes	.408
People	.251
Sourcing	.833
Information	.209

Table 39: MANOVA Statistics Results on Industry

Companies Size

Dimension	Kruskal-Wallis Test Significance
Strategy	<.001
Structure	.009
Governance	.006
Processes	<.001
People	<.001
Sourcing	<.001
Information	<.001

Table 40: MANOVA Statistics Results on Company Size

APPENDIX 7: RESULTS CORRELATION– SPEARMAN'S RHO

Dimensions	Strategy	Structure	Governance	Processes	People	Sourcing	Information
Strategy	1	.423**	.476**	.637**	.500**	.410**	.467**
Structure	.423**	1	.376**	.339**	.241**	.359**	.496**
Governance	.476**	.376**	1	.399**	.382**	.442**	.535**
Processes	.637**	.339**	.399**	1	.411**	.384**	.460**
People	.500**	.241**	.382**	.411**	1	.451**	.463**
Sourcing	.410**	.359**	.442**	.384**	.451**	1	.488**
Information	.467**	.496**	.535**	.460**	.463**	.488**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Table 41: Results Correlation – Spearman's RHO

APPENDIX 8: RESULTS CLUSTER ANALYSIS

	Cluster combination		
Stage	**Cluster 1**	**Cluster 2**	**Coefficient (correlation)**
1	Dimension 1	Dimension 4	.631
2	Dimension 3	Dimension 6	.533
3	Dimension 2	Dimension 5	.344
4	Dimension 2	Dimension 3	.206
5	Dimension 1	Dimension 2	.085

Table 42: Hierarchical Cluster Analysis Results

APPENDIX 9: OPEN QUESTIONS

The answers of the questions have not been edited nor have grammar or spelling mistakes being removed.

Responses to the open question
Digital upgrade is essential.
Buy-in from board cultural change embraced flexible IT staff.
It may well have helped if you had recapped all the questions you did ask on this page too.
The importance of close engagement with the stakeholders of IT projects at all stages.
You haven’t asked about in-house development/customisation. You haven’t asked about quality of delivery of IT services. You haven’t asked about whether or to what extent the Business has a dependency on IT.
Security is the main concern of our clients along with confirmation that we can meet and continue to meet law/government budget changes in a timely manner.
Agility, applications assessment and hybrid it…
The questions highlight the key areas of IT organisational design in a comprehensive form.
Cloud Technology, Big Data, Internet of things.
Whether the design should enable cloud based solutions.
IT security, Server details and location
The right mix of roles/capabilities to avoid bottlenecks i.e. Theory of Constraints to deliver results of projects. I.e. analyse design, development, testing operations in balanced proportions depending on throughout of each. Ability to change the ratio of skills over time to respond to changing demands or projects. Involvement of customers or user department representatives brought into the IT department to maximise chances of what is produced aligning with what is desired/needed and quick responses to questions or queries and prioritisation of items in the backlog. Physical proximity and sufficient space for e.g. stand up meetings.

Recruitment issues.
StaffingCompetenciesTraining.
Legal aspects – jurisdiction.
Data security.
The design should be robust enough to updated with new technologies.
Rather than just focus on the broader business taking over traditionally IT tasks should the IT department actually include broadly business focused members?
Cost.
It is expert and professional.
It is` a very good service and very important as well.
It is more useful and helpful.
The security, the useful of technology, the prospect of the technology.
Very professional.
Security, easy to use, flexibility.
PlatformsCloud based platforms.
Use of the cloud in dealing with data.
Being seen in the public eye.
Security is the most important part of the digital age, second to that would be an agile approach to keep up with the industry and demands of the consumer.
Data security.
IT security is paramount.
That IT should meet business needs.
How important is sound IT knowledge? How important is it that management have strong IT knowledge? How important is to keep jobs in Australia?
Real and practical insights and expositions for the digital age.
DILLIGAF.
Agility capabilities of org design.
One thing I find important is that IT professionals have to interact with clients more and more. Stereotypically IT professionals lack ”people

skills“. I believe more and more for IT professionals to succeed personally AND for heavy IT companies (especially smaller/younger ones) having IT professionals with the ability to interact with clients is important.

Promoting education/retraining.

Centralized the products and cost effectiveness.

Real time collaboration with potential clients through marketing platform.

Since Google & Facebook counterfeit all content should their be US Federal raids on these organisations and all employees and investigators for these organisations?

IT professionals communication (i.e. understanding users language/argot).IT professional ability to be flexible in thinking.

Data Security.

Security is very important.

What degrees are needed.

Security.

Sociological implications of removing employees from ”cube“ environments to ”open-air“ agile development environments.

Whether agile adds anything.

Security.

Working hours.

Remember the cloud.

Project management, who takes control of the project - IT management or specified Project Manager. Website design - does this fall into IT or need to have separate projectCloud based services - how does this impact IT.

How the cloud influences IT. How does remote IT personal versus housed personal effects perception.

Send all the H1B employees back to India. Bringing in foreigners kills American jobs.

Combine business vs technology vs security.

Harvard Business Review Analytic Services, in association with Marketo, developed a whitepaper - ”Designing a Marketing Organisation for the Digital Age“ – to guide CMOs on designing the marketing organisation of the future. This whitepaper offers exclusive insights from some of the brightest minds in marketing, including academic scholars, management consultants and CMOs of some of the leading brands in the world.

It is best solution for software technology.

Deging is the easy and secure the details and handle is easy.

Hi three, areas becoming more customer centric Evolution of the digital practitioner role, New skills and behaviours in the digital era.

We also asked a simple question: Are you ready to do business in a ... Digital Transformation versus ..

We could have also touched big data on larger side.

The good one IT feeld good one.

What is the age and how long it will take in case of security and lack of knowledge or leak any important message then what measure should be take.

I am happy to work in it organisation.

Services multinational Citigroup. Citibank was .... In 2015 Citigroup Inc. "s consumer bank was ordered to pay $770 million in relief to borrowers for illegal.

Good customer presentation.

Environment Work force Policies.

Regarding IT security.

1. Our area is telecom sector. 2. We deals with it services with our clients. 3. Our company provide world class services in telecom sector.

How investments in digital marketing can deliver exceptional returns?

Data analytics.

Cloud computing, big data, digital transformation.

With everything that comes to our attention we have to now ask - “what obstacles ... Conversely no matter how important a statement may have appeared when it was ... why narrative structure collapsed into reality TV, why and why almost no one can ... This always-on approach to digital technology surrenders my nervous...
Design management and optimization.
Security, risk and governance.
Yes of course IT should be handling all the digital changes.
Good technology.
SecuritySoftware updated.
Security.
People and process.
First its security, second is user friendly, third is multi platform integration.
Data analytic, cybersecurity and smart deviced.
IT GovernancePortfolio programme & project management IT Service Management.
Data.
Allowing to cater for future expansion. Security.

Table 43: Answers to Open Questions