

How to Design an IT Department? A Review and Synthesis of Key Characteristics

Full papers

Anna Wiedemann

Center for Research on Service Science
Neu-Ulm University of Applied Sciences
anna.wiedemann.@hs-neu-ulm.de

Andy Weeger

Center for Research on Service Science
Neu-Ulm University of Applied Sciences
andy.weeger.@hs-neu-ulm.de

Abstract

The design of an IT department received much attention during the last years. CIOs and IT managers still have a great interest how they can set up their IT department. Previous research discusses various key characteristics or even delivers archetypes of the IT department. However, a synoptic view of the screws CIOs can set, is still missing. Subsequently, the aim of the present paper is to synthesize existing literature in order to gain an overview about the key characteristics of an IT department. To that end, a systematic literature review was conducted. The paper contributes a set of nine characteristics grouped along three dimensions: organizational, technological, and human dimension. The nature of the IT artifacts deployed by the IT department as well as the real net output ratio of the IT function were identified as important characteristics, which were not addressed by existing typologies of IT departments.

Keywords

IT department, IT function, key characteristics, literature review

Introduction

Most contemporary business processes are not conceivable without the support of adequate Information Technology (IT). Subsequently, more and more firms are not viable without IT (Peppard and Ward 2004). Therefore, spending on IT has become a major part of corporate expenses (Schryen 2011). However, prior research has shown that investments in IT do not by default contribute to a positive firm performance. Rather, the measurable impact of IT investments seems to be particularly dependent on the firm's ability to effectively manage the resource IT (Santhanam and Hartono 2003).

The IT department contains all groups and units that are responsible for the management of the resource IT (Chung and Snyder 2001; Saunders and Jones 1992). The purpose within the organization is to provide IT solutions and IT-based services and to continually align them with ever-changing business objectives in order to support organizational goals (Guillemette and Pare 2012; Sabherwal et al. 2001).

In view of the importance of IT for contemporary enterprises it is not surprising that the management of the IT function gained significant importance in the last years. In this regard, surveys repeatedly show that Chief Information Officers (CIOs) have great interest in the design of the IT function and particularly its key characteristics such as organizational structure and governance modes (Kappelman et al. 2015; Luftman and Ben-Zvi 2010). However, knowledge concerning the nature of the IT function seems to be very fragmented (Guillemette and Pare 2012).

Paving the way to a unified view on the IT function, Guillemette and Pare (2012) propose five distinct key characteristics of IT functions: the critical activities carried out by IT specialists, the most important skills and abilities for IT professionals, the nature of the relationship with business units and external partners, and IT governance. However, discussions with CIOs reveal that these characteristics miss important

aspects such as the degree of outsourcing and the characteristic of the IT artifacts (e.g. hardware, applications, services, etc.) that are managed by the IT function. Moreover, literature shows that the technological and architectural characteristics of the IT artifacts employed by the IT department (Ross 2003; Tiwana and Konsynski 2010) as well as the nature of their deployment and management are of particular importance for contemporary firms (Kappelman et al. 2016).

Since business’ dependency on IT continually increases (Kien et al. 2013) and the nature of IT as well as its management is in flux, researchers as well as practitioners call for a better understanding of the IT function (Chung and Snyder 2001). It is expected that there are key characteristics of the IT function that determine if and how it is able to cope with recent business requirements as well as technological and organizational trends. As laid out above, research on such characteristics is fragmented. In order to contribute to our understanding of the IT function and to address these limitations, this paper aims to provide a synthesis of the key characteristics of the IT function as discussed in prior research. To that end, we put forth the following research question:

What are key characteristics of cooperate IT functions that are reported in literature and that are open to CIOs influence?

In order to answer this research question, we conducted a systematic literature review and synthesized the attributes of the IT function that can be governed by CIOs or IT managers. As to that, findings reveal the key characteristics of the IT function within contemporary organization structured along three distinct dimensions.

Method

Literature reviews provide overviews of current states of research in distinct fields, synthesize existing knowledge and identify research gaps and unexplored research questions. As to that, reviewing literature is a necessary process in scholarship, which ensures that new research is connected to the existing body of knowledge within a research topic (Webster and Watson 2002; Wolfswinkel et al. 2013). In order to identify the key attributes of IT departments we follow the Grounded Theory approach proposed by Wolfswinkel et al. (2013) and conduct such a review.

The Grounded Theory approach provides a method for systematically reviewing existing literature. By means of a repeating processes of data collection and analysis, this approach aims to build and correlate concepts in order to develop new or extend existing theory (Strauss and Corbin 1990). The five stages of the approach that facilitates the development of “*a theory-based or concept-centric yet accurate review*” (Wolfswinkel et al. 2013, p. 47) are presented in detail below.

Definition of Research Scope

For identifying prior research, we decided not to use a key-word based search strategy but rather to manually scan the table of contents of premier IS research journals from North America and Europe (Schwartz and Russo 2004; Wolfswinkel et al. 2013). This decision was particularly motivated by the fact that search using keywords like “IT”, “function” and “department” would have resulted in too many irrelevant articles, which increases the chance of missing articles that could prove valuable to our research question.

Following Webster and Watson (2002), the criteria for inclusion or exclusion of articles have to be defined first. Our review explicitly focuses on characteristics and management issues of IT functions, IT department, IT organizations, and IT centers. The emphasis is on past investigations of the design of IT departments and IT management archetypes. Particularly, we were looking for articles that are describing key characteristics, and key or management issues of an IT function.

Inclusion Criteria	Exclusion Criteria
Investigations which focus on IT function and discuss key characteristics	Investigations with strong focus on the outcome (e.g. performance) of an IT function
	Investigations which deliver no attributes/capabilities/

	components or insights for the design of an IT function
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Table 1. Inclusion and Exclusion Criteria***Search for prior Literature***

We included eight recommended journals by the Association for Information Systems (AIS) senior scholars group in 2011 (i.e., the senior scholars basket of eight) plus MISQ Executive. We included latter one because it contains frequently cited practice based publications in IS and is well-respected in practice and academia. Furthermore, we included the past five years of the conference proceedings of the International Conference on Information Systems (ICIS) and European Conference on Information Systems in our analysis (ECIS). By including the A- or B-rated conference proceedings, we intend to ensure that our literature review captures the latest research that is not already published in highly regarded journals.

Selection of relevant Literature

Webster and Watson (2002) recommend to start the literature search with important journals and conference proceedings to conduct a forward and backward search of selected articles afterwards. Following their advice, we identified relevant articles by scanning the title and abstract of each article within the selected journals and conference proceedings. If heading, key words and abstract suites our inclusion criteria, papers were included for further review. Following this strategy, 72 articles have been identified.

In a next step, we read all these articles and applied our exclusion criteria. As a result, 46 papers have been excluded. For the remaining 26 articles, we performed a backward research by checking the articles cited within the paper. Moreover, we used Web of Science and Google Scholar to perform a forward search in order to identify articles that cited these articles. The results of backward and forward search have been analyzed using the same inclusion and exclusion criteria, resulting in another 15 articles that have been included in our analysis, to summarize we selected 41 papers. Table 2 presents our findings from the nine journals and two conference proceedings.

Journal	Coverage	Hits	Included
MIS Quarterly	1977-2015	24	9
Journal of Strategic Information Systems	1991-2015	6	5
Journal of Management Information Systems	1984-2015	9	1
Journal of Information Technology	1986-2015	7	1
European Journal of Information Systems	1991-2015	3	0
Information Systems Journal	1991-2015	1	1
Information Systems Research	1990-2015	11	2
Journal of AIS	2000-2015	0	0
MIS Quarterly Executive	2002-2015	6	5
International Conference on Information Systems	2010-2015	2	1
European Conference on Information Systems	2010-2015	3	1
Others Sources (forward/backward search)			15
Total		72	41

Table 2. Considered Sources and Number of Identified Articles

Analysis of prior Literature

Aiming to derive high-level concepts or categories, we coded the selected papers following the guidelines as proposed by Wolfswinkel et al. (2013). In order to mitigate the risk of coding bias, the research team has developed rigor rules that guided the coding and analysis process. After the guidelines have been set up, one author went through the paper and coded passages covering information about the focus and theory base of the paper, applied methodology, considered characteristics of the IT functions and primary findings. Applying an open coding approach, the researchers then went through the codes concerning the characteristics of the IT function in order to identify overlaps and patterns. As a result, an initial set of characteristics were derived. Subsequently, researchers developed the conceptual matrix, which comprises the name of the characteristic, definition and its manifestations within a table. Afterwards, we synthesized this table by applying axial and selective codes. Hitherto we developed and refined categories by synthesizing identified characteristics and –if necessary– created sub-categories for the characteristics. During analysis regular meetings were set up. Here researchers discussed emergent findings, issues and divergent views, until agreement regarding the codes could have been achieved.

Literature Analysis

Several researchers investigated the design of the IT function and proposed design and management guidelines (Agarwal and Sambamurthy 2002; Galbraith 2009; Gordon and Gordon 2002; Guillemette and Pare 2012; Peppard and Ward 1999). Analyzing and comparing the theoretical and empirical findings of these papers, we were able to identify nine distinct characteristics. In search of structural features that cluster the categories we decided to introduce three dimensions that have been already used to structure IT capabilities: the organizational, technological, and human dimension (Schäfferling 2013). The rationale for this decision is twofold. First, these dimensions emerged naturally during coding data and discussing the results. Second, much literature concerned with IT capabilities demonstrates that factors within these dimensions affect various organizational outcomes related to IT. Below we present the key characteristics related to these dimensions that emerged during our analysis.

Numerous investigations try to enhance our understanding of the IT function with different focus, some authors provide investigations for the **organizational dimension** like strategy, structure, governance, and formalization. Research that focus on one or more concepts, e.g. Tamim et al. (2012) examined various configurations of the strategy and structure of IT departments. Olson and Chervany (1980) shed light on the relationship between organizational characteristics (e.g. formalization) and the structure of IT department. Interestingly they derived feature of an IT department from literature which are influencing the degree of centralization.

The concepts within the **technological dimension** primarily focus on the nature of technology and how it is deployed within an IT function. The concepts of architecture, primary activities, outsourcing degree, and technological innovation are clustered within this dimension. Ross (2003), for instance, identified a typology for characterizing the architecture of the IT artifacts employed within the organization. The typology encompasses silo architectures, standardized architectures, innovative architectures and modular architectures. Cross et al. (1997) propose an IT transformation model with seven components for managing an IT department. The authors deal with the IT value chain to identify services that could be outsourced. After analyzing different sources, the concept of outsourcing degree and other technological concepts which are important for the management emerged (see table 3).

The **human dimension** encompasses characteristics that reflect IT professionals' relationship to business units and their primary competencies. Hereto, we recognized literature that present effects of IT functions interactions with other partners as well as on characteristics for skills within an IT department. For instance, Clark et al. (1997) investigated design elements of an IT department for creating change readiness capabilities. They found that relationship management and necessary skills are important key attributes. Peppard and Ward (1999) examined the relationship between the IT professionals and the business units and show that strong business/IT relationships are required for organizational success.

The following table summarizes the findings of our analysis structured along the organizational, technological and human dimension.

Characteristics/ concepts	Definition	Discussed manifestations	References
Organizational Dimension			
Strategic position	The strategic position is reflected by a pattern in a stream of decisions made by the IT department regarding the deployment, management, and investment in information technology in organizations.	The strategy of an IT department may be oriented towards <ul style="list-style-type: none"> • business • technological innovation • baseline system provision/support 	Agarwal and Sambamurthy (2002); El Sawy et al. (1999); Gottschalk and Taylor (2000); Guillemette and Pare (2012); Tamim et al. (2012)
Organizational structure	Organizational structure reflects the organizational design of an IT function and includes the distribution of responsibilities and reporting lines.	The structure of an IT department may be <ul style="list-style-type: none"> • centralized • decentralized • hybrid 	Brown (1999); Ein-Dor and Segev (1980); Fowler and Wilkinson (1998); Gordon and Gordon (2002); Guillemette and Pare (2012); Markus et al. (2013); Lee et al. (1995); Sambamurthy and Zmud (1999); Tamim et al. (2012); Zmud (1984)
Governance structure	Governance structure is defined as the decision making structure and the accountability for IT-related decisions.	IT-related decisions are made by <ul style="list-style-type: none"> • individuals from business (management-level) • IT executives (management-level) • business and IT executives (collaboratively, management-level) • business and IT units (operational level) 	Agarwal and Sambamurthy (2002); Bowen et al. (2007); Cross et al. (1997); Curley (2006); Guillemette and Pare (2012); Reich and Nelson (2003); Rockart et al. (1996); Ross (2003); Vaast and Levina (2006); Weill (2004); Wu et al. (2014)
Formalization	Formalization is defined as the degree to which the IT department deploys and adheres to organizational standards (e.g. rules and processes such as IT Service Management standards).	The rules and processes employed within and by an IT department may be <ul style="list-style-type: none"> • formalized • informal 	Olson and Chervany (1980); Tamim et al. (2012); White and Christy (1987)
Technological Dimension			
Technological architecture	Technological architecture refers to the overarching structure and properties of the relationships among the systems and applications in an organization's IT portfolio (Tiwana and Konsynski 2010).	The IT architecture may be characterized as <ul style="list-style-type: none"> • Silo architecture • Standardized architecture • Modular architecture The IT systems and applications encompasses <ul style="list-style-type: none"> • innovative, new technologies • good practice technologies 	Bharadwaj et al. (1999); El Sawy et al. (1999); Feeny and Willcocks (1998a); Fuller and Swanson (1992); Ross (2003); Sambamurthy and Zmud (2000); Tarafdar and Gordon (2007); Tiwana and Konsynski (2010)
Primary activities	Primary activities are defined as the most important activities that are performed by IT professionals within the IT function.	The IT department primarily focuses on <ul style="list-style-type: none"> • business critical activities • IT critical activities • business necessary activities 	Agarwal and Sambamurthy (2002); Cross et al. (2010); Feeny and Willcocks (1998c); Feeny and Willcocks (1998a); Guillemette and Pare

		<ul style="list-style-type: none"> IT necessary activities 	(2012); Peppard (2003); Peppard and Ward (1999); Rockart et al. (1996); Ross (2003); Tarafdar and Gordon (2007)
Outsourcing degree	Outsourcing degree is defined as the extent to which the IT function decided to hand over services to external providers (including off- and near-shore functions).	The real net output ratio of the IT department may range from <ul style="list-style-type: none"> solely in-house supply selective outsourcing total outsourcing 	Cross et al. (1997); Dibbern and Heinzl (2009); Lambert and Peppard (1993)
Human Dimension			
Relationship characteristics	Relationship characteristics reflect the modus operandi and nature of the collaboration between business (internal clients) and IT as well as between IT and external partners and vendors.	The relationships of the IT department may be <ul style="list-style-type: none"> proactive reactive strong limited 	Agarwal and Sambamurthy (2002); Brown and McLean (1996); Cross et al. (2010); Curley (2006); Peppard and Ward (1999); Ross et al. (1996); Guillemette and Pare (2012); Rockart et al. (1979); Rockart et al. (1996); Ross (2003); Reich and Nelson (2003); Ward and Peppard (1996)
Primary competencies	Primary competencies are defined as the most important skills, characteristics and knowledge of the IT professionals within the IT function.	The nature of the most important competencies of the IT staff is <ul style="list-style-type: none"> technical business management 	Boyatzis (1982); Clark et al. (1997); Boyatzis (1982); (Guillemette and Pare 2012); Peppard et al. (2000); Tarafdar and Gordon (2007)

Table 3. Findings - Concept Matrix

Discussion and Conclusion

Limitations

Before discussing the findings and their implications, we acknowledge a few limitations of our study. First, the methodology of this review is based on the guidelines for a systematic review of Webster and Watson (2002) and Wolfswinkel et al. (2013). Though a structured literature search with the most relevant outlets in IS was performed, we acknowledge that research in other areas such as strategic management might be also relevant to our research question. Subsequently, further research may include other research fields, and identify and analyze papers in outlets such as the Strategic Management Journal or Academy of Management Journal. Second, the proposed synthesis reflects an extension of the few available typologies in order to characterize IT functions. However, until now, the characteristics are solely grounded in prior research and need further theoretical amplification. Third, the concrete manifestation of the characteristics proposed above, their interrelations as well as effects need further elaboration – theoretically and empirically.

Contributions, Implications and Further Research

Synthesizing prior research, this paper provides the following major contributions. First of all, we provide a comprehensive overview of characteristics related to the design of an IT functions synthesized from prior literature and organized along three dimensions. The key characteristics of IT functions that have been derived are distinct and can be actively influenced by IT managers. Moreover, the characteristics are organized along three dimensions: the organizational dimension, the technological dimension and the human dimension. The resulting framework is depicted Figure 1 below.

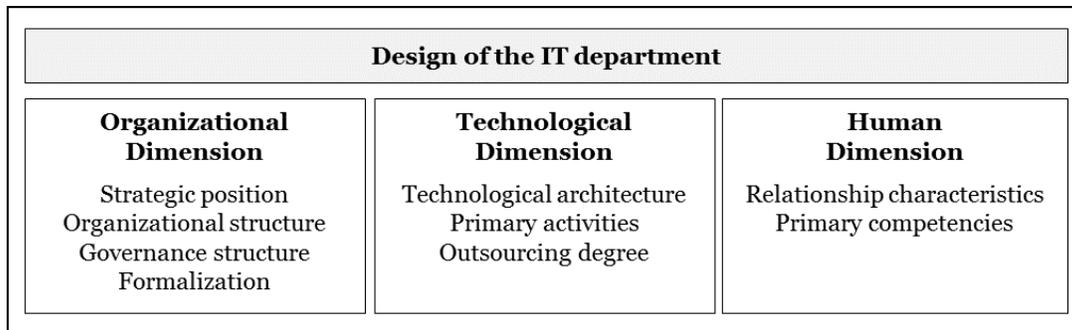


Figure 1. Findings - Three Dimension of Key Characteristics

The framework extends existing research as knowledge regarding the design of the IT function is very fragmented and hitherto rarely consolidated. Past literature primarily focused on a few characteristics of IT functions such as structure (e.g. Kien et al. 2013; Markus et al. 2013; Olson and Chervany 1980) or strategy (e.g. Gerow et al. 2015; Gottschalk and Taylor 2000; Tavakolian 1989), but did not provide a holistic perspective on the design of the IT function. Although they do not cover all characteristics that we have identified, only a few articles form notable exceptions: Agarwal and Sambamurthy (2002), Galbraith (2009) as well as Guillemette and Pare (2012) propose some principles and models concerning the design of the IT function, which go beyond single factors. However, they miss some important aspects. Particularly, the nature of the IT artifacts managed by the IT department (i.e. technological and architectural characteristics) as well as the real net output ratio of the IT function (i.e. outsourcing degree) are hardly considered by existing models on the IT function. In light of the importance of recent IT management trends such as in memory technology and cloud computing (Kappelman et al. 2015), key characteristics of the IT department should also reflect the nature of the IT artifacts employed as well as the scope of IT services that are provided internally.

Since the derived framework consolidates the work within this research stream, it may guide further research aimed to gain knowledge on how to purposefully design the IT function. Further research may investigate how CIOs manage the characteristics of their department and how distinct configurations (e.g. combinations of characteristics) as well as adjustments to these configurations impact performance measures such as IT spending, time to market, IT capabilities etc. As to that, this research presents the screws that CIO can set to manage his function within ever-changing environments.

Second, structuring the characteristics along three distinct but interrelated dimensions emphasizes the need for analyzing the key characteristics of IT functions holistically. This research indicates that academia and practitioners alike must consider organizational aspects such as structure and governance, technological aspects such as IT architecture and primary activities of IT staff as well as human aspects such as social relationships and core competencies of IT staff in unison. As to that, our framework provides a starting point for further investigations considering the interrelations of the characteristics. Further research may provide theoretically and empirically grounded insights regarding potential manifestations of the characteristics and how these interrelate.

In this regard, our analysis already indicates that the characteristics of the technological artifact designed, operated and managed by the IT function is of particular importance. For instance, IT managers can focus on the deployment of innovative and novel technologies or rather stick to proven technologies. Hereto, the design of the technological artifact will –most likely– interfere with other dimensions e.g. through characteristics of the human dimension such as the primary competencies of IT staff (Agarwal and Sambamurthy 2002) or characteristics of the organizational dimension such as strategic position and formalization. IT functions that focus on novel technology, for instance, may need staff with distinctive technology competencies and organizational setting that enables speedy adaptation to IT trends and effective adjustments of new rules and process. In this regard, further research building on our framework may investigate how the properties of their IT portfolio determines and is determined by other key-characteristics.

Third, our research reveals that prior research that aimed to synthesize characteristics of the IT department put the *outsourcing degree* in second place. However, our literature review discloses that the outsourcing degree is a significant setting lever for CIOs and IT executives that highly interrelates with

other aspects of the IT function. By defining the real net output ratio within the IT function, IT managers define one of the key components how their IT function creates value for the organization. Flexibility may be increased, while significant savings may be realized by increasing the outsourcing degree (Reich and Nelson 2003). Moreover, the outsourcing degree may also interrelate with other characteristics of the IT function, particularly within the organizational dimension (e.g. strategic position and governance structure). For instance, IT functions with a strong focus on providing IT systems and support effectively, are likely tend to outsource large part of their IT (Susarla et al. 2003).

Last not least, the concept matrix as depicted in Table 3 may help practitioners to identify courses of action regarding the design of their IT function. However, further research is needed to uncover the manifestations of the characteristics, purposeful combinations and links to performance measures. By means of logical reasoning and empirical studies, further research may extend existing typologies such as the IT management profiles as proposed by Guillemette and Pare (2012). Based on such theoretically and empirically grounded considerations, further research may develop guidelines to practitioners concerning the best set-up of their IT function in relation to contingent factors that are beyond their design flexibility.

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