A Literature-based Derivation of a Meta-framework for IT Business Value

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Abstract: The business value of IT in companies is a highly discussed topic in information systems research. While the IT business value is an agreed upon term, its decomposition and assessment on a more detailed level is ambiguous in literature and practice. However, assessing the IT business value is pivotal for goal-oriented IT management. Therefore, we suggest a hierarchical decomposition of the IT business value along aggregated impacts and atomic impacts. We introduce a taxonomy to gain a better understanding of what types of atomic impacts may be caused by IT investments. With the help of the taxonomy, we classify a total of 957 values from existing value catalogs and derive 29 archetypal IT impacts grouped by a company's business units. Bundling this grouping with exemplary impacts for the IT value assessment, we finally propose an IT value meta-framework for the structured business value assessment.

1 INTRODUCTION

The business value of IT in companies is a highly disputable topic in information systems (IS) research (Melville et al., 2004; Brynjolfsson and Hitt, 2003; Mirani and Lederer, 1998; Müller et al., 2018; Pathak et al., 2019). Without an understanding of the business value of IT investments within a company, no goal-oriented IT management is possible (Schütte et al., 2019). The "naive" expectations about only positive economic effects of IT have been discussed for a long period in literature as IT productivity paradox, focusing on the value contribution of IT and its contribution to the success of companies in the 1980s and 1990s (Brynjolfsson, 1993; Brynjolfsson and Hitt, 1998). More recently, the opinion has become accepted that IT in general has a positive influence on a company's productivity (Brynjolfsson and Hitt, 2003). But the problem still exists that the variance in the return (positive and negative) on IT investments is still high and the IT business value, defined as extent of the contribution of IT investments to the productivity or success of a company (Cao, 2010), is therefore still difficult to determine. Despite these uncertainties in the IT business value, companies extend their IT budgets for investments in digitalization endeavors (Fersht and Snowdon, 2020). Nevertheless, the assessment of IT business values prior to an IT investment is especially important in times of crises such as the American subprime mortgage crisis, the European debt crisis and currently the coronavirus disease in which IT budgets are typically reduced. With reduced IT budgets, decisions demand for more elaborated business cases and cost-benefit analysis to approve IT investments (Hajli et al., 2015). Nevertheless, despite the crises, investments in IT are still necessary, for example to be able to react more flexibly to changes or to adapt the current business model to changes caused by the crises. However, the IT business value of single IT investments is often assessed by a decision maker's rule of thumb (Schniederjans et al., 2010).

To better deal with IT investment decisions, IS researchers so far have proposed approaches to assess the IT business value of an IT investment in a company (Mooney et al., 1996; Tallon and Kraemer, 2006) and have introduced a number of value catalogs including specific impacts and expected business values of IT (Melville et al., 2004; Samulat, 2015; Porter, 2001a; Farbey et al., 1992; Gregor et al., 2006; Kurniawan et al., 2016). A value catalog is a reference list of positive and negative effects (Schulze, 2009) that can be attributed to the launch or productive op-

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eration of an IT system (Schütte et al., 2019). These catalogs consist of a set of either specific or abstract possible impacts for IT systems in general or specific industry or system constellations with the downside that these impacts are not always directly quantifiable in an arbitrary company (Bartsch, 2015). Nevertheless, value catalogs indicate possible IT business values and allow decision makers – at least for one catalog - to fully assess the business value of a future IT investment and avoiding formally defective decision models that cannot be solved (Adam, 1996). The literature already contains a few value catalogs for the identification of the IT business value that are intended to serve this purpose. However, the lists vary in the number, the definitions and the granularity of categories (Schryen, 2013). Also, many existing catalogs are prone to problems regarding a comprehensive and customizable IT value assessment (exemplary IT value catalogs in brackets). Oftentimes, catalogs do not sufficiently indicate atomic effects and are rather abstract (Mirani and Lederer, 1998). Related to this issue are missing or insufficient hierarchizations of impacts. While the majority of catalogs aims to assess the IT business value as a whole (Baumöl and Ickler, 2008), those approaches are oftentimes incomplete due to abstractions from context specific aspects. Specific catalogs on the other hand (Schulze, 2009) appear to dismiss important aspects mentioned in the taxonomy of IT impacts (Figure 2). In general, IT value catalogs are also not designed to be configured for a specific application context, missing necessary mechanisms and methods for such customizations (Porter, 2001a).

Conducting a structured literature review (Webster and Watson, 2002), we have identified 32 catalogs including 957 impacts. These impacts both contain several duplicates and vary in their scope and meaning. Thus, we aim at providing archetypal IT impacts for the assessment of arbitrary IT investments. Based on these archetypes we will propose a meta-framework for the IT business value assessment. Our research enables practitioners to extend their IT business value assessment with our archetypal impacts or build IT value catalogs themselves. Researchers may build on our archetypal IT impacts for further quantitative analysis of the IT business value.

The remainder of this research is structured as follows: firstly, we will set the foundations for the meta-framework development involving IT business value and value catalogs in general and characteristics of atomic IT values in particular. Secondly, we will sketch our scientific approach followed by a presentation of our IT value archetypes within the meta IT value framework. Finally, we discuss our findings and briefly summarize our main results and provide an outlook on future research.

2 FOUNDATIONS

2.1 IT Business Value Decomposition

The IT business value can be defined as the impact of IT on organizational performance (Melville et al., 2004; Mooney et al., 1996; Devaraj and Kohli, 2003), which is widely established in the literature (Pathak et al., 2019). Melville et al. complement this general definition with an indication of the level and also the type of impacts: “at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts” (Melville et al., 2004). While efficiency refers to internal impacts such as productivity enhancement (Tallon and Kraemer, 2003), product quality (Barua et al., 1995), profitability improvements (Melville et al., 2004) or cost reduction (Tallon and Kraemer, 2003), competitive refers to external impacts such as competitive advantage (Parsons, 1983), product differentiation (Belleflamme, 2001) or market expansion (Tallon and Kraemer, 2003). Although there is a general agreement about what an IT business value can be and the topic has been discussed for many years, “the relation between IT investments and firm performance remain elusive” (Masli et al., 2011). It is still not clear what are the returns and the concrete values generated by IT investments in particular, and the decomposition of the IT business value in general (Pathak et al., 2019; Wang et al., 2012).

Some authors have already addressed this gap in research and decomposed the IT business value to possibly observable impacts. We propose value catalogs as an important starting point for the identification of the IT business value in a specific organization (Schütte et al., 2019). An optimal value catalog hierarchically decomposes the IT business value (level 1) into aggregated values (level 2), observable, atomic impacts (level 3) and guides the assessment providing key questions (level 4) for the impact identification (Figure 1). The hierarchical decomposition avoids formally defective decision problems (Adam, 1996).

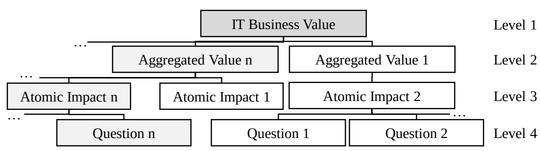

Figure 1: Decomposition of IT Business Value.

2.2 IT Value Dimensions and Characteristics

The variety of atomic IT impacts can be classified according to the following dimensions and characteristics (Nickerson et al., 2013) presented in the taxonomy in figure 2. The proposed taxonomy consists of six dimensions each consisting of several mutually exclusive and collectively exhaustive characteristics (Nickerson et al., 2013; Bailey, 1994). The *Business Unit* (1) characteristics are based on the value chain introduced by Porter which dis-aggregates a firm in strategically relevant primary and supporting activities (Porter, 2001a). Logistics (Log) activities are originally divided in inbound and outbound logistics (Porter, 2001a). Under logistics we comprise all activities associated with receiving, storing, and disseminating inputs to the product and with collecting, storing, and physically distributing the product to buyers. Under Operations (Ops) we subsume all activities associated with transforming inputs into the final product. Due to the original focus of (Porter, 2001b) on industrial enterprises with mainly physical products, we retrospectively also assign the creation and provision of services to this activity in order represent today's business environment (Parasuraman et al., 2005). Marketing and Sales (M&S) refers to activities that make the product or service appealing to customers and also to activities that are necessary for the buyer to purchase the product. Services (Ser) includes activities to maintain or increase the value of the product or service. Thus, this activity contains the delivery of services created by operations and services accompanying physical goods. Procurement (Proc) includes all activities that are necessary to purchase resources and necessary material used in the operations and other business unites of the company. Technological Development (TD) is understood to comprise of a variety of activities that deal with the improvement of a product or service and in particular with the process associated with it. Human Resources Management (HR) consists of the activities related to the recruitment, training, development and remuneration of all types of personnel (Porter, 2001b). For coding impacts that have an influence on several business units we introduce Cross-Organizational-Activities (COA) as further characteristic. It includes activities that involve general management, planning, finance, accounting, legal, governance affairs, and quality management which usually supports the entire chain and not individual activities.

The *Tangibility* (2) of an IT impact is concerned with the extent to which it can be measured and evaluated in economic terms (Lucas, 2000). The literature generally distinguishes between tangible and intangible impacts. Tangible impacts represent impacts that can be measured and quantified economically (Mirani and Lederer, 1998). Intangible impacts on the other hand are very hard to quantify, oftentimes not allowing for such economic evaluations (Lucas, 2000). Thus, a qualitative assessment of the impact is necessary (Kesten et al., 2007).

A widespread distinction in the *Level of Examination* (3) is the individual level, the firm level and the industry level (Bakos, 1987; Chau et al., 2007; Kauffman and Weill, 1989). We are following this view, especially since this distinction plays an important role in explaining the productivity paradox. The individual level effects of the IS affecting employees on an individual level, such as improving skills or increasing the employee's satisfaction (Chau et al., 2007). Firm level is concerned with IT impacts which have an influence on the whole organization including cross-organizational processes. For example, process improvements or increased organizational performance (Soh and Markus, 1995). This level of examination also refers to the value chain of the organization, thus customer and supplier related activities or processes. The industry level contains IT impacts going beyond the organizational boundaries and its value chain, e.g. on the entire industry or the national economy (Chau et al., 2007).

Dimensions	Characteristics							
Business Unit (1)	Log	Ops	M&S	Ser	Proc	TD	HR	COA
Tangibility (2)	Tangible Impacts				Intangible Impacts			
Level of Examination (3)	Individual Level		Firm Level			Industry Level		
Performance Focus (4)	Operational Process Performance				Management Process Performance			
Time of Occurrence (5)	Immediate Impacts				Anticipated Impacts			
Direction (6)	Positive				Negative			

Figure 2: Taxonomy of IT Impacts.

The definition of IT business value already emphasizes that the *Performance Focus* (4) is a central aspect, which should also be considered when identifying impacts. Operation process performance is usually created by tangible impacts of the IT. They represent automatizations of activities or processes which constitute the regular day-to-day business, thus affecting the performance of the organization. However, they also oftentimes form the basis for intangible impacts that build on them (Mooney et al., 1996). Management process performance increases the availability and quality of information, allowing for better coordination, control and a decision making by the management.

IT systems produce a (potentially continuous) stream of net benefits. Thus, this dimension focuses on the *Time of Occurrence* (5) of the impacts. Conducting an a priori assessment of the impact of the IT at the time of the investment decision, the impacts until and exploitable immediately at the go-live (immediate impacts) of the IT can be determined and probable future impacts (anticipated impacts), by accessing the quality of the IS as a proxy measure, can be anticipated (Figure 3) (Gable et al., 2008).

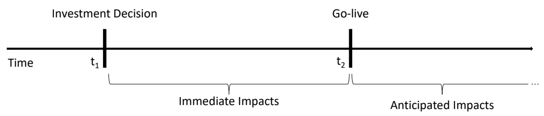

Figure 3: Time of Occurence.

Investments in IT systems do not only provide positive impacts to the organization. To assess the overall benefits of an IT, it is necessary to analyze the *Direction* (6) of these impacts (Schumann, 1992). As the majority of the literature focuses on positive benefits of IT, our presupposition is to regard IT impacts as positive, if a negative character of an impact is not explicitly stated. Positive impacts have contributed to an overall corporate objective, to justify the IS investment (Schulze, 2010). The implementation and the operation of an IT system may also cause direct (one-time) and indirect (ongoing) negative impacts such as costs for the organization (Schulze, 2010).

3 RESEARCH APPROACH

To analyze possible IT impacts and derive a profile of aggregated clusters of impacts, we conduct a structured literature review and cluster identified IT impacts accordingly. Our analysis begins (1) with the identification of IT impacts already discussed in the literature (Figure 4) to build upon existing knowledge regarding IT-impacts (Webster and Watson, 2002). The review starts by identifying and selecting qualified sources upon which the relevant data can then be extracted. This data, primarily the individual IT impacts, builds the foundation for the subsequent creation of the IT value framework. By limiting the keyword search (Urbach et al., 2009) to leading journals (AIS Senior Scholars' Basket), the quality of the results should be ensured (Webster and Watson, 2002). Based on an initial screening of the literature we formulated the following generic search string that is customized for EBSCOHost: *(Information Technology OR Information System* OR IT OR IS) AND (Value Catalog* OR Impact* Catalog* OR Value Catalog*)*

To broaden the possible literature pool, German publications where also recognized by translating the search string. After an initial screening based on the criteria according to Fink (2019, p. 53) (e.g., language: German/English; research subject: IT systems; etc.), a total of 57 contributions could be identified. Due to the lack of a common generic term, the keyword search yielded rather imprecise results, putting special importance on the subsequent forward and backward search (Webster and Watson, 2002). The identified contributions were subjected to a thorough selection process defined by the following selection criteria: (a) the content must meet the previously established definition of IT impacts, (b) the catalog must be based on some form of categorization, and (c) the catalog must contain atomic impacts. A total of 32 sources were deemed suitable for extracting and analyzing their contents. Key sources for developing our meta-framework are illustrated with exemplary impacts in figure 6.

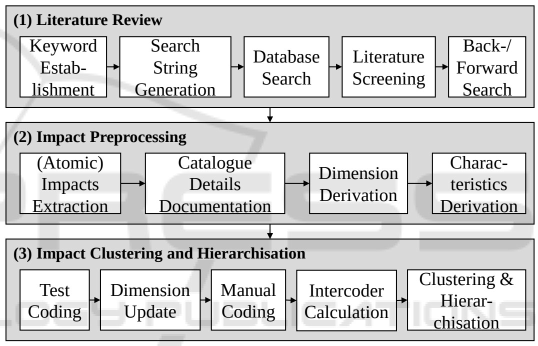

Figure 4: Research Approach.

We then (2) extracted all impacts from the identified sources with focus on the atomic impacts. Following a systematic selection process (Schwarz et al., 2007), all sources were read to document relevant data in a structured form. Specifically, atomic impacts and their respective categories were collected in an Excel spreadsheet, while additional aspects of each IT value catalog were documented separately. This selection process resulted in a collection of 957 IT impacts, of which 682 can be designated as atomic (level 3). Aggregating the impacts in a concept matrix (Webster and Watson, 2002) led to the overarching dimensions and characteristics describing the variety of impacts identified (Section 2.2).

Using this data-set of 682 atomic IT impacts, we firstly conducted a qualitative content analysis involving each (hierarchy of) impacts and their respective research paper and codified (3) each IT impact regarding the presented dimensions and characteristics. After an initial test coding with a set of 50 impacts, we updated the dimensions and their respective characteristics. For example, it appeared that the dimension *Form of Investment* investigating the type of IT and related staff to be invested in could not be coded reliably and therefore had to be dismissed. Also, the characteristic *All* had to be removed from the dimension *Performance Focus* due to its distorting effect. Having the dimensions and characteristics established, five independent coders knowledgeable about IT business value in general and IT value catalogs in particular manually assessed the selected IT impacts. As suggested in the literature (Nili et al., 2017), those coders where trained in the coding procedure and provided with a coding guide stating the definitions of each code. Due to the large number of IT values, the coding was done in multiple stages in order to prevent coder fatigue (Jourdan et al., 2008; Neuendorf, 2002). We used Microsoft Excel and VBA to support the coding process. If information for an IT impact is missing, we considered supplementary material such as referenced papers. If an IT impact is assigned with diverging characteristics during the coding process, the characteristic used by the majority of the coders is assigned. Cases in which an unambiguous decision cannot be made as the coders all assigned different characteristics are discussed among the five coders via online communication media, referring to the respective reliability measures (Weber, 1990). To assess the coding quality, we calculated Fleiss' Kappa as suggested indicator (Landis and Koch, 1977) for the intercoder reliability (Fleiss, 1971) for each dimension. This method allows for determining the agreement between more than two coders while accounting for agreements by chance (Nili et al., 2017). The calculated kappa values are benchmarked against a set of fixed agreement measures in order to access the reliability of our coding (Landis and Koch, 1977). The intercoder reliability for the dimension Direction is almost perfect (0.98) and substantial for Business Unit (0.61). The dimensions Tangibility (0.47) and Level of Examination (0.54) both constitute a moderate level of agreement between the coders. For Performance Focus (0.35) and Time of occurrence (0.40) a fair strength of agreement could be measured. The coding processes leads to a codified table of 682 IT impacts. After qualitatively assessing the IT impacts, the clusters are established by statistical methods (Denscombe, 2008). We cluster the hand-coded IT impacts to derive archetypal IT impacts generalizable for arbitrary IT investments. The clustering is used to abstract from the diverging connotations of the IT impacts used by the authors of the value catalogs under consideration. The meta-framework provides an overview on the existing IT impacts as previously described in literature. We applied hierarchical clustering on the set of 682 IT impacts with their respective coding. For deriving the number of clusters, we visually examined the dendrogram resulting in a number of 29 clusters (Ketchen and Shook, 1996). Aiming at maximizing the homogeneity within each cluster, we apply the Ward method with squared Euclidean distances (Täuscher and Laudien, 2018). The clusters as archetypal IT impacts form level 3 in our decomposition of the IT business value (Figure 1). In order to aggregate the impacts we used the business unit dimension as it includes the highest number of characteristics, thus allowing for the highest degree of differentiation. This dimension also seemed to be a key differentiator among the derived clusters. Additionally, the business unit dimension is perceived to be the most relevant for the internal organization of a company, regarding a practical application of the framework. This aggregation follows Porter et al., taking the perspective of key organizational activities (Porter, 2001b), also building upon previous classifications of IT impacts (Anselstetter, 1984). The resulting meta IT value framework is presented in the following chapter indicating the number of IT impacts summarized in each cluster following the cluster ID in brackets (cluster ID - number of impacts).

4 IT VALUE FRAMEWORK

By applying the hierarchical cluster analysis to the IT impacts, we identify 29 distinct archetypal IT impacts for the third level of the IT business value decomposition. These impacts can be aggregated (level 2) to the business units (section 2.2). For exemplary archetypal IT impacts, we propose exemplary IT impacts and leading references allowing practitioners to better assess the IT business value of their respective IT investment. Further guiding questions can be derived based on the following descriptions of the archetypal IT impacts and mentioned literature. This also allows for a customization of the framework to the specific IT investment decision regarding organization, IT system, and other environmental factors (Brynjolfsson and Hitt, 2003). An extract of the developed IT value framework is depicted in figure 5 illustrating the structure and design of the framework (level 1-3). The extract is detailed in figure 6 presenting the clustered archetypal IT impacts as level 3 impacts and exemplary impacts for level 4. We used the characteristics of the business unit dimension (level 2) for aggregating the clusters of IT impacts (level 3) and developing a hierarchical IT value framework.

The *Log* aggregated value consists of two impacts. Better inventory management (Log 1 - 32) which leads to cost reductions in this domain. This can be achieved by impacts reducing the inventory (O'Leary, 2004), e.g. delivering products electronically (Schumann, 1992), increasing the turnover (Vanlommel and De Brabander, 1975), or reducing the storage requirements (Andresen et al., 2002). IT systems can also improve the incoming goods inspection (Log 2 - 9) e.g. by impacts decreasing reclamation and spoilage risks (Anselstetter, 1984).

By clustering the *Ops* aggregated values two distinct, archetypal impacts can be identified. The first cluster involves improvements to production processes (Ops 1 - 27). Those production related efficiency and effectivity benefits can materialize in various immediate impacts. Some examples are an IT-based increased throughput (Mooney et al., 1996), optimized capacity utilization (Schulze, 2009), reduced operational costs, or higher production reliability (Anselstetter, 1984). Another cluster is constituted by impacts which improve the product quality (Ops 2 - 8). This can be achieved by providing lean production (Shang and Seddon, 2002) or a higher degree of standardization (Vanlommel and De Brabander, 1975).

Six archetypal clusters are identified for the *M&S* aggregated value. Impacts of the IT system can improve the M&S capabilities (M&S 1 - 8) of the organization. Examples are the ability to provide instant price quotations to clients (Andresen et al., 2002), analyzing ordering behaviors (Schumann, 1992), or adding multi-currency capabilities in IT systems (Shang and Seddon, 2002). Another aspect of the M&S business unit is represented by the cluster which improved customer retention (M&S 2 - 12). Those impacts can improve the overall customer relations (Gammelgård et al., 2006; Mirani and Lederer, 1998) or by saving customer requests and utilizing such data in order to provide personalized offers (Schumann, 1992). Some impacts are specifically directed towards increasing sales (M&S 3 - 7) and the respective business unit. Possible approaches are to implement ordering systems in order to develop new sales areas (Schumann, 1992) and to increase responsiveness to customers (O'Leary, 2004). The sales management (M&S 4 - 6) cluster contains impacts that support decision makers in this domain, e.g. by providing faster and cheaper information about the success of marketing measures (Schumann, 1992) or more elaborated product range analysis (Anselstetter, 1984). Besides increasing and managing sales, IT systems can also provide time savings in marketing, sales, and product delivery (M&S 5 - 23). By introducing sales automation (O'Leary, 2004), faster billing (Gable et al., 2008), or immediate price and availability information (Schumann, 1992) can, for example, result in decreased capital commitment or less delayed deliveries (Anselstetter, 1984). By Developing competitive sales capabilities (M&S 6 - 10) consist of impacts which improve the company image and public relations (Andresen et al., 2002). Additionally, through superior marketing (Vanlommel and De Brabander, 1975), market (Anselstetter, 1984) and sales analyses (Schumann, 1992) , the company can improve its competitive position (Anselstetter, 1984).

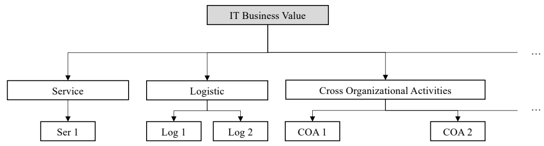

Figure 5: Extract from the IT Value Framework.

All impacts assigned to *Ser* can be represented by the archetype improved customer services (Ser 1 - 18) that contains operational, cross organizational activities which improve the quality and delivery of customer services (Gammelgård et al., 2006). Improvements can be achieved, for example, by impacts accelerating responses to such enquiries and a faster, better delivery of the requested service (Andresen et al., 2002), or by reducing the overall need for services (e.g. maintenance) (O'Leary, 2004). The customer interaction can also be impacted by interactive and customizable services (Shang and Seddon, 2002) or 24/7 service availability (Riggins, 1999).

The *Proc* cluster analysis resulted in two archetypal impacts. On an operational level, IT can contribute to a more efficient procurement of resources (Proc 1 - 15). This refers to faster (Anselstetter, 1984) and cheaper (Vanlommel and De Brabander, 1975) procurement by e.g. improving the order management (O'Leary, 2004) or faster responses to supplier quotations (Andresen et al., 2002). Improved bargaining against suppliers (Proc 2 - 6) involves IT impacts improving the supplier selection resulting in improved supplier identifications and assessments (Andresen et al., 2002) as well as improvements to the order planning, control, and monitoring (Anselstetter, 1984).

The aggregation of the *TD* impacts can be decomposed in to two IT value archetypes. Improved IT infrastructure support (TD 1 - 18) constitutes impacts which provide immediate benefits by improving upon the IT infrastructure of the company. Those can materialize in improvements to the data security (Kesten et al., 2007), quicker, easier, and cheaper incorporation of product features (Porter and Millar, 1985), or reduced communication costs (Mirani and Lederer, 1998). Impacts assigned to the improved R&D (TD

2 - 16) cluster allow a company to make product, service and business process innovations and to alter their product life cycles (Mooney et al., 1996), thus possibly utilizing IT as an competitive weapon (Parsons, 1983). Exemplary impacts consist in an faster application development (Mirani and Lederer, 1998) and the ability to apply previously unfeasible business technology (Porter and Millar, 1985).

The clustering revealed two impacts for the aggregated *HR* values. Staff reductions (HR 1 - 22) constitutes e.g. impacts to increase employee productivity (Gable et al., 2008) in order to avoid the need to increase the work force (Anselstetter, 1984) or decrease the current number of employees (Petrovic, 1994). Another approach is to reduce the staff requirements (Andresen et al., 2002). Impacts which improve the employee's skills (HR 2 - 17) focus on learning using IT. Those skills can materialize in a broadened skill level (Shang and Seddon, 2002) and enhanced recall of job-related information (Gable et al., 2008) as well as social skills such as the ability to work autonomously (Shang and Seddon, 2002) and improved human relations (Anselstetter, 1984).

The aggregated *COA* values can be decomposed into twelve archetypal impacts. Operational time and cost savings (COA 1 - 109) at firm level constitutes the largest cluster. Those impacts represent classic effectiveness and efficiency benefits which can be achieved through investment in IT. Examples are various forms of cost reductions (e.g. staff, transactions, etc.) (Andresen et al., 2002; Shang and Seddon, 2002) and process improvements (Riggins, 1999). Those impacts are mostly tangible and occur immediately after the implementation of the IT system. The improvements in management process (COA 2 - 62) cluster is primarily concerned with immediate information-related impacts of the IT investment and how they affect the management. For example, IT investments can increase the availability and accuracy (Gregor et al., 2006) of information, enabling faster, and more efficient decision making (Parker et al., 1988). Impacts enabling the development of new business areas (COA 3 - 6) constitute a relatively small cluster. This can be done by new products and applications (Bartsch, 2015) or amendments to the workforce, policies, and procedures (Shang and Seddon, 2002). Impacts clustered in the improve market position (COA 4 - 63) group are cross-organizational, mostly anticipated and directed towards management processes. To name a few, IT systems may support strategic goals of the company (Baumöl and Ickler, 2008), constitute a competitive advantage (Weill and Broadbent, 1998), or enable changes to the business model (Schulze, 2009). The cluster improved corporate growth (COA 5 - 11) contains impacts which enable the company to grow or ones that minimize related risks. IT can create such growth by increasing the operational readiness (Anselstetter, 1984), allowing for new services (Shang and Seddon, 2002), or minimizing the risk of new business ventures (Andresen et al., 2002). IT systems can also increase the company flexibility (COA 6 - 53) allowing the company to adapt to future changes. Exemplary impacts for this cluster are an increase level of standardization (O'Leary, 2004) and an improved change management (Gammelgård et al., 2006). The growth management (COA 7 - 11) cluster contains impacts IT can have on the highest company level to generate growth. Examples are building a cost leadership (Shang and Seddon, 2002), leveraging the companies size (O'Leary, 2004) and to increase the market share (Andresen et al., 2002). Impacts of IT systems can also create and defend competitive advantages (COA 8 - 16) by developing new markets and influencing the relationship to competitors. For example, impacts creating or removing barriers for market entry (Schulze, 2009), allowing expanding to e-markets (Shang and Seddon, 2002), and improving relations to external parties (Gammelgård et al., 2006). By improving the integration and information flow (COA 9 - 66) across the company, IT impacts can provide various positive, but oftentimes intangible benefits. This allows to perform tasks separated in time and space or to increase idea and information sharing among project teams (Andresen et al., 2002). The cluster improved employee satisfaction and performance (COA 10 - 12) shows how IT impacts can directly affect the workforce. Those impacts usually apply to all business units and are difficult to quantify in monetary terms. For example, a better performing system can increase the moral or the interpersonal communication (Shang and Seddon, 2002), some impacts may also boost employee's creativity (Mooney et al., 1996). Besides those primarily positive impacts of IT, such investments also cause considerable costs. The IT investment costs (COA 11 – 12) represent direct and indirect costs associated with the IT investment. For example, acquisition and personnel costs as well as an increased dependence on the IT (Anselstetter, 1984). In the cluster time savings in daily business operations (COA 12 - 5) IT systems contribute to such savings by reducing calls and mails (Anselstetter, 1984) as well as changes to the individual workplace (Schumann, 1992).

ID	Aggregated Values	Examples of Impacts of the Aggregated Values
COA 1	Operational time and cost savings at firm-level	Labor cost reduction (Shang und Sheddon, 2002; Mooney et al., 1996), Cost reductions (Porter and Millar, 1985; Parsons, 1983; O'Leary, 2004; Gammelgard et al., 2006; Gable et al., 2008), Productivity Improvements (O'Leary, 2004; Gable et al., 2008; Andresen et al., 2002; Parson, 1983), Overall operation efficiency and effectiveness (Shang und Sheddon, 2002; Mooney et al., 1996; Bamöl und Ickler, 2008), Speed up transactions or shorten product cycles (Mirani und Lederer, 1998), Reduced planning times (Andresen et al., 2002), Enabling faster access to information (Gregor et al., 2006), ...
COA 2	Immediate improvements in management process	Improving information accuracy (Gregor et al., 2006), Availability of new, better or more information providing opportunity to compete morc effectively (Parker et al., 1988), New Reports/Reporting Capability (O'Leary, 2004), Improved ability to coordinate and integrate (Gammelgard et al., 2006), Increase the flexibility of information requests (Mirani und Lederer, 1998), Better asset management (Shang und Sheddon, 2002), ...
COA 3	Development of new business fields	Business growth with increased employees, new policies and procedures (Shang und Sheddon, 2002), Improved capture of design and construction decisions (Andresen et al., 2002), Development of new business fields (Baumöl and Ickler, 2008; Bartsch, 2015), Better research/development planning (Anselstetter, 1984), ...
COA 4	Improved market positioning of the company	Enable new market strategy (Shang und Sheddon, 2002), Help establish useful linkages with other organizations (Mirani und Lederer, 1988; Andresen et al., 2002; Gregor et al., 2006), Improved strategy formulation and planning (Gammelgard et al., 2006), Strategic competitive advantage (Andresen et al., 2002; Weill and Boradbent, 1998), ...
COA 5	Improved corporate growth (and reporting)	Business growth in transaction volume, processing capacity and capability (Shang und Sheddon, 2002), Reporting (Mooney et al., 1996), Business growth in new markets (Shang and Sheddon, 2002), …
COA 6	Increased flexibility to addapt to future changes	Global resource management (Shang und Sheddon, 2002), Expandable to a range of applications (Shang und Sheddon, 2002), Improved organizational culture (Gammelgard et al., 2006), Improved change management (Gammelgard et al., 2006), Increased business flexibility (Andresen et al., 2002; O'Leary, 2004), Reduced technology risks (Andresen et al., 2002), ...
COA 7	Growth management	Build cost leadership (Shang und Sheddon, 2002), Increased market share (Andresen et al., 2002), Leverage Size (O'Leary, 2004), Revenue increases through product differentiation (Schumann, 1992), ...
COA 8	Creating/defending competitive advantages	Enable the organization to catch up with competitors (Mirani and Lederer, 1998), Improved relations with external parties that are neither customers, competitors nor suppliers (Gammelgard et al., 2006), Negating existing entry barriers (Parsons, 1983; Schulze, 2009), Creating new entry barriers (Parsons, 1983; Schulze, 2009), ...
COA 9	Improved integration and information flow	Improved communication (Gammelgard et al., 2006), Make use of extensive user feedback (Riggins, 1999), Fewer information bottlenecks (Andresen et al., 2002), Enabling easier access to information (Gregor et al., 2006), Smoother work flow (Vanlommel and Brabander, 1975), Business integration (Weill and Broadbent, 1998), Information processing efficiency (Parker et al., 1988), ...
COA 10	Impoved employee satisfaction and performance	Greater employee involvement in business management (Shang and Seddon, 2002), Increased employee satisfaction with better decision making tools (Shang and Sheddon, 2002), Satisfied employees for better employee service (Shang and Sheddon, 2002), Creativity (Mooney et al., 1996), ...
COA 11	IT-Investment costs	Acquisition and implementation costs (Anselstetter, 1985), Personnel costs for training and instruction (Anselstetter, 1985), indirect investment costs (Schulze, 2010), …
COA 12	Time savings in daily business operations	Labour time saving (Kesten et al., 2007), Fewer phone calls (Anselstetter, 1985), Fewer letters (Anselstetter, 1985), …
HR 1	Staff reductions	Save money by avoiding the need to increase the work force (Mirani and Lederer, 1998; Gregor et al., 2006), enhances effectiveness in the job (Gable et al., 2008), Reduced staff requirement (Andresen et al., 2002), Personnel Reduction (O'Leary, 2004; Petrovic, 1994; Anselstetter, 1984), …
HR 2	Improving employee skills	Shorten learning time (Shang and Sheddon, 2002), Improved learning and/or increased knowledge of persons in the organization (Gammelgard et al., 2006; Gregor et al., 2006), learning throug the presence of IS (Gable et al., 2008), Enabling of cross-functional teams (Andresen et al., 2002), ...
Log 1	Reduced inventory and better inventory management	Inventory Reduction (O'Leary, 2004; Schumann, 1992), Higher turnover inventory (Vanlommel and Brabander, 1975; Anselstetter, 1984), Íncreasing the speed of distribution (Parsons, 1983), Improved delivery scheduling (Andresen et al., 2002), …
Log 2	Improved inventory control	Better inventory management (Shang and Sheddon, 2002), More precise production planning, control and monitoring (Anselstetter, 1984), Improved operational decisions (Shang and Sheddon, 2002), …
M&S 1	Improved Marketing & Sales capabilities	Multi-currency capability (Shang and Sheddon, 2002), Improving external access to stock levels and price information (Andresen et al., 2002), Ability to provide instant price quotations to clients (Andresen et al., 2002), …
M&S 2	Improved customer retention	Improve customer relations (Gammelgard et al., 2006; Gregor et al., 2006), Customer loyalty (Schulze, 2009; Kesten et al., 2007), ...
M&S 3	Increased Sales	Provide new products or services to customers (Mirani and Lederer, 1998), Increased Sales (Andresen et al., 2002, Weill and Broadbent, 1989), Customer Responsiveness (O'Leary, 2004), …
M&S 4	Time savings in Marketing & Sales and product delivery	Sales Automation (O'Leary, 2004), Faster invoicing (Andresen et al., 2002), Easily find the best offer (Schumann, 1992), Faster and more secure checkout processing (Anselstetter, 1984), …
M&S 5	Leveraging marketing and sales capabilities as competitive advantages	Improved company image (Andresen et al., 2002), Easier decision making for buyers due to improved evaluation of sources of materials (Porter and Millar, 1985), Better marketing information (Vanlommel and Brabander, 1975), More detailed market analyses (Anselstetter, 1984), …
M&S 6	Improved sales management	More precise sales planning, control and monitoring (Anselstetter, 1984), More precise assortment analysis (Anselstetter, 1984), Faster and more cost-effective information on the success of marketing measures (Schumann, 1992), ...
Ops 1	Improved production processes	Reduced construction time (Andresen et al., 2002), Manufacturing performance (Shang and Sheddon, 2002), improved outcomes or outputs (Gable et al., 2008), Reducing operating costs (Gregor et al., 2006), Throughput (Mooney et al., 1996), …
Ops 2	Improved product and production quality	Quality improvement (Shang and Sheddon, 2002; Kesten et al., 2007), Higher degree of standardization of operations (Vanlommel and Brabander, 1975), Contribute to high quality (Parsons, 1983), …
Proc 1	More efficient procurement of materials	Improved supplier relations (Gammelgard et al., 2006), Procurement Cost Reduction (O'Leary, 2004), Faster response to supplier quotations (Andresen et al., 2002), Cost reduction in the area of raw materials (Vanlommel and Brabander, 1975; Anselstetter, 1984), …
Proc 2	Strengthening the companies position towards suppliers	Better supplier selection (Anselstetter, 1984), Strengthening negotiating power with suppliers (Bartsch, 2015), …
Ser 1	Improved quality and delivery of customer services	Faster delivery of services (Andresen et al., 2002), Improved delivery of products/services (Gammelgard et al., 2006), Improved quality of products/services (Gammelgard et al., 2006), Better customer service (Anselstetter, 1984), Providing customized product or services (Shang and Sheddon, 2002), Improved focus on client requirements (Andresen et al., 2002), Better service to customers (Vanlommel and Brabander, 1975; Anselstetter, 1984), Establish 24 × 7 customer service (Riggins, 1999), Contribute to superior customer service (Parsons, 1983; Shang and Sheddon, 2002; Schumann, 1992)
TD 1	Improved IT-Infrastrucutre support	Save money by reducing system modification or enhancement costs (Mirani and Lederer, 1998), Mainframe or hardware replacing (Shang and Sheddon, 2002), Provide the ability to perform maintenance faster (Mirani and Lederer, 1998), Integration of new functions (Baumöl and Ickler, 2008), Increasing system stability (Kesten et al., 2007), ...
TD 2	Imporved R&D and Life Cycles	Continuous improvement in system process and technology (Shang and Sheddon, 2002), Allow other applications to be developed faster (Mirani and Lederer, 1998), Speedded up by product life cycle by shortening the development process (Parsons, 1983; Mooney et al., 1996), Making new businesses technologically feasible (Porter and Millar, 1985), ...

Figure 6: IT Value Framework.

5 DISCUSSION AND IMPLICATIONS

Although, the meaning of the IT business value is agreed upon in literature (Melville et al., 2004; Devaraj and Kohli, 2003; Mooney et al., 1996), its decomposition to detailed and measurable atomic impacts of the IT system remains either undescribed or varies strongly across existing literature. Hence, we provide decision makers with an IT value framework with possible IT system related impacts and exemplary references for the structured assessment of IT impacts. The framework is customizable to a specific IT investment situation. A proper IT business value assessment requires for IT- and company-specific impacts (Brynjolfsson and Hitt, 2003). However, the IT value framework is neither IT- nor company-specific so that it requires further customization. Nevertheless, the IT value framework allows for a more comprehensive IT business value assessment as it contains more information in a (more) structured form as decision makers usually attempt when applying rules of thumb (Schniederjans et al., 2010). While existing IT value catalogs only incorporate impacts from a single existing catalog (Samulat, 2015; Gregor et al., 2006; Riggins, 1999; Bartsch, 2015), we draw on 32 value catalogs with a total of 957 impacts and propose a hierarchy to aggregate the impacts to a single root value (level 1). With our IT value framework we aim at aligning the different connotations of the IT impacts in existing value catalogs (Melville et al., 2004). During the coding we deviate from the author's classification of impacts. O'Leary for example, categorizes some impacts as intangible (e.g. customer responsiveness, cost reduction) (O'Leary, 2004) that we coded as tangible as KPIs exist to economically measure them. There exist further alternatives for the aggregated values besides the business units. Below the business unit level, several clusters are concerned with the competitive positioning (e.g. Proc 2, COA 4, COA 8) or the organizational capabilities to exploit future potentials (M&S 1, COA 6). These aggregations may also serve as aggregated values in customized versions of the framework. We provide an overview of the existing literature on IT impacts and provide decision makers with additional exemplary IT impacts and references. The framework can be used both for the identification of impacts a priori to an IT investment decision and during the project implementation for the controlling of impact achievement (Schütte et al., 2019).

Due to the changing role of IT and the progress (DeLone and McLean, 2003) from the early 1970s until today, existing catalogs must be viewed critically. While (Anselstetter, 1984) for example highlights the reduction of paperwork as a main IT business value, more recent catalogs focus on capabilities enabled by introducing future IT systems (Melville et al., 2004; Kurniawan et al., 2016). IT systems have developed from the support of human actors to a high level of automation in many industries. This development needs to be considered when dealing with general impacts extracted from IT value catalogs. Applying our IT value framework or IT value catalogs in general, decision makers must pay attention that specific atomic impact are only included in one impact category. Otherwise, a possible double accounting would distort the IT business value assessment (Bartsch, 2015). Although our sample of 32 IT value catalogs results in a total of 957 impacts, we do not raise a claim for completeness, as our systematic literature review was rather narrow compared to vague terminology on value catalogs. Thus, we started our literature research on major IT business value (and German equivalent) literature and focused on forward and backward search (Webster and Watson, 2002). Because of our focus on scientific literature, we excluded practitioner contributions on IT value catalogs and did not include additional impacts not mentioned in prior research. As indicated in the scientific approach section (Section 3), we reached substantial results for the coding of the business unit and direction dimension but only achieved fair results for the performance focus and time of occurrence. The coders disagreed on the performance focus of impacts such as "Creating competitive advantage" (Gregor et al., 2006), "Create service excellence" (Gregor et al., 2006), or "Altering the product lifecycle" (Parsons, 1983). It seems that these dimensions require for further characteristics as a differentiation between operational and management level is difficult. For the dimension time of occurrence an additional characteristic indicating the quality of the IT system as enabler for future impacts may be more comprehensive (Gable et al., 2008). Nevertheless, we argue that the independent coding of five experts with a Fleiss' Kappa of 0.35 is still a valid result (Landis and Koch, 1977). While recent research generally suggest Krippendorff's alpha (Nili et al., 2017), Fleiss' Kappa is expected to provide similar results for the specifications of our coding (Landis and Koch, 1977) while being much more adaptable to the tools for the statistic evaluation (VBA) (Nili et al., 2017). Kappa statistics may also be subject to a paradox in which a strong agreement between the coders is reflected by a disproportionately low index, which has to be taken into account during the analysis. The rather complex coding scheme and the large amount of codes increases the probability for coding errors

(Campbell et al., 2013). We tried to minimize the cognitive difficulty for the coders by training, providing a coding manual (Nili et al., 2017), and conducting the coding in multiple stages (Jourdan et al., 2008; Neuendorf, 2002). However, this circumstance must also be considered during our analysis. Once the intercoder reliability has been calculated, the question arises as to what constitutes an acceptable reliability level. While most reliability measures, e.g. percenter agreement, require a high level of agreement, Kappa values can be accessed by more liberal criteria due to their relatively conservative indices (Lombard et al., 2002). Thus, we adopted the agreement measures by Landis and Koch, which of cause represent an arbitrary division (Landis and Koch, 1977). However, they provide fixed measures against which we can benchmark our Kappa values to access the reliability of our coding. Even more importantly those agreement measures allow us to better identify deviating understandings of the IT impacts and analyze such coding variation (Olson et al., 2016). Those findings could then be integrated into our IT value framework to account for different perspectives on IT impacts.

6 CONCLUSION

The IT business value on the highest level of abstraction is an agreed upon term in literature. However, its decomposition and assessment on a detailed level of atomic impacts is often not described. We propose to hierarchically decompose the IT business value to an assessable and atomic level via aggregated impacts, atomic impacts and questions. For assessing the expected IT business value of an IT investment there already exist 32 IT value catalogs including 957 possible impacts for IT that partially differ in denomination and definition. The classification of 682 atomic IT impacts results in 29 clusters of atomic impacts that can be aggregated to a company's business units as aggregated values. The meta IT value framework further provides exemplary impacts and further literature for assessing each of the atomic impacts more specifically. The contribution of this paper is to provide a comprehensive meta-framework of IT impacts that takes into account all the key aspects identified earlier. This allows a holistic IT impact assessment to be performed in any practical context, which was not possible with previous frameworks. We have deliberately chosen the perspective of key business functions to guide practitioners, but other perspectives may be considered in future papers.

Another important avenue for future research is the further operationalization of atomic and exemplary impacts with guiding questions, making them configurable for specific IT investments decisions and industries. As this research focuses on the atomic impacts within existing values catalogs ignoring the specifics and peculiarities of the catalogs itself, future research may investigate the IT system- and company-specifics of these catalogs. Additionally, as we solely rely on impacts from existing IT value catalogs taken from the literature, future research should also integrate practitioner sources and may also incorporate additional impacts derived from IT projects. These additional impacts can reflect current trends in IT system development and incorporate state of the art processes. In addition, the IT value framework should be applied in practice to get insights into, for example, whether the abstraction of IT business values is sufficient. This evaluation will be the next step in our research.

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