Towards a Taxonomy of Strategic Drivers of IT Costs

Constanze Riedinger[1(✉)], Melanie Huber[2], Niculin Prinz[1], and Christopher Rentrop[1]

[1] Konstanz University of Applied Sciences, Konstanz, Germany
constanze@htwg-konstanz.de.riedinger, {niculin.prinz, rentrop}@htwg-konstanz.de
[2] BITCO[3] GmbH, Konstanz, Germany
melanie.huber@bitco3.com

Abstract. Nowadays, information technology (IT) is a strategic asset for organizations. As a result, the IT costs are rising and there is a need for transparency about their root causes. Cost drivers as an instrument in IT cost management enable a better transparency and understanding of costs. However, there is a lack of IT cost driver research with a focus on the strategic position of IT within organizations. The goal of this paper is to develop a comprehensive overview of strategic drivers of IT costs. The Delphi study leads to the identification and validation of 17 strategic drivers. Hence, this paper builds a base for cost driver analysis and contributes to a better understanding of the causes of costs. It facilitates future research regarding cost behavior and the business value of IT. Additionally, practitioners gain awareness of levers to influence IT costs and consequences of managerial decisions on their IT spend.

Keywords: Delphi Study · Strategic Cost Drivers · IT Cost Drivers · Cost Behavior · Information Technology

1 Introduction

A functioning IT Cost Management (ITCM) ensures organizations to make the right decisions when investing in information technology (IT) [1] and to increase the customer value [2]. ITCM also strengthens cost awareness and influences IT costs anticipatorily [1]. These goals require the investigation and a deep understanding of cost and cost behavior [3]. Thus, cost management proposes the identification, classification, and estimation of "factors causing a change in the total cost" [4]. These strategic cost drivers determine cost behavior fundamentally and long-term [1] and therefore enable the establishment of the strategic position of an organization. They describe cost across the entire value chain [5] and impact customer value, revenue, and profitability [6]. Already in 1996 a study by Carr and Tomkins [7] stressed that successful companies focus twice as much on cost driver analysis – regardless of the companies' strategic position - differentiation or cost leadership [8]. Nowadays, IT is seen as a strategic asset [9] and IT costs account for an increasing part of the total cost within organizations

M. Papadaki et al. (Eds.): EMCIS 2022, LNBIP 464, pp. 555–569, 2023.
https://doi.org/10.1007/978-3-031-30694-5_39

[10]. As a first step and to enable cost driver analysis, cost driver identification aims for cost transparency [11]. However, a study of 474 IT managers in 2021 states that 79% of the respondents still face a lack of transparency and understanding of costs for their IT investments [10]. This prevents managers from measuring and highlighting the value proposition of their IT [12]. A comprehensive overview of strategic IT cost drivers would enable the required transparency and the investigation of cost behavior as measure to make the right decisions and to increase business value in the long term. Thus, it is the paper's goal to deliver a structured overview about the strategic drivers of IT costs and assess their influence.

Structured overviews on strategic cost drivers emerged in the 1980s and 1990s as taxonomies presenting a variety of "strategic choices" [13] that drive costs in manufacturing companies [5, 14]. Their main objectives were to better understand incurring costs and related profitability as well as to identify levers of influence for the overall cost of an organization [6]. However, those taxonomies of strategic cost drivers do not include nowadays' IT perspective. Information system (IS) researchers also make use of the analysis and evaluation of cost drivers: they investigate IT cost drivers for the cost estimation in software development [15, 16], software maintenance [17], or for measuring the cost of scrum activities [18]. IT cost driver research focuses on subsections or individual IT solutions [19] and thereby neglects the interaction of systems and information technology as a whole. This impedes comprehensive transparency and understanding across the total IT landscape. Furthermore, they focus on tactical cost drivers rather than giving a strategic perspective. Yet, IT cost driver research lacks a holistic and structured overview of strategic IT cost drivers. We therefore conduct a Delphi study to get a consistent and verified picture of the strategic drivers and their influence on IT costs. Our study contributes to scientific research by strategically enhancing existing concepts in the context of IT cost drivers and, consequently, by developing and verifying a taxonomy of strategic drivers of IT costs. Additionally, practitioners gain awareness about levers for cost influence and opportunities for strategic discussion on IT costs and the value proposition of IT.

This paper is structured as follows: first, we outline cost driver research. We then introduce the Delphi method as our research method comprising an exploratory study in the preparation phase, the expert selection, and the Delphi survey itself. Finally, we present and discuss our findings, and then draw our conclusions.

2 The Importance of Strategic Cost Drivers for IT Management

IT is a strategic asset for most organizations which leads to rising IT budgets [20]. Therefore, the main focus of managers is on the optimal use of IT and thereby to ensure IT's contribution to strategy and business value [12]. Consequently, the transparency and understanding of root causes of IT cost are prerequisites in strategic decision-making [1]. To understand those root causes, cost driver analysis is a strategically important instrument in cost management. The concept of cost drivers describes and analyzes cost behavior [5] to reveal the root causes of costs [21] and to better understand the costs of a whole organization or a certain area [19]. The strategic cost management discipline introduced the term cost driver to describe those factors that cause costs [8] or decision

variables that drive costs [6]. We define cost drivers as "factors or decision variables that influence costs". They can be divided into operative, tactical and strategic cost drivers [22]: operative cost drivers, such as production volume, focus on manufacturing on a short-term basis. Tactical cost drivers are identified especially in terms of cost allocation with Activity-Based Costing (ABC) systems and explain mid-term cost dependence. They are determined for specific use cases. Strategic cost drivers are long-term decisions variables that affect tactical and operative cost drivers [23]. They influence the cost position of organizations fundamentally and across periods [22]. For organizations those cost drivers and their relationships are strategically important as they result from strategic management decisions [6]. Therefore, the identification of strategic cost drivers contributes to transparency of IT costs [11] and in a second step their detailed analysis leads organizations to gain understanding about the root causes of their cost position and influence them [5].

The digital transformation of organizations and the resulting increase in IT investments led to growing research interest in IT cost drivers [1]. However, this consideration of cost driver in IT is mainly used in the context of ABC and cost allocation [19], on the level of tactical cost drivers. Raz and Elnathan [24] identify potential cost drivers for typical project activities for their ABC model. Pramono and Suryani [18] consider ABC and corresponding cost drivers to measure benefits of cost usage in scrum-based companies. Ooi et al. [25] present an ABC approach to estimate and recover system development and implementation costs with cost drivers such as project duration, project type, number of features or back-end complexity. Raghu and Chaudhury [26] identify the lines of code and function points as ABC cost drivers in software development. Besides the ABC approach, cost driver models are also proposed for other specific use cases such as cost estimation, IT operations and evaluation of IT solution profitability: Boehm et al. [15] base their software development cost estimation model (COCOMO 2.0) on 23 cost drivers. Factors for a better understanding of software maintenance cost are according to Benaroch [17] divided into system attributes (age, size, complexity, information quality constraints, software volatility), and personnel factors (number of maintainers, location diversity, skill diversity). Herzfeldt [19] presents a cost driver model for IT solutions to measure their profitability over the complete life cycle: the IT cost drivers are divided into three main categories: input, value creation process and uncertainty. A total of 214 cost drivers are assigned to 30 categories in the model.

As pointed out, the existing research presents IT cost drivers on a tactical level for specific use cases. Thereby, there is a lack of the strategic perspective describing those variables that influence the tactical cost drivers in the first place and long-term. Furthermore, presented IT cost driver models describe their influence on individual sub-areas for the development and the evaluation of IT solutions. This does not reflect IT's strategic position within organizations and its increasing importance. Furthermore, it neglects the company-wide evaluation of interrelated IT contributions and their generated business value. To our knowledge, there is no structured overview on strategic IT cost drivers, although, such categories build "a powerful taxonomy for classifying the different types of cost drivers" [27]. Approaches presenting taxonomies on strategic cost drivers [5, 13] emerged mainly in the 1980s and 1990s and set their focus on manufacturing and not

IT. Banker and Johnston [6] give an overview on those cost driver taxonomies. However, those overviews do not yet include todays' position and omnipresence of IT within organizations. These shortcomings of existing approaches lead to the research question of this publication: *What are the strategic drivers of IT costs and what is their influence on IT costs?*

3 Research Method

The Delphi method is used to "exploratively examine a complex problem through a group of experts" [28]. In IS research it has been applied for several use cases: validation of definitions and classification [29], development of frameworks [30] or to achieve a consensus on a ranking [31, 32]. The Delphi method is defined by four generic characteristics: anonymity, controlled feedback, an iterative process, and the statistical aggregation of group responses [33]. The objective of our research is to obtain a comprehensive overview of strategic cost drivers and their influence on IT costs. Since strategic cost drivers have a long-term effect, their influence is difficult to measure and is therefore preferably estimated; this estimate can be made by experience or experts [22]. A Delphi study can support this estimate through consolidating expert opinions in an iterative process with several rounds including controlled feedback [34]. Thereby it also omits group dynamics and bias because the experts within a Delphi study are anonymous to each other [33]. We further choose the method as it can be conducted easily gathering multiple expert opinions with flexible and asynchronous processing [35]. Furthermore, the standardized Delphi questionnaire allows us to aggregate and quantify expert opinions statistically [35]. For these reasons, we consider the method to be appropriate to answer our research question.

For the design of our study, we apply the characteristics and specifications of Delphi method variants in IS research according to Strasser [28]: With an objective to generate facts, we design our study to elicit opinions and gain consensus. We choose experts in a wide sense with total anonymity and a not too large size of the expert panel. The predefined set of issues is developed in an exploratory study. This is the basis for the first round of our survey with a quantitative questionnaire including options to provide qualitative explanations [29].

We structure our Delphi study in three steps: we start with an exploratory study, conducted as data triangulation [36]. We follow earlier research for cost driver identification applying data triangulation [21], to make use of multiple sources and develop a predefined set of issues [34]. Second, we define criteria for the expert selection, identify and approach experts and develop the questionnaire for the Delphi survey [36]. Third, we execute the Delphi survey in two rounds with interim analyses to classify the answers and develop a validated overview of strategic drivers of IT costs. The stop criterion for our Delphi study was to reach consensus on a set of strategic drivers. We define consensus for categorical yes/no answers with 75% agreement and for the 5-point Likert scale with the inter-quartile deviation (IQD) ≤ 1 [37].

4 Results

In the following we present the results of our Delphi study following the three steps: exploratory study, expert selection and questionnaire, and execution of Delphi survey.

4.1 Exploratory Study

The data triangulation starts with a literature review according to Cooper [38] to ensure a theoretical background of our study. Our search extended to the beginning of 2022. We limited our search to title, abstract, and keywords with the search keywords "IT cost driver", ("cost driver" OR "cost factor") AND "information technology", „influencing factors" AND "information technology" AND "cost". The search was then performed with a focus on research papers published in major conferences or journals (following the IS basket of eight) in four databases: *AISeL*, *EBSCOHost Business Source Premier*, *Sciencedirect* and *IEEE*. We removed duplicated and irrelevant publications by applying defined exclusion criteria [39]: publications without focus on IT costs or in other languages than English or German. We conducted both forward and backward search [40] to avoid missing important references. In our literature search we identified 17 publications, of which 11 explicitly specify IT cost drivers. The first author carried out a qualitative coding [41] and identified and categorized these IT cost drivers. They were then reviewed and adjusted in two iterations with the other authors. After two iterations of qualitative coding, we developed a first set of six strategic cost drivers of IT costs with short explanations: *Number of Users, Complexity, Performance Quality, Sourcing Quality, Service Level* as well as the *Size/Service Offer of IT.*

Using the result from the literature review, we applied the research method of expert interviews to obtain a comprehensive picture of the phenomenon in practice [42]. In doing so, we conducted semi-structured and in-depth interviews [42] to have the opportunity to ask more detailed follow-up questions. We interviewed 15 experts from practice, providers, and academia to cover a broad spectrum of people and functions via Microsoft Teams in German language. Finally, we transcribed, and anonymized all interviews. We conducted qualitative coding [41] for the analysis of interview data, using the tool MAXQDA. We used the defined cost drivers from the literature review to assign respective codes to the data but also applied open coding to identify additional strategic drivers and corresponding categories for classification [41]. We thereby expanded our six cost drivers from literature review to a list of 15 after the expert interviews. Those 15 cost drivers are categorized in qualitative coding in the four categories:

- *IT service offer*: IT Scope, Number of IT-based Products
- *Complexity of IT landscape*: Harmonization, Standardization, Technical Complexity
- *Quality*: Performance Quality, Service Level, Sourcing Quality, System Quality, Security Requirements, Compliance Requirements
- *Corporate context*: Number of Users, Organizational Complexity, Business Infrastructure, Corporate Culture

We then conducted an expert workshop following the procedure of Kluge et al. [36]: four researchers revised and specified the results of the exploratory study as a basis to

develop the Delphi questionnaire. They examined and formulated detailed descriptions for the strategic cost drivers, and their influence from the codes of the expert interviews and verified the established categories to classify the strategic drivers of IT costs.

4.2 Expert Selection

For the selection of experts for our delphi survey, we followed the recommendation of 5–20 panelists by Rowe et al. [33]. When choosing experts, we followed the job title and verified that they have several years of experience in the field and thereby aimed for a heterogeneous panel [31, 34]. We contacted German-speaking experts, what led to a panel of initially 21 experts responding the first round (R1) and 18 in the second round (R2). The panel (Table 1) included practitioners (P) (13 in R1|11 in R2) of a variety of company sizes and sectors, IT consultants (C) (5|4) and academics (A) (3|3).

Table 1. Overview of Delphi Study Experts

	Function		**Function**		**Function**
P1	Chief Information Officer (CIO)	P8	IT Portfolio Management	C2	CEO, IT Service Consultancy
P2	Chief Executive Officer (CEO)	P9	Head of IT Governance	C3	ITCM Consultant
P3	Head of IT Governance	P10	IT Portfolio Management	C4	IT Management Consultant
P4	CIO	P11	IT Controlling	C5	IT Strategy Consultant
P5	Head of IT Governance	P12	IT Controlling	A1	Professor, University of Applied Sciences
P6	Chief Financial Officer (CFO)	P13	IT Portfolio Management	A2	Academic Consultant ITCM
P7	Head of IT Governance	C1	CEO, ITCM Tool Supplier	A3	Academic Consultant IT Management

For the development of the Delphi questionnaires, we followed the guidelines proposed by Belton et al. [34]: the questionnaire for each round was designed and conducted in the survey tool ZOHO Forms to ensure a fast and efficient procedure. Each draft was then pre-tested to ensure plausibility, comprehensibility, and consistency and refine the questionnaire [34, 36]. Furthermore, each questionnaire was designed for a maximum time exposure of 15 min to limit the fatigue of the participants [34].

4.3 Execution of Delphi Survey

Next, we started an online Delphi survey to validate the identified strategic drivers from the exploratory study, complete the list and assess their influence. The execution took

place in April and May 2022. It was conducted in iterations of two weeks for each survey round and in between one week of interim analysis.

In the first round of the Delphi survey, we presented the identified cost drivers and their influence deducted from the exploratory study and asked the panel for validation. On a Likert scale with categorical responses (yes/no/don't know), the experts could agree (yes) or disagree (no) on the strategic drivers and on the description of their influence on the level of IT costs. The don't know option was provided to avoid possible misstatements [35]. Furthermore, we included options to provide qualitative remarks on each cost driver. Those remarks allowed us to adjust our descriptions of the drivers and their influence. To complete the list of strategic cost drivers, we provided a qualitative request at the end of the survey for the panel to add missing cost drivers of IT costs. In a third question the expert panel could estimate the intensity of each cost drivers influence on the level of IT costs on a 5-point Likert scale (In your opinion, to what extent can the cost driver influence the level of IT costs? 1 – Very Low,…, 5 – Very High). We then statistically assessed the responses and conducted a qualitative coding of the remarks and additional drivers proposed by the panel [41]. The coding team made various changes on the list of cost drivers, based on the remarks of the panelists [29]; these changes are summarized in Table 2. All in all, the panelists agreed on 9 cost drivers, their influence description, and their influence level (IQD $<=1$) in R1.

Table 2. Changes made after Round 1

Cost Drivers	**Adaption**
IT Scope	Adjusted description of cost driver based on remarks
Performance Quality	Divided into *personnel quality* and *processes quality* following the remarks
Sourcing Quality	Adjusted description of cost driver and extended by a second influence description based on remarks
Number of Users	Adjusted description of cost driver and influence based on remarks
Organizational Complexity	Adjusted description of cost driver based on remarks
IT Setup	Added based on the remarks under category corporate context
Strategic Fit	Added based on the remarks under category corporate context
Corporate Culture	Removed, as no consensus on a direct influence could be reached and it rather influences diverse strategic cost drivers

In the second round of the Delphi survey, we provided statistical feedback on the 15 cost drivers from R1. Personal feedback on the qualitative remarks was sent to each panelist privately. We put the adapted cost drivers (Table 2) on vote again in R2 and reached consensus for a total of 17 cost drivers. The panelists provided no further qualitative remarks and we assessed the quantitative responses similar to R1.

Summarizing, our research resulted in 17 drivers clustered in the four categories from the qualitative coding: *service offer of IT*, *complexity of IT landscape*, *quality* and

corporate context. We present the results including the statistics in Table 3. The average influence level (mean ∅) of each factor estimated by the experts in the Delphi survey can range from very low influence on IT costs (1) to a very high influence on IT costs (5). An IQD less or equal to 1 defines consensus on the influence level.

Table 3. Strategic Drivers of IT Costs

Short description (cost driver & cost influence)	**Consensus**	
Service Offer of IT	**Round**	**Level**
IT Scope describes the degree of IT coverage within an organization	R2 (100%)	∅ = 3,68 IQD: 0,88
The higher the degree of IT coverage in an organization, the higher the IT costs	R1 (95%)	
Number of IT-based Products describes the level of IT in systems or services for internal use or customer products	R1 (100%)	∅ = 3,6 IQD:0,5
The more systems or customer products are based on IT, the higher the IT costs	R1 (91%)	
Complexity of IT Landscape	**Round**	**Level**
Technical Complexity describes the complexity of the landscape in terms of the interaction of the systems in the enterprise architecture as well as the age structure of the landscape	R1 (100%)	∅ = 4,14 IQD:0,5
The higher the technical complexity of the IT landscape, the higher the IT costs	R1 (95%)	
Standardization describes the degree of use of standard applications and services in an organization	R1 (95%)	∅ = 4,05 IQD:0
IT costs decrease until an optimal level of standardization is reached. From this point on, IT costs rise again, because the execution of the processes with standard tools often necessitates corresponding workarounds or additional process steps	R1 (91%)	
Harmonization describes the degree of consolidation of services, systems and infrastructure components that serve the same purpose	R1 (100%)	∅ = 3,95 IQD:0,38
IT costs decrease until an optimum level of harmonization is reached. From this point on, IT costs rise again, because excessive harmonization requires a high level of coordination to carry out the processes with unified systems	R1 (100%)	
Quality	**Round**	**Level**
Personnel Quality describes the quality and know-how of the personnel from IT and business departments	R2 (100%)	∅ = 3,11 IQD:0,88
The higher the quality of the personnel, the lower the (additional) IT costs	R2 (86%)	
Process Quality describes the quality of IT processes. In addition to the classic "plan, build and run" processes, this also applies to management processes and IT service processes	R2 (100%)	∅ = 3,21 IQD:1,0
The higher the process quality, the lower the (additional) IT costs	R2 (95%)	
Sourcing Quality describes the quality of IT system purchasing	R2 100%)	∅ = 3,32 IQD:0,5
1. The better the quality of sourcing, the lower the (additional) IT costs 2. The higher the dependency in sourcing (e.g. negotiating power of suppliers), the higher the IT costs	R1 (95%) R2 (89%)	
System Quality describes the quality of the individual IT systems	R1 (100%)	∅ = 3,09 IQD:1,0
The higher the system quality, the lower the IT costs (e.g. for operating and maintaining systems, etc.)	R1 (86%)	

(*continued*)

Table 3. (*continued*)

Short description (cost driver & cost influence)	**Consensus**	
Quality	**Round**	**Level**
Service Level describes the performance level that is defined and required for IT services, including attributes such as availability, flexibility, and speed	R1 (95%)	∅ = 3,41 IQD: 0,5
The higher the required service level, the higher the IT costs	R1 (95%)	
Security Requirements describe the demands for IT security management in the organization and the preventive measures	R1 (100%)	∅ = 3,78 IQD:0,5
The higher the security standard and prevention requirements, the higher the IT costs	R1 (100%)	
Compliance Requirements describe the demand for compliance defined both externally and by the corporate code	R1 (95%)	∅ = 2,82 IQD:0,5
The more compliance requirements, the higher the IT costs	R1 (95%)	
Corporate Context	**Round**	**Level**
Number of Users describe the number of people using IT systems	R2 (86%)	∅ = 3,14 IQD:0,38
The more users, the higher the IT costs (for (software) licenses, hardware equipment, user support etc.)	R2 (100%)	
Organizational Complexity describes the organizational structure and complexity	R2 (95%)	∅ = 2,73 IQD:1,0
The more complex the organizational structure, the higher the IT costs	R1 (91%)	
Business Infrastructure describes the number of locations of an organization, the global structure and the "global footprint" of an organization	R1 (91%)	∅ = 3,45 IQD:0,5
The more complex the business infrastructure, the higher the IT costs	R1 (91%)	
IT Setup describes the structural setup of IT departments in the organization	R2 (100%)	∅ = 3,37 IQD:0,5
The more diverse the IT structure, the higher the (additional) IT costs	R2 (84%)	
Strategic Fit describes the fit of strategy, structure, and culture	R2 (84%)	∅ = 3,0 IQD:1,0
The better the alignment of strategy, structure, and culture in an organization, the lower the (additional) IT costs	R2 (79%)	

5 Discussion

The results from the Delphi study in Table 3 show that apart from strategic decisions that are related to IT at the first sight (*service offer of IT* and the *complexity of the IT landscape)*, also strategic decisions regarding the *corporate context* or *quality* have an influence on the level of IT costs.

As a first category of strategic drivers, we identified the *service offer of IT*. In IS cost driver literature, the service offer is mainly related to the size of systems [17], number of features and project duration [24, 25] or the number and size of backlog items [18]. However, for a broad and strategic consideration of IT within an organization, experts proposed the differentiation between *IT scope* and *number of IT-based products.*

The increasing *service offer of IT* often results from management decisions following the industry standard or other external influences: one interviewee explains that IT-based products are especially relevant for a digital industry standard and thereby implies higher

IT costs. A current study stresses this rise of IT costs as they become an increasing part of the total cost within organizations [10]. However, higher investments in IT may also lead to a decrease of overall cost due to automatization and staff savings. This shows that the overall understanding of cost behavior demands to also understand the complex interplay of those cost drivers [13]. Future research should therefore study those interrelations and their impact on the level of cost.

The results show three strategic drivers of IT costs in the category *complexity of the IT landscape*: *technical complexity*, *standardization*, and *harmonization*. The taxonomies on strategic cost drivers of the 1980s consider complexity on the level of a single IT system as a cost driver for manufacturing [5, 13, 43] and equally IS research defines tactical IT cost drivers related to complexity: complexity of the software itself [17], of the type of client [44] or activity [18] as well as related to the number of function points [26]. Our results stress the influence of the overall landscape. The high degree of consensus between the panelists (IQD $\leq$ 0,5) highlights this interrelation between the complexity of the IT landscape and the overall IT cost. The differentiation into three strategic drivers stresses that the *complexity of the IT landscape* may have different influence.

Technical complexity causes the highest level of influence on IT costs. Thereby, experts mention decisions on the compatibility of legacy systems or new systems within the landscape or the interplay between systems of different technologies. *Standardization* as well as *harmonization* are measures to reduce complexity and thereby are drivers to save IT costs [9]. However, the experts specify that if the level of harmonization or the application of standards exceed the optimum, IT costs increase due to a higher coordination effort, workarounds or even the emergence of shadow IT. A study by Zimmermann and Rentrop [45] confirms this interrelation between the emergence of shadow IT and harmonization. According to one expert, the right balance between individual needs and the standard solution is therefore crucial in these strategic decisions.

The category *quality* includes seven strategic drivers. *Personnel quality* and *process quality* as strategic drivers of IT costs show similarities to the structural factor *experience* proposed by Shank [13], however experience is not specifically related to IT processes or digital skills. The strategic driver *process quality* relates to the definition, execution as well as the continuous improvement of processes. This includes the classical IT processes of "plan, build, run" [9] but also governance or management processes. In IS literature the number of resources, the resource rate [18] and the skill diversity [17] are identified as IT cost drivers. However, our taxonomy explicitly includes the quality of business and IT *personnel*. One expert specifies the skill of an employee to adapt to the situation and use the know-how while another expert stresses the leadership skills of managers. However, organizations struggle to find talents and therefore plan further investments for new talents and skills [20] and consequently the influence of this strategic driver demands detailed further analysis.

Furthermore, we identified the strategic driver *sourcing quality*, adapted from tactical IT cost drivers such as number of suppliers, contracts or the number of requisitions proposed in IS research [24]. In addition to this quantitative focus, our result shows a focus on the cooperation with suppliers and the quality delivered as characteristics of *sourcing quality*. This becomes increasingly relevant, as many organizations move to the

cloud and need an elaborated management of vendors [10]. Another strategic driver is the *service level*. IS research proposes tactical drivers for software cost estimation such as required reliability and reusability [15]. However, the strategic driver *service level* also includes attributes such as flexibility or speed, which become increasingly important in the volatile environment. A current study confirms this by highlighting future IT as strategic asset that must be flexible and fast [46]. Earlier IS research does not explicitly include strategic choices on *system quality, security* and *compliance requirements* that drive IT costs. Our result validates those three as strategic drivers and especially strategic choices on the measures and preventions of IT security strongly influence IT costs (3,78). A recent study [20] confirms the increasing *security requirements* which strongly influence organizations investments in IT.

Globalization and digitization require a change in organizational structures and value creation and therefore lead to strategic management decisions for new alignment [9]. Those strategic decisions have an influence on the level of overall IT costs. We identified five strategic drivers and subsumed them in the category *corporate context.* Existing IS research did not propose IT cost drivers with a special focus on the *corporate context*, apart from the number of users [24]. However, the proposed definition of *number of users* incorporates a broader view including internal and external users.

Besides the *business infrastructure*, the expert panel validates *organizational complexity*. Organizational structure can be divisional, functional, following the matrix organization or else, which hampers a clear description of the influence of *organizational complexity* on IT costs (2,73 with IQD of 1). Therefore, the management within those structures is decisive for the description of the influence level. *Organizational complexity* also includes the number of hierarchical levels that may lead to more complicated communication channels. This is in line with difficulties in cooperation between business and IT due to organizational complexity or separation [9]. It also accounts for the structural organization and global footprint of IT departments and IT coordination costs rise with a global dispersion of IT employees. Therefore, the expert panel proposed another strategic driver: *IT setup.*

Strategic fit describes the alignment of strategy, structure, and culture and results from the interplay of strategic direction of an organization together with prevailing structure and processes as well as a corporate culture: experts mention collaboration such as DevOps or agile structures to achieve strategic goal and these collaboration models need to be supported by an according mindset or corporate culture. Also, the role of IT department as cost center or service center needs to be aligned to strategy and supported by the corporate culture. However, good alignment may lead to less IT cost for support but to higher total IT costs due to a higher degree of IT usage. These contrasts reflect the difficulties of the panel to reach consensus on the influence and the level estimation (79% and IQD = 1,0).

The developed taxonomy allows the classification of strategic decision variables that drive IT costs. Each of these strategic cost drivers involves a variety of strategic choices and management decisions [13] as well as tactical and operational drivers [23]. Former cost driver research states that hierarchies or taxonomies to classify cost drivers are an important step in the development of new theory [27], to achieve a comprehensive

overview to describe cost behavior and to explain cost and competitive position of organizations [13]. In cost driver research the identification of strategic drivers is followed by their analysis [22] with special focus on determinants and consequences of managerial decisions [3]. Managers take a variety of strategic decisions that are not directly IT-related (e.g. *business infrastructure* and *organizational complexity*) however, they may also lead to an influence on IT costs. The drivers therefore are a strategically important instrument of ITCM to enhance cost awareness at the decision locations in management and to foster managers' consciousness for the consequences of their decisions on IT costs. Likewise, the consequences of strategic decisions are generally considered to be long-term and errors in the management of strategic drivers may lead to cost issues [22]. Concerning IT costs, the presented drivers advance strategic ITCM and through this enable benefits such as the identification of saving potentials on a long-term basis.

Furthermore, an important part in IS research is the contribution to business value. Earlier studies already highlighted this relation between cost drivers, customer value, revenue and profitability [6]: they present a model on decision-making based on underlying strategy and ending with profitability and shareholder value in which the drivers represent possible strategic decision variables. The strategic cost drivers presented can therefore also offer a way to show interrelations between the value proposition of IT across the entire value chain and the management decisions to accomplish strategy. Our taxonomy therefore represents a basis for further cost driver analysis and research.

6 Conclusion

The identification of IT cost drivers is the first step towards cost driver analysis and thus contributes to a better understanding of the causes of costs as well as the impact of strategic decisions. The goal of this study therefore is to identify strategic drivers of IT costs and to assess their influence. To this end, we conduct an exploratory study including a literature review, expert interviews as well as an expert workshop to identify a first set of strategic drivers of IT costs and their influence. Next, we select experts and prepare a questionnaire for the execution of the Delphi survey to establish a comprehensive and verified overview of those strategic cost drivers. This taxonomy shows that strategic decisions regarding the *service offer of IT*, the *complexity of the IT landscape*, *quality,* and the *corporate context* drive IT costs on various influence levels. The 17 strategic drivers allow a classification of tactical and operational cost drivers as well as strategic decisions and thereby foster the understanding of cost behavior as well as the explanation of cost and competitive position of IT within organizations.

This paper makes a theoretical contribution by providing a comprehensive and validated overview on strategic drivers of IT costs. Moreover, practitioners gain awareness of levers to influence IT costs and consequences of managerial decisions on their IT spend. In addition, the holistic representation enables the identification of cost reduction points and can be a basis for the evaluation of IT contribution to business value.

However, our study has limitations. The selection of experts is a key stage in Delphi studies [34]. For our study, we chose different experts for the interviews in the exploratory study and the expert panel of the Delphi survey with diverse backgrounds and experience and from different industries and company sizes. However, those, in total, 36 experts

from a German-speaking context were not randomly chosen. Thus, the results may not be generalized for all corporate contexts and future research could consider other cultural backgrounds. Furthermore, the study was mainly qualitative. The use of formal mathematical models or quantification in the context of data analyses could provide more detailed information about the impact on the level of IT costs. In addition, the identified cost drivers have a direct impact on IT costs, however, *corporate culture* was excluded due to its indirect influence. The investigation of further indirect influencing factors could expand the picture and contribute to a consideration beyond those examined managerial decisions variables. Nevertheless, the identification of the strategic cost drivers of IT and the given overview are important steps in IT cost driver research and our research serves as a foundation for future research.

The next steps to advance this research are the further analysis of the identified strategic cost drivers of IT and their interrelations as well as the resulting cost behavior. Furthermore, the understanding of managerial decisions that impact the drivers enhances the cost awareness and thereby builds a basis for business IT alignment and strategic cost management. In a third step the relation between strategic cost drivers and business value of IT across the entire value chain should be investigated.

References

1. Egle, U.: IT-Kostenmanagement. Studie zum Kostenmanagement und zur IT bei Schweizer Unternehmen, 1st edn. GRIN-Verlag, München (2008)
2. Horngren, C.T., Datar, S.M., Rajan, M.V.: Cost accounting. A managerial emphasis, 15th edn. Always learning. Pearson, Boston, MA (2015)
3. Banker, R.D., Byzalov, D., Fang, S., Liang, Y.: Cost Management Research. JMAR, **30**, 187–209 (2018)
4. Bjørnenak, T.: Understanding cost differences in the public sector—a cost drivers approach. Manage. Account. Res. **11**, 193–211 (2000)
5. Porter, M.E.: The Competitive Advantage: Creating and Sustaining Superior Performance. The Free Press, New York, NY (1985)
6. Banker, R.D., Johnston, H.H.: Cost and profit driver research. In: Chapman, C.S., Hopwood, A.G., Shields, M.D. (eds.) Handbooks of Management Accounting Research, vol. 2, pp. 531–556. Elsevier (2007)
7. Carr, C., Tomkins, C.: Strategic investment decisions: the importance of SCM. A comparative analysis of 51 case studies in U.K., U.S. and German companies. Manage. Account. Res. **7**, 199–217 (1996)
8. Lord, B.R.: Strategic management accounting: the emperor's new clothes? Manage. Account. Res. **7**, 347–366 (1996)
9. Urbach, N., Ahlemann, F.: IT Management in the Digital Age. A Roadmap for the IT Department of the Future. Management for Professionals. Springer, Cham (2019)
10. Flexera: State of Tech Spend Report (2021). https://info.flexera.com/SLO-REPORT-State-of-Tech-Spend. Accessed 2 Feb 2022
11. Grytz, R., Krohn-Grimberghe, A.: Service-oriented cost allocation for business intelligence and analytics: who pays for BI&A? In: HICSS 2017 Proceedings, pp. 1043–1052 (2017)
12. Kappelman, L., et al.: IT Trends Study 2021. Issues, Investments, Concerns, & Practices of Organizations and their IT Executives (2020). https://trends.simnet.org/trends-study-archive. Accessed 2 Feb 2022

13. Shank, J.K.: Strategic cost management: new wine, or just new bottles? JMAR **1**, 47–65 (1989)
14. Cooper, R., Kaplan, R.: The Design of Cost Management Systems: Text, Cases, and Readings, 2nd edn. Prentice Hall, Englewood Cliffs, NJ (1998)
15. Boehm, B., Clark, B., Horowitz, E., Westland, C., Madachy, R., Selby, R.: Cost models for future software life cycle processes: COCOMO 2.0. Ann. Soft. Eng. **1**, 57–94 (1995)
16. Singh, C., Sharma, N., Kumar, N.: Analysis of software maintenance cost affecting factors and estimation models. IJSTR **8**, 276–328 (2019)
17. Benaroch, M.: Understanding factors contributing to the escalation of software maintenance costs. In: ICIS 2013 Proceedings, Milan, Italy, pp. 3125–3139 (2013)
18. Pramono, E.A., Suryani, E.: Designing cost measurement system in a small scrum-based software company using activity-based costing model. In: ICOIACT, pp. 943–947 (2019)
19. Herzfeldt, A.: Untersuchung der Profitabilität von IT-Lösungen. Eine Praxisstudie aus Anbietersicht. Springer Gabler, Wiesbaden (2015)
20. State of the CIO. Executive Summary. IDG Inc. (2022). https://foundryco.com/tools-for-marketers/research-state-of-the-cio/. Accessed 21 May 2022
21. Foster, G., Gupta, M.: Manufacturing overhead cost driver analysis. J. Account. Econ. **12**, 309–337 (1990)
22. Kajüter, P.: Proaktives Kostenmanagement. Konzeption und Realprofile. Gabler, Wiesbaden (2000)
23. Brokemper, A.: Strategieorientiertes Kostenmanagement. Controlling-Praxis. Vahlen, München (1998)
24. Raz, T., Elnathan, D.: Activity based costing for projects. Int. J. Project Manage. **17**, 61–67 (1999)
25. Ooi, G., Soh, C., Lee, P.-M.: An Activity Based Costing Approach to Systems Development and Implementation. In: ICIS 1998 Proceedings, p.35 (1998)
26. Raghu, T., Chaudhury, A.: Modeling IS activities for business process reengineering: a colored petri net approach. In: AMCIS 1995 Proceedings, p.125 (1995)
27. Kaplan, R.S.: Innovation action research: creating new management theory and practice. JMAR **10**, 89–118 (1998)
28. Strasser, A.: Delphi method variants in IS research: a taxonomy proposal. In: PACIS 2016 Proceedings, p.224 (2016)
29. Plessius, H., van Steenbergen, M.: A study into the classification of enterprise architecture benefits. In: MCIS 2019 Proceedings, p.33 (2019)
30. Bacon, C.J., Fitzgerald, B.: A systemic framework for the field of information systems. SIGMIS Database **32**, 46–67 (2001)
31. Hehn, J., Uebernickel, F., Herterich, M.: Design thinking methods for service innovation - a delphi study. In: PACIS 2018 Proceedings, Japan, p.126 (2018)
32. Schmidt, R.C.: Managing Delphi surveys using nonparametric statistical techniques. Decis. Sci. **28**, 763–774 (1997)
33. Rowe, G., Wright, G., Bolger, F.: Delphi: a reevaluation of research and theory. Technol. Forecast. Soc. Chang. **39**, 235–251 (1991)
34. Belton, I., MacDonald, A., Wright, G., Hamlin, I.: Improving the practical application of the Delphi method in group-based judgment: a six-step prescription for a well-founded and defensible process. Technol. Forecast. Soc. Chang. **147**, 72–82 (2019)
35. Häder, M.: Delphi-Befragungen. Ein Arbeitsbuch, 3rd edn. Springer VS, Wiesbaden (2014)
36. Kluge, U., Ringbeck, J., Spinler, S.: Door-to-door travel in 2035 – A Delphi study. Technol. Forecast. Soc. Chang. **157**, 120096 (2020)
37. Diamond, I.R., et al.: Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. JCE **67**, 401–409 (2014)

38. Cooper, H.M.: Scientific guidelines for conducting integrative research reviews. Rev. Educ. Res. **52**, 291–302 (1982)
39. Cooper, H.M.: Synthesizing Research. A Guide for Literature Reviews, 3rd edn. Sage Publications, Thousand Oaks (1998)
40. Webster, J., Watson, R.: Analyzing the past to prepare for the future: writing a literature review. MIS Q. **26**, xiii–xxiii (2002)
41. Corbin, J.M., Strauss, A.L.: Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, 4th edn. Sage Publications Inc, Thousand Oaks, CA (2015)
42. Saunders, M.: Research Methods for Business Students, 8th edn. Pearson, Harlow (2019)
43. Riley, D.: Competitive cost based investment strategies for industrial companies. Manuf. Issues (1987)
44. Hamel, F., Herz, T.P., Uebernickel, F., Brenner, W.: Towards a better understanding of IT cost drivers of asset management companies. In: Conf-IRM 2012, Vienna, Austria, pp. 587–598 (2012)
45. Zimmermann, S., Rentrop, C.: On the emergence of shadow IT – A transaction cost-based approach. In: ECIS 2014 Proceedings, Tel Aviv, Israel (2014)
46. 2022 CIO Agenda. Create an Action Plan to Master Business Composability. Gartner Inc. (2021)