

IT/IS Organisation Design in the Digital Age – A Literature Review

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Abstract—Information technology and information systems are currently at a tipping point. The digital age fundamentally transforms a large number of industries in the ways they work. Lines between business and technology blur. Researchers have acknowledged that this is the time in which the IT/IS organisation needs to re-strategize itself. In this paper, the author provides a structured review of the IS and organisation design literature addressing the question of how the digital age changes the design categories of an IT/IS organisation design. The findings show that most papers just analyse single aspects of either IT/IS relevant information or generic organisation design elements but miss a holistic ‘big-picture’ onto an IT/IS organisation design. This paper creates a holistic IT/IS organisation design framework bringing together the IS research strand, the digital strand and the generic organisation design strand. The research identified four IT/IS organisation design categories (strategy, structure, processes and people) and discusses the importance of two additional categories (sourcing and governance). The authors findings point to a first anchor point from which further research needs to be conducted to develop a holistic IT/IS organisation design framework.

Keywords—IT/IS strategy, IT/IS organisation design, digital age, organisational effectiveness, literature review.

I. INTRODUCTION

INFORMATION technology (IT) and information systems (IS) are currently at a tipping point. Digital trends fundamentally transform a large number of industries in their ways of working [1]–[4]. Lines between business and technology blur [5]. IT/IS becomes a commodity that business can tap into anytime anywhere – without necessary help from an internal IT/IS organisation [6]. Additionally, more and more business departments see themselves as the new owner of the IT/IS agenda. Marketing owns the digital strategy, sales determines the landscape of analytic tools – only to mention three players within any organisation [7], [8]. Furthermore, trends like ‘bring you own device’ (BYOD), ‘Big-Data’, ‘Cloud-Computing’ and others challenge the assertiveness of policies and governance within organisations [9]. In conjunction with these trends go the macroeconomic trends that shape a world where everyone connects with everyone [10]. Sociologists name this phenomenon the ‘networked society’ [11] or the ‘technosociety’ [12]. This leads to a complex environment in which business constantly demands IT/IS to be the simplifier that connects all dots and makes relationships transparent instantly, if wanted [13]. All these

requirements can be summarized in the need of IT/IS’s anticipation of behavioural patterns that have changed in the way consumers interact in their daily life with technology [14]–[16] but also in the changing role of IT/IS organisations as a ‘service supporter’ rather than a ‘service provisioner’ [5], [17]. Especially the latter aspect is driven and enforced by more and more outsourcing and offshoring initiatives that try to save costs and simultaneously increase quality by sourcing IT/IS from external partners [18].

Organisational change is the keyword to infuse an IT/IS organisation with the capabilities mentioned above. Needed for such a change is the art of 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.” [19, p. 12] While the amount of literature that explores organisation design is prevalent, peer-reviewed literature that explores IT/IS organisation design is rare. One could argue that this is because organisation design itself is something that is not related to a specific organisational function but to the organisation as a whole [20]–[22]. But the author of this paper rather supports the view of [23] who argued that the amount of IT/IS research papers is very rare in total which results in an impeded way to review the existing literature. Nevertheless, the already mentioned changes that are driven through the digitization of the world in conjunction with the adjusted expectations to the IT/IS organisation’s role make it most relevant to understand how the organisation design of the IT/IS function becomes a sustainable competitive advantage in the near future. Therefore this paper builds the first foundation and shapes the further research agenda in the field of IT/IS organisation design by reviewing the existing literature. Reading through some non-peer-reviewed literature unveils some insight. A few articles are publicized that elaborate on different dimensions that a ‘Chief Information Officer’ (CIO) needs to look at when adjusting its organization [24]–[26]. Most articles concentrate on specific terms like workforce enablement [27] or shed light on the adjustments that need to be made on a corporate governance level to incorporate the new digital requirements [28]. Some others analyse which pattern can be found within current IT/IS organisations and what determines these patterns [29]. Other authors generally speak about the changes that occur but not about the strategies that need to be adapted to enable an IT/IS organisation to harness these changes [30].

The link to those findings results in the problem scope of this research paper: *Only a few IT/IS organisation design*

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models exists, and those concentrate on a selected area but not on an overarching approach how to design an IT/IS organization in the digital age (Problem Scope (PS)).

This is the starting point and the motivation for the research presented in this document. The research reviews the current literature and evolves a first version of an 'IT/IS organisation design framework' that helps to identify the categories that are most critical to be designed within an IT/IS organisation.

The research question of this paper is: *What is the collective sum of IT/IS organisation design elements that is necessary to design a successful IT/IS organisation in a digital world? (Research Questions (RQ))*

The results will inform future research which then needs to test those elements with statistically valid research methods. In addition it will build a starting point for other IT/IS researches within the field of IT/IS organisation design or even only parts like 'IT/IS strategy', 'IT/IS governance' or 'IT/IS processes'.

II. WHAT IS 'DIGITAL' AND WHAT IS A 'DIGITAL TRANSFORMATION'?

First off all 'digital age' within this paper stand for the time from 2010 onwards. This has been derived from a Google analysis on when the word kicked-off to be used on a bigger scale. The word 'digital transformation' is nowadays in each and every newspaper and TV show prevalent. McAfee [32] was one of the first authors with his article 'Enterprise 2.0' that described the influence that technology can have on organisations at its core – the way it fundamentally works. In his article he asked '[if] we finally have the right technologies for knowledge work?' [32]. What he describes is the way in which new technologies change the knowledge management processes that we are used to. Turban et al. [31] describe similar ideas in his article around 'collaboration 2.0' where he maps new technologies like 'microblog' or 'social networks' to the existing processes and capabilities within an organisation and illustrates how these change. Looking back to those development it becomes clear that the more easily to access and friendlier to use those technologies are, the more an organisation gets disrupted in its core organisational aspects. While this is clear for organisations as a whole it also applies to IT/IS organisation in particular as those organisations manage the technologies. 'Digital' is therefore just the next step to cover even wider implications of technology within our daily lives. Nevertheless, due to the fact that the word 'digital transformation' in its nature covers a wide context area it has various definitions. Therefore, both words are first explained separately. The word 'digital' is first defined. Whereas some authors define it in a sense of IT/IS-enabled innovation [33] in a very broad sense others define it as a defined list of certain elements (e.g. 'big data and advanced analytics'). Within this research paper digital is defined as the sum of technologies that change formerly physically processes into processes that are partly or completely enabled through technology.

The word 'transformation' on the other hand has been used for many years in different contexts. Most of the times it is used to describe when a certain state moves from one

condition to another in a certain timeframe [34]–[36]. In the context of organisation design those transformations are contextualized with the term 'organisational transformation' (OT) [9], [34], [37], [38]. One of the central aspects of an organisational transformation is that it touches all elements of an organisation: structure, governance, processes, roles and capabilities [22], [39]. A transformation is not something that changes one of those elements but changes the entire set of those elements. What is typically seen to understand the entire impact of its relevance is the value chain of a business as it helps to understand the overall impact areas. Literature defines three basic OT theories [34] when looking at the way the organisation is transformed. The first one can be described as iterative which means that the transformation impact develops over time [40], [41]. Other authors argue that OT doesn't evolve but is fast and abrupt [42]. The last theory assumes that OT is brought from the outside, meaning whatever changes in the ecosystem happen do also have implications on the organisation and therefore lead to a need for transformation [43]. Besson and Rowe [34] compared those three theories with the current literature on IT/IS/IS organisation transformation and have confirmed those. Anticipating the different viewpoints this paper defines the term transformation as the sum of activities that incrementally change a starting state into its future state.

Combining those two definitions builds the foundation of the research conducted for this paper.

Digital transformation in IT/IS organisation design is defined as the sum of technologies that incrementally change formerly physically processes into processes that are partly or completely enabled through technology.

The defined problem scope and the definition of a digital transformation in IT/IS organisation design have been used to shape the methodology to answer the research question.

Methodology

The research methodology is a combination of a standardized literature selection process by [23] and a well perceived analysis process to structure the findings within the literature review, the 'qualitative content analysis', originated from the 'grounded theory' [44]–[46]. Table I highlights the research methodologies steps that were used and the linked process framework. Whereas the first five steps have been defined prior to research start, the last three steps were conducted along the literature review process and are described within the findings section of this paper. Nevertheless, the methodological steps of the qualitative content analysis are described within this section.

The keywords were derived from an unstructured review of a set of twenty peer-reviewed and non-peer-reviewed articles in the field of organisation design, information system and information technology. The second step was to define the set of journal databases that were used to conduct the research. Based on their self-description the following four journal databases were used to cover the majority of the articles: 1. ScienceDirect, 2. WebOfScience, 3. Wiley Online Library and 4. SpringerLink. Step three was then to package the identified

keywords into search strings that work with the different databases. The illustration here shows the example for one of the databases in scope. The backward and forward review process mostly used through WebOfScience was then used to identify further articles that are of great importance for the research. Especially the 'citation index' functionality helped to collect the most influential articles. The fifth step limited the search only to 'peer-reviewed publications' and articles published later than the year 2010. Especially the latter limitation factor ensures that articles are written in times where digital trends are existent as defined in this paper.

TABLE I
APPLIED RESEARCH STEPS

Research Step	Used process framework
1. Define set of keywords related to the field of research	[23]
2. Select relevant journal databases	[23]
3. Create search mechanism out of the defined set of keywords	[23]
4. Use backward and forward citation reviewing to ensure a holistic analysis of the research area	[23]
5. Define limiting factors to ensure high-quality and newest article hits	[23], [44]
6. Create 'research guiding principles' that ensure an objective analysis process	[44]
7. Analyse articles	[44]
8. Create summary of findings	[44]

Overall, this keyword-based search in addition to a manual 'relevance rating' to sort out the articles not-applicable for this research resulted in the retrieval of 354 papers. Those papers were then pre-read to identify the ones particularly relevant in the area of IT/IS strategy and organisation design with regards to digital trends, so that the qualitative content analysis was eventually conducted for 51 papers dealing with the implications of IT/IS strategy and organisation design in the digital age.

The last three steps of the research methodology are built around the qualitative content analysis. The author of this paper has chosen the qualitative content analysis to follow a structured and well recognized way of summarizing findings and deriving implications for further research in the field of IT/IS organisation design. The qualitative content analysis, as well as most qualitative research methods, originated from the social sciences. Its founder describes the qualitative content analysis as "a research technique for the objective, systematic, and quantitative description of manifest content of communications" [47]. It can use inductive or deductive reasoning to derive themes and categories out of the data sets. This is done through the researcher's analysis and continuous comparison of data. Even though it was initially developed as a method that was predefined to analyse patterns in spoken interviews it's nowadays used with various forms of media. For literature analysis, interview analysis, etc. Its overall goal is to analyse the presence of certain words, phrases, quotes or sentences in a pre-defined range of literature. Literature in the context of this paper means peer-reviewed essays and proceedings. Presence is described as the amount of occurrences and its derived implication. The presence is then

used to build categories and subcategories that give an answer to the initial research questions. Generally, there are eight steps to finalize the qualitative content analysis [48].

Step 1. Prepare the Data: This initial step is concerned about the transformation of any media into written text. This paper's research is entirely based on the current state of written media in the relevant context and therefore doesn't need to require any transformation. Additionally, research step number two covers the decision about which media is in scope for the research and which one is out of scope.

Step 2. Define the Units of Analysis: This phase is about the level of categorization. How deep should the analysis be? What are the guiding principles? How should the process be executed? It is important that these guiding principles are 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 in this paper, there are mainly two ways to develop the categories: a deductive and an inductive approach. If a theory has to be developed from scratch or existing theories are purposely not taken into consideration, an inductive approach is normally chosen by the researcher. The inductive approach overlaps very much with the coding approach of the ground theory [48]. Vice versa, if existing theory should be confirmed or more detailed insight should be developed, a deductive approach is more common [48]. Pros and cons can be read for each approach, but always vary with the overall purpose of the research study. This dissertation uses the inductive approach to avoid a biased category system right from the start due to the existing organisation design models. One overarching aspect of this step is also that the outcome, the categorization system, has to be collectively exhaustive and mutually exclusive, meaning it covers the entire research scope and doesn't have any overlaps in their categorization. Most literature states this as one of the most challenging and most time consuming activities of this research method [44], [48], [49].

Step 4. Code All the Text: This is the execution of the actual coding of the mediums in scope. It is an ongoing process that is executed on an iterative basis. Most likely is that new categories arrive by newly added media, that need to be embedded recursive.

Step 5. Assess Your Coding Consistency: Due to human failures it is unavoidable to recheck the consistency of the coding executed in step 4. Inconsistency usually arrives by later added categories, spelling mistakes, ambiguous categorization definition, etc.

Step 6. Draw Conclusions from the Coded Data: A really good explanation is given by [48] who states 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.”

Step 7. Report Your Message and Findings: This is the final step of the research method. It covers the documentation of the different categories and subcategories.

III. FINDINGS

The following summary of the findings focuses on the structure that the author developed along the qualitative content analysis and the highlights that can be drawn from the findings in the field of IT/IS organisation design. Section A elaborates on the definition of the categories that were used to structure the information within the papers whereas section B summarizes the findings within each of the defined categories.

A. IT/IS Organisation Design Categories for the Coding Theme

One of the central activities of the qualitative content analysis (QCA) is the definition of the categories that structure the qualitative research. As described above, there are two ways to create those categories: deductive and inductive. This research followed a deductive approach. It has analysed the most important papers on organisation design in general and for IT/IS specifically to derive the categories for the coding theme.

Organisation design models have been used throughout the last century to acknowledge macroeconomic and microeconomic changes and implement the corresponding adjustments to create effective organisations [19], [39]. Frederick Tylor was the first researcher and practitioner in the field of organisation design [50]. He separated different tasks into autonomous and manageable elements. This was then the start to divide labour into different organisational units within one organisation. One of his most known examples is the Ford Motor Company assembly line where different organisational groups execute different tasks at a time by simultaneously feeding into the same end product. His work was adapted and refined by multiple researchers. The most acknowledged ones are Leavitt's diamond [51], Galbraith's Star Model [21], McKinsey's 7-S [52] and the Burke-Litwin model [53]. After Taylor's groundwork the mentioned researchers discovered the impact of change on the existing model. Initially, Leavitt discovered that change does not occur in isolation, but affects multiple parts of the organisation. He therefore built his 'Diamond Framework' on four elements that are affected as soon as an organisation faces change. This was a fundamental change in research as most organisation designers at that time thought of organisation structure to be the only element of organisation design [21]. Nevertheless, most of the above models have been developed within the last two decades. [54]remarks that “[...] each was developed in an era of relative stability when organisations tended to have a single overarching business design that for most parts flowed down through the various divisions and business units”. The author goes on an argues that in today's agile times, these frameworks provide a reasonable ground work but need to be

wisely used in the current context and most probably adjusted to the rapid pace of change that occurs every day. Friedman [55] supports this argument by giving various examples how the world today changes the way organisations organize themselves. Whereas models suggests to closely separate different organisational structures, he gives specific examples of companies that did the contrary to enforce collaboration. But not only the two authors have recognized this trend but also others have worked on renewed frameworks. Baldwin [56] for example has finished a working paper that elaborates on the changes that need to be made to organisation design in a world of distributed innovation. The author shows the different effects that distribution has on different dimensions and how these influence the other parts of the design. She is using the above mentioned frameworks to come to conclusions on how organisations need to change. Other frameworks are the “Fractal Web” [57], Ralph Kilmann's “Five Track Model” [58] or the “Holonic Enterprise Model” [59].

Looking beyond pure organisation design models, IT/IS specific models have also derived from the literature. Gartner as the leader in IT/IS specific research published its “IS Model” and its “IS LITE Model” in addition to well-known consulting companies [60], [61]. Looking more specifically at the history of the IT/IS related models shows a slightly different development. Whereas the organisation design models have constantly developed throughout the last century, the IT/IS organisation design models have slowly developed but also dramatically changed from decade to decade. Whereas the 80 ties and 90 ties proposed completely integrated IT/IS departments, the change of the century was the start of “IS Lite” and “Reduced IT/IS” models driven by the question whether IT is relevant at all [62].

The fact that pure organisation design models offer a more solid ground work for an initial categorization on IT/IS organisational design has mainly influenced the decision to use a well-known general organisation design model to categorise the findings. Based on the publication time and reputation gained within the research community this research has used the star model of [63]. The categories of the model have been used for the coding theme of this research. The five categories of Galbraith's star model are described in Table II. The questions for each of the categories were derived from [64].

TABLE II
APPLIED QCA CATEGORIES

Category	Question to be answered
Strategy	How do we differentiate ourselves from competitors?
Structure	How is the IS function organised?
Processes	What are the key roles?
Rewards	How is the work managed?

B. Structuring the IT/IS Organisation Design Spectrum

1) Strategy

The QCA confirmed what is already mentioned in the beginning of this paper that the IT/IS function is currently at a

tipping point where an adjusted IT/IS organisation design is needed to mirror the upcoming demands of digitization, especially driven through the increase in Software as a Service (SaaS) solutions [65], [66]. As mentioned earlier, it is possible for any business unit to purchase most standard IT/IS services from an external IT/IS service provider leaving only the cumbersome and 'difficult to manage' services to the internal IT/IS organisation. Moreno-Vozmediano et al. [67] and Harris et al. [68] emphasis on this by highlighting the behaviour that will become normal in the business functions that many employees first turn to the 'cloud' before they approach the internal IT/IS organisation. Setting this in context means that the strategy of the IT/IS organisation must be to position itself as the business enabler rather than a support function [9], [33], [69]. A quote of one CIO within one of the literature brings it to the point: 'We need to get business to see that IT/IS development is an enabler, not a barrier' [68]. Kappelmann et al. [70] emphasis a similar aspects but uses the title 'business/IT alignment'. According to their study it becomes more and more dominant that this is the critical success factor where IT/IS organisations need to improve. Van den Hooff and de Winter [71] illustrate an active involvement of business will help to develop an explicit interest of business in IT/IS and therefore strengthen the overall alignment. The authors go on and build a bridge to agile development methods that strengthen the ties between both parties as the interaction becomes much more intense as compared to a normal 'waterfall' or 'v-model' development cycle [33], [72], [73]. If the internal IT/IS organisation can transform itself towards a driver of competitive advantage for the business it has the chance to strongly shape the business's trajectory. Some research also suggests that the CIO becomes the most crucial influencer and decision maker within the organisation. Mostly driven by the extensive knowledge that IT/IS staff has about financial instruments like analytics, marketing instruments like salesforce.com, HR tool suites like 'workday.com' and many other innovative IT/IS solutions [15], [74], [75]. This positive outlook is supported by another study that illustrates that business productivity moves into the focus of an IT/IS organisation within the next few years, nevertheless cost reduction is still a topic of high importance [70], [76].

Another topic that is very often discussed in the literature in-scope is the 'IT/IS sourcing strategy' [77]. Some viewpoints recommend to build a strategic base of suppliers, but to not fall into the trap of outsourcing for 'god-sake' [78]. The authors recommend to evaluate the 'tradeoff between production costs and coordination or transaction costs'. Costa et al. [79] support that argument and states 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 quote is also supported by [18]. This tendency is further supported by another research paper that has evaluated the trend of outsourcing internal IT/IS staff. The research shows for example that the outsourcing of IT/IS staff in Asian countries has sky rocked from <0.5% in 2010 to 5.5% in 2011. But not only to reduce costs but also to

fill the existing skill gaps that the organisations are not able to fill themselves [76].

2) Structure

Structure is the category that almost everyone knows of. Some authors actually state that organisation design is more or less only structure [39] which is proven to be not valid anymore by many researchers [52]. Organisation design goes far beyond structure, but structure is a central part of an organisation's design.

Especially the difference between decentralization and centralization is predominantly discussed under this category but also 'span of control' and the division of labour. The article base unveiled different opinions on whether digital trends force an IT/IS organisation to be rather centralized or de-centralized. Kaiser and Buxmann [78] have analysed a set of companies and found out that especially the strategic supplier management should be organized centrally to unveil contractual synergies whereas the operational supplier management is mostly organized de-centrally, as it interacts with the suppliers on a day-to-day basis. In addition, [78] highlights that a structure separating 'development-orientated suppliers' and 'infrastructure suppliers' is recommended as the origin of their work and their contractual basis vary significantly. According to [70] there is no either or question anymore but rather a separation on which aspects do save money (should be organized centrally) and which functions provide value-add to the business (should be organized de-centrally). The authors support their findings with additional research results that show a steady decline in centrally or de-centrally organized IT/IS organisations supporting their view that a federated organisational structure is key for the overall success. In addition, structure can also help to bridge the gap between business and IT/IS therefore becoming an enabler of the business rather than an obstacle. Jablowski et al. [69] suggest a 'balanced function matrix structure from the IT/IS perspective, with IT/IS staff reporting to both the business units and the IT/IS hierarchy'. Nevertheless, this aspect needs to be closely thought through as other basic literature on organisation design tells us that reporting lines towards the business and the IT/IS need to be wisely established and incentivised to achieve the necessary behaviour [68], [80], [81].

But the digital age brings also new collaboration tools with it. Those new technologies allow for a more simplistic way to de-centralize IT/IS functions due to the fact that information flows seamlessly from one point to another [82]. Furthermore, the cloud computing technology paired with analytics algorithms and social media applications within an organisation allows IT/IS personnel to be situated de-centrally putting a much higher focus on virtual teams. Looking at the specialization of IT/IS organisation, [82] sees the degree of specialization of IT/IS staff not related to any digital trend but rather to the size of the overall IT/IS organisation. The smaller the IT/IS organisation the less specialised the IT/IS personnel.

Last but not least, one paper elaborates on how digital capabilities can be best build into the organisational structure.

The authors suggest informal structures to build innovation capabilities into the organisation, whereas other authors argue that a specific organisational unit, what in this paper is called an 'innovation center of excellence (CoE), should be established [83].

A final remark within this section should be made on 'IT/IS governance'. There are basically two opinions among the researchers. One side of the continuum argues that 'laissez-faire' governance is the right way to handle the new requirements [36], [68]. Whereas the other extreme argues that an authoritarian governance is needed to manage this very agile environment [18], [84], [85]. Simonsson et al. [86] support the latter aspect by arguing that good IT/IS governance performance leads to higher business/IT alignment. What can definitely said from the research for this paper, is that there is much more space to elaborate on the governance topic than can be discussed within this paper and should therefore be picked-up in further research studies on IT/IS governance.

3) Processes

Processes are concerned about the way decisions are made, information flows and how the organisation collaborates [64]. Linking the findings within the 'strategy section' to process requirements quickly demands for processes that standardize business/IT alignment and supplier management to ensure a streamlined and effective way of working within the IT/IS function [71], [87], [88]. The ladder aspect, an effective supplier management, is emphasized by [78] who state that supplier management becomes a key enabling process to strengthen the quality of service therefore leading to higher business satisfaction. But supplier management is a two-sided story. Also the suppliers itself have got requirements that need to be fulfilled to deliver the promised quality of service. One predominant requirement are the adaptation of standard IT service management processes [89]–[92].

Another focus seems to be on the processes that deal with the supply and demand controlling. 'Pay-as-you-go' payment schemes bring a lot of complexity into the game and need to be wisely monitored [68]. But this not only demands for standardized and scalable processes but also for a tight interaction between the IT/IS organisation and the controlling department – also letting room to discuss whether the latter one is better integrated into the IT/IS organization [79], [93]. The profit-centre versus cost-centre discussion is also raised within the discussion of those controlling processes. Costa et al. [79] argue that for commodity services a cost-centre approach is valid whereas for value-adding services a profit-centre approach should be used. Even though this position is supported by other authors it is recommended to incorporate the increased complexity of the charge-back model in the business case equation.

Knowledge management and collaboration are other hot-topics according to the literature. Even though they have been highlighted within the last ten years to be a driver of competitive advantage, they are now 'essential for survival'. If an organisation and especially an IT/IS organisation is not

capable to set-up a consistent and concise knowledge management framework it is doomed to be out of business [90], [94]–[97]. Another opinion is documented by [98], [99] who argue especially in regards to knowledge sharing processes that they might support the exchange of information but won't be the 'wholly-grail' that solves every communication issue. What is needed according to him is a 'practice based perspective' that serves on a 'just-do-it' attitude of the IT/IS staff. Lastly, innovation is another 'hot-topic'. Whereas some literature argues that a strict and streamlined process is needed others demand only the required tools to be in place (e.g. tools, meeting structures, etc.) [100]. The innovation process need to be linked with the innovation governance aspect described in the 'structure' category.

4) Rewards

Rewards are looking at how behaviour is shaped through the goals and how an organisation assesses individual progress [64]. Even though there are some paragraphs about the adjusted requirements of reward systems it was quite surprising that only one real design implication could be drawn from the paper base. This design criteria for rewards is that IT/IS managers should think about the technical equipment that the IT/IS staff is able to use and the freedom of bringing their own devices to execute their work [101], [102]. Even though it seems to be a bit weird that only one aspect could be found along the research it also raises the questions whether rewards is a question that an IT/IS organisation needs to answer. It could be assumed that this is a pure matter of the organisation as a whole. Further research on these aspects should be done to understand whether rewards are purely shaped on a corporate level and therefore functional sub-organisations are not required to have a specific answer to that topic.

5) People

The 'people' category is defined as the basis of skills that an IT/IS organisation needs and the way the IT/IS staff is trained to achieve those skills. Heier et. al. [17] have specifically looked at general changes that are becoming strategically relevant in the digital age. Both come to the conclusion that IT/IS organisations need to deal with two different sets of requirements – one determined by an industrial view of strong guidance and stability and one of a more digitized view where adaptability and scalability are key to the success of an effective IT/IS organisation. Marchand and Peppard [26] call this a "Schizophrenic IT/IS Organisation".

Looking specifically at the required capabilities in the digital world; [69] sees the problem solving capability as one of the most strategically important capabilities to gain. According to their paper, operational activities become less important as outsourcing tenures are more and more prevalent and managerial capabilities push into the spotlight, especially in the area of problem solving. Even more to the point is the statement that hard skills like hardware and software maintenance as well as updates become obsolete [90], [103].

A different aspect but pushing in the same direction is the digital workforce [104]. IT/IS managers need to understand that the characteristics of the generation of employees now entering the workforce have different viewpoints and attitudes towards their work environment than any generation before [105]. An IT/IS organisation design needs to incorporate those changes and has to give an answer of how the different capabilities are build up and how this is aligned with the attitudes of the new employee generation.

Another aspect that was prevalent along the analysis of the paper base are the required skill groups that need to be existent within an IT/IS organisation. 'Product breadth competency, new business development competency, innovation adaptability competence and organisational learning competency' are the capabilities that were derived from a study among a set of IT/IS organisations [106]. Those competencies can either be trained or brought into the organisation through recruiting activities. As upskilling in general is less expensive than hiring, the IT/IS workforce can gain those described competencies, if the IT/IS staff is willing to be trained. Bucic and Ngo [107] elaborate on another way to build up the required competencies – the 'alliance learning' which means to cooperate with other organisations on innovation. This can also be seen in other industries like the automotive industry where for example BMW and Mercedes develop new engine technologies collaboratively even though they strongly compete in the market [108].

When looking at the described digital trends throughout this paper, it can be assumed that in the near future more and more business functions turn into the 'cloud' to purchase their own IT/IS services [67]. This effect can only be minimized through a well-positioned value proposition of the IT/IS organisation but not entirely constrained as already pointed out in the 'strategy' category. It is very critical that the right skills are developed among the IT/IS personnel in regards to security [76], [109], data and compliance which might arise through the 'uncontrolled' purchasing behaviour of the business [68], [78], [79], [95], [110]–[112]. Some authors illustrate new roles that incorporate the new capability requirements. Whether these are the ones described above or others that are for example big-data related, which would be named the 'data scientists' [35], [113], [114] – or communication related [115]–[118]. Discussing those new roles might lead to a complete new set of organisational roles as some authors recommend [119], or evaluate which behaviours are necessary to be adapted by the current IT/IS staff [71], [98]. Birmholtz et al. [98] are even more clear and describe that a lack of 'knowledge sharing' willingness causes the problems in the relationship between business and IT/IS.

But moving into the digital age also leads to additional challenges that not only the skillsets and adjusted roles needed are different [120], also the governance mechanisms demand for adjustment [17], [28], [121] and more intense supplier contacts ask for worldwide deployment of IT/IS staff. Also those requirements need to be incorporated into the IT/IS organisation design in a digital age. The literature in scope doesn't give an answer but opens a potential solution scope to

build-up the necessary skills. Attracting new talent is another topic to be discussed. Legacy technologies not only do not perform according to today's business requirements they also do not match the IT/IS employee's desire to enjoy state-of-the-art technology [68], [122]. This aspect could make a difference attracting new employees in an age where 'war-of-talent' is a day-to-day battle.

IV. DISCUSSION, CONTRIBUTION AND FURTHER RESEARCH

Discussing the findings within the *strategy* category shows two particular aspects that an IT/IS organisation needs incorporate into their value proposition. According to the findings it firstly must be position itself as the business enabler rather than a support function [9], [33], [69]. 'Business/IT/IS alignment' has been identified by many authors to be a key requirement of the IT/IS function. Easily speaking, the business needs to have a good feeling to approach the IT/IS function for any IT/IS related matter. Secondly, a professional supplier management becomes mission critical as more and more of the IT/IS operation is going to be brought-in from external vendors. Cloud computing is only one driver of those happenings. According to the literature this supplier management should be supported by a professional IT/IS controlling function that ensures consistent quality of service with market competitive pricing structures.

The *structure* category brought up three focus areas. First, the finding that an IT/IS function should be structured along a federated approach, positioning the standardized functions in a central set-up whereas the business enabling functions into a de-centralized set-up. The second aspect of IT/IS governance is intensively discussed in the literature as there are two different viewpoints. One argues that governance needs to be authoritarian whereas the other party argues that only a 'laissez-faire' governance succeeds. Thirdly, the topic 'build-in innovation' is discussed about how the IT/IS organisation can incorporate innovation thinking by simultaneously running the old legacy environment. The literature has given some advices but this area should be further researched to get a more holistic view on it.

The findings within the *process* category consistently supported the findings within the strategy category. Literature demands for a structured business/IT alignment process that should focus on two aspects. The first is to build in a process that allows for a structured problem-solving between business and IT/IS with clear responsibilities and the second one focuses on an agile way of collaboration between business and IT/IS to push for more interaction points between both parties. Another finding is that a standardised IT/IS service management framework needs to be implemented to best interact with the range of external partners and get the best prices. According to the findings, most external vendors can only offer the prices if their standard processes are understood and integrated with the IT/IS organisation.

Rewards were a rather minor topic among the literature base in scope. It is assumed by the author that this is a pure

matter of the organisation as a whole not specifically the IT/IS function and therefore should be removed from a holistic IT/IS organisation design framework. Further research on these aspects should be done to understand whether rewards are purely shaped on a corporate level and function organisations are not required to have a specific answer to that topic.

Lastly, the *people* category illustrated many different aspects that can be structured around three dimensions. The first is the fact that more and more of the operational activities are not anymore executed by the IT/IS workforce but rather through external suppliers. This demands an IT/IS workforce that focuses on managerial activities rather than operational ones. Furthermore, the digital trends demand for a new skill group that the IT/IS workforce needs to develop. These are security, compliance and information strategy skills. Lastly, it was prevalent that the so called 'digital natives' change the way people interact within the organisation. This trend needs to be anticipated by the IT/IS organisation and be built into the organisation's DNA. But literature showed also that there are currently no design recommendations how this can be done.

The research has shown that the use of Galbraith's star model helps to structure the findings in the first place. But it is

also obvious that for an IT/IS organisation design there are additional categories that seem to be as relevant as the existing ones. 'Sourcing' and 'governance' are discussed intensively in the literature and need to be further researched to finally decide on the reshuffling of the existing categories. This is illustrated by a range of papers within the research scope [72], [76], [78], [79], [123].

Overall, this research has made a first step for bringing relevant articles from different viewpoints together to shape a general understanding of IT/IS strategy and organisation design in a digital age. It has illustrated a first IT/IS organisation design framework with a set of categories that can be used to understand the implications of the digital age. Nevertheless, this framework needs to be further developed and probed among a wide amount of IT/IS professionals. Further research needs to be on sourcing and governance aspects to build an even stronger basis for a first IT/IS organisation design framework. Secondly, a set of hypotheses needs to be developed to be tested in a quantitative analysis among IT/IS executives and practitioners to validate those hypotheses.

TABLE III
LIST OF ANALYSED PEER-REVIEWED PAPERS

#	Paper	Strategy	Structure	Processes	Rewards	People	#	Paper	Strategy	Structure	Processes	Rewards	People
1	[35]					X	27	[100]	X		X		
2	[95]			X			28	[113]					X
3	[124]					X	29	[97]			X		
4	[87]			X			30	[88]	X	X	X		
5	[71]	X					31	[70]	X				
6	[36]	X					32	[125]	X	X	X		X
7	[82]		X				33	[126]	X	X	X		X
8	[73]	X					34	[76]	X	X	X		X
9	[18]	X	X				35	[37]		X			
10	[96]			X			36	[83]		X			
11	[86]		X				37	[69]	X	X			X
12	[99]					X	38	[85]		X			
13	[105]					X	39	[68]	X	X		X	X
14	[65]	X					40	[77]	X				
15	[104]			X		X	41	[112]			X		
16	[127]						42	[128]			X		
17	[78]	X	X				43	[79]	X		X		
18	[106]					X	44	[114]			X		
19	[109]			X		X	45	[122]					X
20	[67]					X	46	[118]					X
21	[102]				X		47	[9]	X				X
22	[66]	X					48	[90]		X	X		
23	[80]		X				49	[103]			X		X
24	[111]			X			50	[101]		X		X	
25	[91]			X			51	[92]			X		
26	[129]		X										
		SUM	18	17	20	3	19						

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