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Abstract

In light of the continued economic pressure on IT organizations, the efficient delivery of IT/IS services remains a crucial issue. Hence, IT managers have to break down and justify their service delivery costs. For this purpose, many IT executives revert to comparative assessments like IT/IS benchmarking. In recent years, IT/IS benchmarking has been increasingly used to support IT/IS management on a strategic level. This approach has specific requirements for the data collection instrument. Hence, this paper introduces such an instrument for strategic IT/IS benchmarking and presents its development over a period of more than six years, during which it was applied in 126 companies.

1 Introduction

Today's IT organizations can be described as a "business within a business" [29, p. 432]. This requires IT executives to refocus from the classic "plan, build, run" approach to the more sophisticated "source, make, deliver" [39]. Managing IT/IS strategically has therefore become more complex, thus increasing the need for appropriate information to steer IT/IS efficiently. Benchmarking has been identified as a well suited tool for measuring the relative efficiency of

IT/IS [18, 26]. Nevertheless, such benchmarks often focus on performance or prices of certain IT services [29], or are used mainly for marketing purposes [18]. Unfortunately, and despite the rather long tradition of strategic benchmarking [e.g., 36], experiences of its use in the strategic IT/IS management (SITM) context have scarcely been documented to date [26]. Hence, in this paper, we introduce an instrument for strategic IT/IS benchmarking. We describe how it was developed and applied, as well as how the various parts of the instrument contribute to making SITM comparable. The instrument has undergone four revision cycles, during which 126 companies' feedback was incorporated. Among these companies, several reported on how the benchmarking results had helped them to revise their strategy or at least to identify areas of future improvement. This leads us to the conclusion that our instrument allows a systematic comparison and, therefore, an assessment of SITM.

2 Theoretical background

2.1 Benchmarking

Benchmarking can be defined "as a continuous search for and application of significantly better practices that lead to superior competitive performance" [36, p. 2]. The data needed for this is gathered by measuring both qualitative and quantitative indicators in the respective domains. Benchmarking has become an established approach – also in the IT/IS field [14, 28]. However, IT/IS benchmarking has mainly focused on products and services – particularly on costs and other quantitative measures – and only recently began to incorporate business processes [29]. Benchmarking on the strategy level, however, has not yet been fully embraced [23], especially not within IT/IS [19]. Despite its long tradition, there is to date no consensus regarding the theoretical foundation of benchmarking [24]. For example, there are many different benchmarking classifications that structure the benchmarking object [10, 11, 19]. Most of these suggestions are based on the approach by Camp [4] and have been adapted to a specific application context. However, five key benchmarking activities are generally required: (1) determine what to benchmark, (2) form a benchmarking team, (3) identify benchmark partners, (4) collect and analyze benchmark data, and (5) take action [7]. The underlying data collection instrument is an integral part of every benchmark study, reflecting its structure and focus. Such an instrument's design is crucial for the comparability and expressiveness of the issues analyzed, since it has to capture not only the necessary contents, but also the related context. The latter is a crucial factor for a benchmark study's sustainable success [17, 26].

2.2 Strategic IT/IS management as a benchmarking object

As a benchmarking object, SITM influences the respective benchmarking instrument's design. On the one hand, the instrument needs to cover all aspects with regard to contents, while, on the other hand, the IT/IS management processes also need to be considered. Regarding the contents of SITM, its various domains and their mutual dependencies have to be taken into account. Several classification approaches distinguish between IT applications [30], IT infrastructure [22], strategic and organizational aspects [1], and the functional IT context [32]. However, there are only few approaches to structuring the complete SITM domain. Earl [9], for example, distinguishes between IS, IT, and IM strategy. Other approaches embed IT

strategy functionally; that is, with respect to certain business areas in the organization's context [e.g., 1, 32]. Mocker and Teubner [22] consider IT infrastructure, IS, and the underlying resources. The lack of empirical grounding and the mere marginal consideration of the organizational structures are the weak point of many of these approaches. Riemp et al. [27] address this challenge by proposing and validating an empirically grounded, integrated SITM framework. By incorporating IT professionals' practical experiences regarding the requirements of actual IT organizations, they increase their model usability and acceptance. Hence, we have decided to structure our instrument on the basis of this framework (figure 1). In addition to covering the relevant contents, an instrument for strategic IT/IS benchmarking should also be adapted to the SITM process. According to Chen et al. [6], research has considered SITM as a process from various perspectives, ranging from strategic IS planning and strategic business-IT alignment to the competitive use of IS. However, as characterized in the introduction, the recent IT/IS developments call for an adaption of existing approaches [12, 13]. Several authors have therefore started to transfer approaches from traditional management to IT/IS [6]. In addition, Müller et al. [26] emphasize the usefulness of benchmarking to determine IT's current strategic position. These authors also stress the importance of contextual fit for a successful benchmarking. This has an important implication for the design of an instrument for strategic IT/IS benchmarking: The instrument's possibility to capture context information must be given. We have considered this requirement in our research.

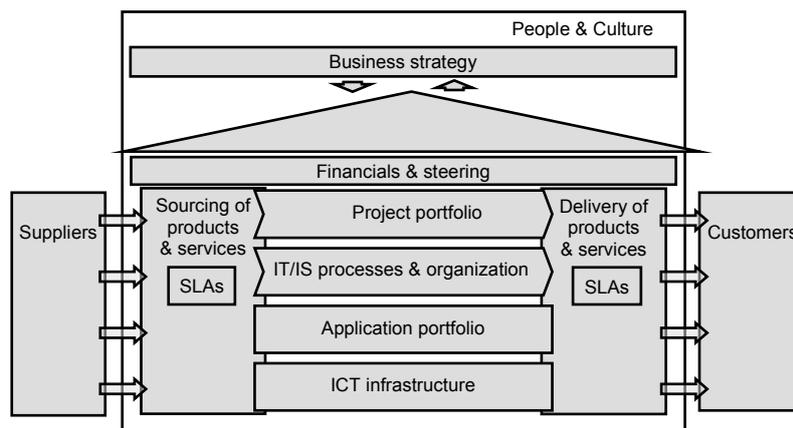


Figure 1: Strategic IT/IS management reference framework [27]

2.3 Quality criteria for benchmark instruments

When developing a benchmark instrument, various quality criteria need to be fulfilled. We identified these criteria by reviewing the existing literature and reverting to "additional knowledge"; that is the "experiences and expertise that define the state-of-the-art in the application domain of the research" [15, p. 89]. The first two important quality criteria have already been presented in the previous section. First, a benchmarking instrument needs to cover the relevant contents of the benchmarking domain – in our case, SITM. This also leads to a better understanding of why specific data is collected and what is, in turn, necessary for top management commitment to and acceptance of the benchmark project [e.g. 4, 17, 26]. Second, the instrument needs to consider the processes of that domain. An important aspect here is the possibility to contextualize the results according to the SITM process. A sound contextualization also fosters interpretability [4]. Further, comparability is an important

precondition of interpretability. A benchmarking instrument needs to assure that the data collected from different companies can actually be compared [e.g., 4, 17]. This can be achieved, for example, by providing all the participants with precise definitions of the data to be collected. However, a trade-off is needed between precision and comfort to keep the definitions manageable [4]. The definitions' proper level of detail can often only be determined over time by incorporating participants' feedback. Finally, the most important quality criterion of a strategic benchmarking instrument is purpose fit – in our case, the enabling of a comprehensive SITM comparison.

3 Methodology

In our research, we rely on the design science paradigm [16, 21]. In general, design artifacts can be both technical and organizational-methodological [2, 34]. Our instrument falls into the second category. In the course of the last six years, we developed our instrument through a total of four iteration rounds (see table 1). Within these iterations, we conducted rigor and relevance cycles. In the rigor cycles, we either incorporated new insights from research or practice, or analyzed and included the feedback from the previous iteration. In the relevance cycles, we applied our instrument in a benchmarking study and captured feedback from the participants by using questionnaires and workshops. In addition, we reverted to our observations of the respective benchmarking studies to evaluate our instrument. During the different iterations, we used various research methods. For example, in the iterations 1, 2, and 4, we mainly relied on exhaustive literature work [37], expert interviews, and workshops [3]. In addition, our knowledge of and experiences in the domain were used to develop the instrument. In iteration three, we mainly relied on case research [38] to obtain deeper insights into how our instrument is used during strategic IT/IS management. A detailed report on the methodology and results of this third iteration can be found in [25].

<i>Iteration</i>	<i>Diagnostic</i>	<i>Design decisions</i>	<i>Effects on instrument</i>
#1 – Initial application	<ul style="list-style-type: none"> • Definitions are too imprecise • Question wording needs revision 	<ul style="list-style-type: none"> • More detailed explanation of terms and KPIs 	<ul style="list-style-type: none"> • Compilation of short glossary • Revision of question wording
#2 – Instrument redesign	<ul style="list-style-type: none"> • Vast amount of change proposals with regard to covered contents 	<ul style="list-style-type: none"> • Instrument redesign on the basis of a reference framework for SITM 	<ul style="list-style-type: none"> • Seven subquestionnaires covering SITM domains
#3 – Incorporation of process model	<ul style="list-style-type: none"> • Benchmarking needs to be embedded into the overall IT/IS strategy process • Benchmark results need sound contextualization for improved interpretability 	<ul style="list-style-type: none"> • Extension of instrument with a process model • Extension of instrument to allow for collection of context information 	<ul style="list-style-type: none"> • Method for strategic IT/IS benchmarking • Section to collect predefined context information • Comment fields for additional context information
#4 – Refinement	<ul style="list-style-type: none"> • IT's changing role towards a "business within the business" needs to be accounted for 	<ul style="list-style-type: none"> • Rework and improvement regarding IT service management and IT processes 	<ul style="list-style-type: none"> • New sections regarding service management covering insights from ITIL and related disciplines

Table 1: Iteration process of instrument development

4 Instrument development

Our instrument was developed in four iteration rounds. The first one started in 2004 and the most recent concluded in 2010. In total, we applied our instrument to 126 companies to which we had access via a large benchmarking initiative. The participants spanned 12 industries, their sizes ranged from very small up to very big (global players), and they had very different maturity levels with respect to strategic IT management. At the beginning of every benchmarking round, we held single-day introductory workshops to assure that all participants understood our instrument and would fill it out in a similar fashion. While we plan to keep improving the instrument in the future, we decided to present our instrument now, as we have dealt with each of the previously identified quality criteria at least once. We adjusted the instrument's content perspective, solved many comparability issues, and investigated the process perspective by extending the instrument with a process model and a way to contextualize the results. Each of the four iteration rounds also provided profound insights into the instrument's applicability. The overall iteration process is described in table 1; an overview of the benchmark instrument in its current version is presented in table 2.

4.1 Initial instrument development

During the initial instrument development, we aimed at covering the relevant SITM facets, while keeping the instrument as parsimonious as possible to make it manageable for IT executives. This trade-off resulted in a single questionnaire with 400 questions focused on essential SITM issues, such as the basic costs and quantities, as well as the qualitative measures of IT strategy. We pretested the instrument in seven companies and incorporated the feedback into the questionnaire. The purpose of this pretest was to remove bugs and test the instrument's general understanding and applicability.

4.2 Iteration 1: Initial application

During the pretest, the users had various problems understanding the questions and indicators. Consequently, we reformulated the problematic questions and compiled a short glossary for the participants. Technical bugs were also removed. After this pretest, we applied our instrument in two benchmark studies with a total of 76 companies in 2004 and 2005. During these studies, it became apparent that precise definitions and delineations of the cost measures are crucial. Despite a short glossary, the 36 participants in the 2004 study had many queries regarding definitions and delimitations. Unfortunately, we were not able to answer all of them right away – some were simply too detailed. In the final workshop, most participants expressed their appreciation of the contents, but had concerns regarding some of the indicators' comparability due to their definitions' lack of precision. Consequently, we revised these definitions after this benchmark round. Other feedback, such as proposals for additional contents, was kept in mind but not incorporated, as we were focusing on the definitions. The revised instrument was then again applied in a benchmark study with 40 companies in 2005. The feedback was very encouraging. Many of the participants maintained that the benchmarking allowed them to compare their IT/IS on a strategic level for the first time. Additionally, the remaining definitional imprecision was not as problematic as it had been before. Again, many suggestions were made regarding further content improvements and additions.

4.3 Iteration 2: Instrument redesign

After iteration 1, we had a vast number of ideas on how the instrument could be improved. However, the ideas were so multifaceted and heterogeneous that we were unable to summarize them in a few moderate changes. Consequently, we decided to do a major redesign of the instrument. Considering the number of improvement ideas, it became clear that not all of them could be handled in one monolithic questionnaire. We therefore decided to build the necessary restructuring on an existing scientific SITM reference framework, which would increase the participants' acceptance of the instrument. Hence, during the rigor cycle of the second iteration round, we conducted an extensive literature search for SITM reference frameworks. We finally decided to use the framework depicted in figure 1, as it was the only one that had been empirically tested. We then restructured and extended our instrument on the basis of the framework's domains, which resulted in seven sub-questionnaires. Most of the resulting structures and measurements can be found in table 2. These have undergone only a few adjustments since then. In addition to this redesign, we again improved our definitions. We thus not only extended the glossary, but also added detailed completion information on every question. To account for the now much longer instrument (1000 items, instead of 400), we decided to make only the basis questionnaire ("Organizational context and IT strategy"; see table 2) mandatory and the others optional. To evaluate our redesigned instrument, we applied it in a benchmarking study with 26 companies in 2007. This time, we used short questionnaires in the final workshop to capture the feedback in a structured way. Most of the participants stated that the new structure was very well suited for strategic IT/IS benchmarking and that they could match their IT organization very well with the framework. The modularized structure received many positive reactions, as it enabled the distribution of the sub-questionnaires to the respective company experts. Furthermore, the refined definitions and completion information led to positive reactions, although there were still questions on the cost measures.

4.4 Iteration 3: Incorporation of process model

Besides the reactions to the instrument's new structure, the additional comments and reactions in the second iteration round mainly pointed towards IT organization's changing role to a service provider and the importance of a proper strategy process integration. Benchmarking projects seemed to be more successful if companies choose a participative approach with all the relevant stakeholders. While our attention was strongly focused on the contents of the benchmarking endeavor so far, the participants' feedback highlighted the need to take a closer look at the process perspective. Consequently, in the third iteration round, we took the opportunity to participate in three companies' strategic IT planning processes. These companies were chosen as they relied on benchmarking as part of their efforts to generate data needed for strategy making. In this convenience sample, we observed our instrument's use during the IT strategy process. The case studies took place from the summer of 2007 to the winter of 2008 in companies from different industries, of different sizes, and structures. Each case study took between two and five months to complete. For a detailed description of the cases and results see [25]. The insights we generated allowed us to derive several important design decisions. The first was to extend the mere content structuration by introducing a process and role model. These models would ensure the successful execution of a benchmarking project and its proper integration into the overall strategic planning process. Second, the active involvement of IT management experts, supported, for example, by

appropriate top management attention, seemed instrumental to generate not only output, but actual outcome. This approach, in combination with additional comment fields in the questionnaires and a new section capturing context information, allowed for a much better contextualization of the benchmark results. This, in turn, leads to a higher degree of interpretability and, eventually, increased acceptance of the results.

4.5 Iteration 4: Refinement

In these three in-depth case studies, something that had already sometimes showed up in previous iterations became very apparent: The change in IT organizations' role towards IT service providers. We realized that this development would also have to be reflected in our instrument. In this iteration, we bundled our expertise with that of a second scientific IT/IS benchmarking initiative. Their experiences and competencies, especially with regard to IT service management, strongly contributed to improving our instrument. We restructured and extended our fifth questionnaire "IT organization and IT processes" to account for IT's new role according to the "source, make, deliver" paradigm. We therefore incorporated process analyses according to ITIL, determined the process and service management quality more precisely, and added a detailed section on the service desk as the most important interface to business users. Again, we revised and improved our glossary and definitions. The resulting instrument was then validated in a benchmarking round in 2010. A total of 14 companies participated. For the first time, almost no questions were raised regarding the delineation of IT costs. Most of the participants accepted the definitions without question. Nevertheless, questions now arose regarding the newly incorporated sections, such as the service desk. Furthermore, in the questionnaire about "IT services" in which we had adjusted some of the services (e.g., servers or telephony), several questions were raised about the definitions. However, in our current fifth iteration round, these issues are being adjusted and revised.

5 A benchmarking instrument for strategic IT/IS management

Our benchmark instrument at the end of iteration round four consisted of seven sub-questionnaires covering the SITM domains according to Riempp et al. [27]. An overview of the questionnaires can be found in table 2. The complete questionnaire is available on request from the authors. We collect both quantitative and qualitative data. Quantitative measures are used for costs and other countable facts, while qualitative measures collect "softer" facts with the help of nominal or Likert scales. Qualitative questions allow for a more holistic analysis of a companies' SITM. This is supported by comment fields for additional context information and detailed definitions for each item. On the basis of the collected items, we calculate a set of 130 key performance indicators (KPIs) (for examples, see table 2). From the quantitative measures, we derive common KPIs such as IT costs per turnover, margin or outsourcing quota, but also subject-specific KPIs such as the average ticket backlog per service desk employee. With respect to the qualitative measures, the items captured via Likert scales are of particular interest. These items allow for the derivation of summarized indicators (SI) for various topics such as IT strategy process, sourcing strategy, or IT service management. SIs indicate how advanced the IT organization's processes are, and how strongly they are anchored in the organization. An SI is a value between 0 and 100%, with 0% meaning that the respective process does not exist and 100% meaning that all facets of a process exist, are standardized, and anchored in the organization. For each SI, we measure

between 6 and 18 items, which are condensed by calculating the arithmetic mean and a scaling it to 100%. In summary, the KPIs form the basis for the interpretation of the benchmark results. IT executives usually first look at these KPIs to determine which areas need a closer look. In the following subsections, we will introduce the questionnaires and discuss how these contribute to strategic IT/IS benchmarking.

<i>Questionnaire</i>	<i>Dedicated domain from figure 1</i>	<i>Topics</i>	<i>Examples of KPIs</i>
Organizational context & IT strategy	Business and IT/IS strategy, IT/IS governance, financials	<ul style="list-style-type: none"> Organizational classification General company data IT strategy Hot IT topics Cost and quantity structures 	<ul style="list-style-type: none"> IT costs per turnover / employee Outsourcing quota External per internal employee Project percentage of total IT costs SI of IT strategy process
IT sourcing	Suppliers; sourcing of products & services	<ul style="list-style-type: none"> IT sourcing strategy Management of IT sourcing Spectrum of externally sourced IT services Success and costs of IT outsourcing 	<ul style="list-style-type: none"> SI of the IT sourcing strategy process SI of the management of external sourcing of services Motivation for current or future external sourcing
IT applications	Application portfolio	<ul style="list-style-type: none"> Application portfolio Costs and quantities of IT applications State of the application and architecture management Complexity of the application landscape 	<ul style="list-style-type: none"> Quota of standard applications Number of applications per IT supported employee SI of application and architecture management Complexity factor and costs of application software
IT infrastructure	ICT infrastructure	<ul style="list-style-type: none"> Costs and quantities of IT infrastructure Complexity and costs of the infrastructure (software) landscape 	<ul style="list-style-type: none"> Ratio of infrastructure software to hardware costs Cost quota servers / notebooks Complexity factor notebooks / infrastructure software
IT organization and IT processes	IT/IS processes and organization	<ul style="list-style-type: none"> IT service management and processes Reporting, budgeting, and controlling processes Service desk 	<ul style="list-style-type: none"> SI of IT service management SI of IT processes Average backlog per service desk employee Average service desk cost per ticket
IT projects	Project portfolio	<ul style="list-style-type: none"> Strategic and operative project management Used process models / frameworks Project success 	<ul style="list-style-type: none"> Percentage of projects on time / budget / quality Percentage of cancelled projects SI of strategic / operative project management
IT services	Delivery of products & services; customers	<ul style="list-style-type: none"> Structural data of service catalogue Costs and performance of the most important IT services 	<ul style="list-style-type: none"> Costs of the provision of a laptop Costs and size per mailbox Costs per terabyte of storage Frequency of backups / archiving

Table 2: Structure of our benchmarking instrument

5.1 Organizational context and IT strategy

Besides collecting information about the current IT strategy, this questionnaire is particularly important for contextualizing the benchmark results. Our experience shows that these can be interpreted much better when the industry, size and turnover of a company, its strategic orientation, the standardization of the processes, cost structures, etc. are also considered. These characteristics were also used as important means of determining the peer group for a participant, which in turn assures a higher level of comparability. Hence, the first questionnaire contains several sections that allow for a sound contextualization and peer group formation (see also table 2): organizational classification, general company data, IT strategy, as well as the cost and quantity structures. The section on IT strategy determines the IT organization's strategic orientation (i.e. role of enabler rather than supporter, growth rather than downsizing). These are also important comparability indicators. In the costs and quantity section, we present a cost breakdown of the overall IT costs and quantities with respects to, for example, sourcing, line work, projects, as well as external and internal IT employees. Another part is collected in the section "Hot IT topics," which captures information about the IT organization's past, current, and future project portfolio. We therefore provide a list of 25 topics with which IT executives currently cope. This list is adjusted yearly after the participants' feedback and an analysis of scientific and practitioner publications to keep it up-to-date. Regarding the IT strategy process, we measure its standardization and maturity by means of 13 items that account for businesses' IT alignment, their handling of strategic goals, IT architecture, and their application portfolio. Examples of these questions are:

- The IT strategy is derived from the business strategy and supports it efficiently and effectively.
- The strategic goals of IT are realized and controlled via established implementation processes.
- The implementation of the IT architecture process is anchored in the organization via a staff position or dedicated work group.

We use 4-point Likert scales to measure the as-is state and an additional 5-point Likert scale to capture an item's perceived importance. The latter does not influence the SI, but helps interpreting and understanding it. Moreover, it allows companies to reflect their strategic role as, for example, certain strategic variables are more important for an enabler than for a supporter [9]. Each question has a detailed definition to assure a high degree of comparability and to cope with confirmation bias [20].

To sum up, this first questionnaire is by far the longest, as well as the most fundamental questionnaire with respect to SITM. The data captured forms the "roof" (as depicted in figure 1) and is crucial for a strategic IT/IS benchmarking. Hence, it is mandatory for all participants to fill out this questionnaire, while the others are optional.

5.2 IT sourcing

IT sourcing is of particular strategic interest, especially in the light of IT industrialization and commoditization [35], and efficient service delivery. Thus, in this questionnaire, we investigate which services and processes IT organizations source externally and which they provide themselves. We also account for the reasons, why specific services and processes are outsourced, as well as for outsourcing's success and costs. Furthermore, in this questionnaire,

we inquire about the IT sourcing strategy and the management of sourcing's maturity. While our experience shows that the maturity of sourcing management is of particular interest for organizations with a high outsourcing quota, having a sound sourcing strategy is also important for companies with a low quota. Besides identifying an actual sourcing strategy, we also investigate the basis on which sourcing decisions are made. This comprises a comparison of internal and external service costs, as well as the usage of structured processes to decide whether services should be delivered internally or externally. In contrast, the maturity of sourcing management accounts for the management of outsourcing providers, and investigates how externally sourced services are steered. Underlying items measure, for example, the degree to which there are underpinning contracts or incentive systems. Overall, this questionnaire supports IT executives in two ways. First, they can judge the contents of their sourcing strategy by analyzing their peers' behavior. Second, they can improve their internal sourcing-related processes by identifying those areas of improvement where their peers have already gained a higher maturity.

5.3 IT applications

Development, operation, and maintenance of IT applications belong to the core cost and complexity drivers in an IT organization. Consequently, we capture the costs, size, as well as efficiency of a company's application portfolio and its respective management processes (e.g., architecture and license management). We also account for the degree of standardization and the usage of application frameworks as important levers for cost savings. In this context, we investigate the license management's maturity as software licenses are usually another IT cost driver. However, the knowledge of quantitative values is not sufficient to steer the application portfolio effectively. Having a mature architecture management is perhaps even more important. Therefore, we capture not only the actual existence of an architecture management, but also whether it is integrated into the long-term IT planning, whether committees and organizational units control the architecture's effective implementation and standard conformity, and whether efficient control mechanisms are employed to monitor the status of the applications.

5.4 IT infrastructure

While IT infrastructure is no longer a competitive differentiator for most companies, it is still a company's backbone, and its availability remains a key prerequisite for and enabler of higher-order IT effects [5]. Hence, shedding light on potentially problematic infrastructure issues is an important SITM facet. Additionally, in light of the increasing virtualization of servers and desktops, this field is regaining strategic relevance, especially from a cost saving perspective. Hence, we analyze the IT infrastructure landscape's complexity and costs, as well as its current level of standardization and virtualization. While other questionnaires have grown over time, this questionnaire has shrunk over the years. Today, it is the shortest of all, only focusing on the most crucial IT infrastructure topics.

5.5 IT organization and IT processes

Compared to its initial version, this questionnaire shows the most radical revision and strongest growth. It reflects IT organizations' ongoing change with regard to service providers and a "business within a business" [31]. The first part of the questionnaire investigates the maturity of IT service management; that is, how service and operational level agreements

are implemented and monitored. We also account for adopted process frameworks like ITIL, CobiT, or ISO20000, and for the implementation status of typical IT processes such as incident management, change management, service level management, demand management, or service desk. With regard to the latter, we capture very detailed information about costs, the personnel, and ticket quantities. In doing so, we account for the input by many IT executives, who wanted a detailed analysis of this very important interface to the business units. The second part of this questionnaire measures the maturity of the reporting and budgeting processes. In summary, benchmarking the IT processes and organization provides IT executives with valuable insights into how to improve their service delivery and, consequently, customer satisfaction.

5.6 IT projects

This questionnaire is of highly strategic relevance. Still, approximately 70% of all IT projects do not meet their objectives in terms of budget, time, and quality [33]. However, the majority of IT investments are implemented through projects [8]. Thus, IT projects are one of the most important parts of an IT organization's internal value chain and must be analyzed in a strategic benchmarking. In this questionnaire, we investigate the state of project management and project success. Regarding the latter, we determine the fractions of project success regarding budget, time, and quality, as well as the number of projects cancelled. In addition, IT executives also wish to know why their project success is worse than that of their peers. Therefore, the instrument also provides a detailed investigation of the strategic and operational project management by inquiring about IT project portfolio management, resource allocation processes, project risk management, and benefit management routines. With respect to operational project management, career or compensation models for project managers are investigated, as well as the charging models for project costs and re-source request handling before and after project kick-off. These issues are completed with an analysis of the adopted project management frameworks and process models. Information about the past, current, and future project portfolio is collected in the questionnaire "Organizational context & IT strategy". In addition, further quantitative project data such as the costs, project employees, etc. is collected in this questionnaire.

5.7 IT services

We analyze the most important delivered IT services on a high abstraction level, examining the costs or prices, as well as the overall service performance. To this end, this questionnaire picks up the nine most often offered IT services (PCs and laptops, servers, database systems, e-mail, archiving, back-up, ERP systems, telephony and network services and storage) and sheds light on their specific performance indicators. Examples of such indicators are the costs of the provision of a laptop, the costs and size per mailbox, cost per terabyte of storage, frequency of backups and archiving, etc. Besides this information, we also capture general structural data on the service catalogue, such as number of IT end-users, size of the service catalogue, and number of agreed on service levels. These indicators are interesting in a peer group comparison, but we also use them to better embed the data into this questionnaire in the organizational context. To sum up, this questionnaire completes the SITM benchmarking by analyzing an IT organization's delivered products and services on an aggregation level suited for IT executives.

6 Discussion and conclusion

In this paper, we have introduced an instrument for strategic IT/IS benchmarking and described its development. We based our initial design on existing research, expert knowledge, as well as our experiences. In a total of four iteration rounds, we developed, redesigned, and improved our instrument by incorporating 126 companies' feedback. By using an established frame of reference for SITM and constantly incorporating participants' feedback, we have gained a good amount of content coverage. The feedback also allowed for a high degree of comparability, as it helped refine our definitions. In addition, we achieved a better embedding of the benchmarking into the overall SITM process by two means. First, we developed and introduced a process model into our instrument. Second, we improved our results' contextualization via commentary fields and specific questions in our first questionnaire. Overall, the vast majority of the participants in our benchmarking rounds confirmed our instrument's high degree of purpose fit. Hence, we can conclude that our instrument enables a comprehensive comparison of SITM, at least in our sample. Our work contributes to research and practice by providing a validated instrument for strategic IT/IS benchmarking. Researchers and practitioners can draw from our insights into the contents and processes that need to be considered in SITM, the quality criteria for a strategic IT/IS benchmark instrument, and how these can be addressed during instrument development and usage. We also underline some of the key requirements of strategic benchmarking like integration into the overall strategy process and proper contextualization. As limitations of our research could be the limited generalizability of our results due to convenience sampling and the comparably small number of participants in our benchmarking rounds needs to be considered. Future research might investigate in more detail how our instrument is used by different companies. For example, we observed that some of our rather inexperienced participants used the KPIs and structures in our instrument to improve or even build their own IT controlling. Furthermore, future research could also investigate the impact our instrument has on an IT organization's strategizing. Some authors [25] emphasize the usefulness of benchmarking for determining IT's current strategic position. In this context, it might be promising to investigate whether and how an adequate benchmark instrument influences the positioning.

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