Measuring the Agility of the IT Application Systems Landscape

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Abstract. A company's ability to change increasingly depends on the ability to change its IT, something referred to as "IT-agility" here. High IT-agility can contribute to increased business agility and thus create a competitive advantage. In this paper we focus on the IT application systems landscape, a resource of significant importance for the IT-agility and competitiveness of a company. To manage IT-agility it must be measurable. In our research, a goal hierarchy and a derived performance measurement (key figure) system was developed to measure and actively manage the agility of IT application systems landscapes. This measurement model is scalable from the measurement of individual domains to the entire IT application landscape. It has demonstrated its practicality in the context of several case studies.

Keywords: IT-Agility, IT Application Systems Landscape, Competitive Advantage, IT Controlling, IT Management.

1 Introduction

The business of companies and thus their business processes and products are changing over time. These changes almost always have an impact on the company's IT in the sense that IT systems need to be adapted. Surveys in recent years among IT managers as well as scientific contributions show that a key requirement for the IT organization is the ability to adapt to the needs of the professional business [5] [6].

Moreover, IT penetration of the core business processes in companies in recent decades has increased continuously. This will be even truer with digital transformation of industries gaining pace. Thus, the change ability of enterprises increasingly depends on the ability to change the IT [4] [21]. In business, we see that some companies are dealing better than others with the continuous need of change in their information systems (IS). Hence, we would like to understand, and ultimately measure and manage this ability of IT. To come up with a sound suggestion for these issues that we will refer to under the label of IT-agility is the central theme of our paper.

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2 Related Work – Literature Review

Based on a very recent and detailed literature review by Termer [33, p.24-30] the use of the “agility” term in information systems research will now be highlighted. By citation analysis, Termer identifies five major sources [p.24-25], amongst 57 relevant contributions, which dominate the definition of the term agility in the actual research literature: [9] [12] [25] [30] [22]. He also reveals that indeed a manifold of sources are used, so that overall a fragmented definition is apparent. It should be noted that in this analysis contributions dealing with agility in the limited context of software development are excluded. Also, papers using the term agility without defining it were excluded from further analysis. Moreover, research on the term “flexibility” is viewed as related, but not identical to “agility”.

Agility is understood by Sambamurthy et al. as an ability to recognize and use market potential rapidly and unexpectedly for competitors [30, p. 245]. This ability has two components: to probe the market (exploration) and to exploit the market (market arbitrage). Furthermore, agility is divided into three dimensions: customer agility, partner agility and operational agility. Even though IT in all three areas is assigned a supportive role, it is not part of the agility consideration [30, p. 246]. IT and the competence of using it are seen as the initiator and enabler for corporate actions, which are conducted in the three mentioned agility domains.

According to Overby [25, p. 121], who also sees IT in an enabling role for business, the capability of (enterprise) agility results in two significant basic skills: on the one hand the ability to notice changes in the corporate environment (sensing), and on the other hand the ability to conduct certain actions in a suitable way regarding these changes (responding). The sensing skill is here explicitly assigned to the tasks of anticipation and the prediction of environmental changes. The ability of responding includes moreover the essential pace to conduct the chosen action [16, p.127-128].

The definition of agility according to Goldman et al. [12] results from a production theoretic view. The term agile describes the ability of producers to be successful in changing, fragmented markets. Some constitutive features are specified: agility is dynamic and unlimited, context–specific, agile companies offensively embrace changes, and agility is offensive, as it creates chances for profit and growth. Termer argues [33, p. 31] that these characteristics overlap with features of flexibility, as described in the research literature. Flexibility refers to the capability of a corporation to be able to move rapidly from one known task to the next one. Here it is important that the appropriate situation is known beforehand and therefore the corresponding tasks to overcome this situation should also be defined in advance [12]. A corresponding questionnaire for the capturing of agility proves to be imprecise and subjective [16, p.127-128].

In the definition according to Dove [9] the ability of responding is especially emphasized: “We look at agility as deriving from both the physical ability to act (response ability) and the intellectual ability to find appropriate things to act on (knowledge management). Agility is expressed as the ability to manage and apply knowledge effectively so that an organization has the potential to thrive in a continuously changing and unpredictable business environment.” [9, p.9]. Hence two essential features of agility are emphasized: on the one hand the ability to act and on the other hand the ability to identify the right things for acting on. Basically the tasks of knowledge management are linked therewith [9, p.9-16]. Products, processes, practices and people are the primary action fields for agility [9, p.83, 163-180]. Dove reveals basic approaches, which contribute to better response ability. These include the abilities to reuse, reconfigure and rescale, which are used for different production scenarios [9, p. 33, 38, 42 and 61], as well as the standardization of interfaces to enable the use of a loosely coupled resource pool [9, p.41].

While considering agility, the aspects of proactive [9, p. 92-99] and reactive changes are incorporated [9, p. 100-107]. Proactive changes are made possible by means of innovation or by taking up the leading position in a division. Its trigger is therefore within the company. Dove refers to reactive changes as the foundation of survivability of a company and as the basis for opportunistic behavior. Reactive actions are always evoked by (external) events, which require such a reaction.

In the definition of agility according to Seo and La Paz the ability to notice signals from the internal and external environment (perception) and the adequate answers (responding) to these signals are placed into the center of the considerations [32, p. 136]. In this process, an organization is subjected to a perpetually changing cycle to which it adapts better and better, and thus ensures survival in a dynamic environment. Possible negative aspects in dealing with agility are predominantly discussed in this literature source [32, p.137–138). For instance, correct information from the environment has to be admitted, which furthermore needs to be made available for an adequate evaluation, so that the decision makers can make a decision on the basis of relevant information. Likewise it must be possible that actions can be implemented in a reasonable timeframe. Information systems have to be capable of this speed without claiming a high management effort. These negative aspects can be mitigated by standardization and outsourcing as well as by a suitable organization and culture.

Termer [33, p.28-30] concludes that none of the references identified in his extensive literature review actually designed a tool that would help companies identify the level of IT-agility attained, or follow the effectiveness of measures to increase IT-agility over time. The only exception, according to Termer, are the works of the research group of Nissen [22] [23] [24] [29], where a key figure system for the measurement of IT-agility was developed and tested in several practical case studies. The present article actually continues the development of this key figure system.

Termer, in his PhD-thesis [33] defines IT-agility from a behavioral point of view, stating that “agile behavior, also agility, is understood to mean the self-motivated, purpose-oriented activities of an organization which aims at the aggressive design of the environment” [33, p.46, translated]. IT-agility here is influenced by three main aspects of company IT: the technical infrastructure, the IT-staff, and the organizational structure, including IT-processes [33, p.49].

For the practical analysis of IT-agility, Termer recommends, drawing a parallel to air combat maneuvers, “to define appropriate actions (maneuvers) and to keep corresponding expectations of their implementation. The concrete execution of the actions could be documented and evaluated (…).” [p. 225, translated] While we view this behavioral definition of IT-agility as interesting from a scientific perspective, it must be said that this understanding is not very helpful from a practical point of view, as we cannot define maneuvers with a company IT in real life. Therefore, our own considerations of IT-agility, which are given in the next section, draw on the abilities and characteristics of the IT to define, measure, and manage the level of IT-agility.

Finally, we want to add the definition of IT-agility as suggested by the influential paper of Conboy [8, p.340] in the context of information systems development (ISD), which is a more limited scope than the one we address in our paper. Conboy states that agility is "the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment." As one can see, there is some similarity to components in the previous definitions, particularly by Dove [9] and Termer [33]. Agility is seen as having reactive as well as proactive parts, ultimately thriving for customer value. We shall use these common aspects in our own conceptualization of IT-agility.

3 Conceptualization of IT-Agility

Our conceptualization of IT-agility is based on the underlying theoretical rationale of the resource-based view of strategic management (RBV). The RBV [1] [27] [37] places the heterogeneous equipment of companies with internal resources as a source of competitive advantage in the center. It is argued that not the sole possession of these resources is the cause of the success of a company, but additionally appropriate employee skills and management skills are needed who know to take advantage of the potential of resources. This will be reflected in our three pillars of IT-agility.

For the characterization of (strategically relevant) resources, various properties were defined in the academic discourse. According to the VRIS-framework of Barney, a resource is valuable, rare (or even unique), inimitable and non-substitutable, i.e. cannot be replaced by other equivalents [1, p 105]. Other authors have varied these properties and added in particular the usability and immobility aspects [35].

Applying the principles of RBV on the subject field of IT, the mere possession of IT does not lead to competitive advantage. Carr has described this situation very strikingly, in which he referred to IT as a commodity without strategic relevance [7]. This can be explained by his narrow viewing angle to pure technique. But strategic value of IT can be achieved through its effective and efficient use. The value contribution of IT to business then becomes a multi-facetted concept, where IT-agility is one component, next to others such as service orientation or enabling compliance [34]. Moreover, the target role of IT as an innovation engine for the company has been stressed in publications recently [17], fueling the understanding that IT is not a mere reactive enabler, but should also have a proactive function in the company.

In our conceptualization, a high IT-agility can be a strategic asset for companies, particularly in turbulent environments, and with many IT-based products or processes. Overall IT-agility is the result of agility in its three constituting parts ("pillars of IT-agility"), which we draw from the RBV and previous research in [22] [23] [24] [29]

[33]: 1. IT-infrastructure, in particular the architecture of the IT application systems landscape, 2. IT-organization / IT-processes, and 3. IT-staff / IT-management. This contribution deals only with the first of these three pillars.

Looking at the IT infrastructure of enterprises, it can be said that not all of its components are equally sources of competitive advantage. In particular, hardware and standard software are not strategically relevant. However, if the entire IT application systems landscape is considered, the criteria of the resource-based approach can be met, as was shown in [24]. Thus it can be stated that with the provision of an agile IT application systems landscape a strategic resource can be created that allows for a sustainable competitive advantage.

The elements of the IT application systems landscape are the application systems (applications and associated data), their interfaces as well as the domains and functions of a company. The architecture of the IT application systems landscape (short: application landscape) describes the application systems, their relationships and structure based on business-related criteria (domains and functions). The (nonexistent) IT architecture of obsolete application landscapes prevent easy maintenance and results in a low ability to change. This is supported by many literature sources, e.g. [11] [19] [28], which view IT application landscapes that have over many years grown uncontrolled as a main cause of the lack of IT-agility in companies. Moreover, there is a common believe that the architecture of the IT application systems landscape represents in fact a key differentiator between highly agile and less agile companies [10] [31] [23].

When dealing with change two archetypal forms can be distinguished: reactive and proactive. Many contributions in the IS literature define a passive coping with change as reactive, whereas an active, internally driven change intention is defined as proactive. When it comes to the type of change required in IT, one can basically distinguish capacitive and functional aspects. Capacitive requirements relate to scalability, i.e. the ability of IT to respond to growing business volumes, or performance, i.e. provide a constant response time even with changing demand volumes. Functional requirements relate to features, products, and processes of IT.

In the literature on agility there are some components of a definition that frequently appear: strategic thinking, identification of opportunities that create business value, proactive (innovative) and reactive (quick response) components, embracing change. We include the aforementioned considerations in our definition of IT-agility:

IT-agility is the ability of a company's IT to respond very quickly (preferably in real time) to changing capacity demands and changing functional requirements, as well as to use the potential of information technology in such a way that the business scope of action of the company is extended or even redesigned.

To manage IT-agility it must be measurable. Today no method is available that measures IT-agility and especially the agility of the IT architecture based on observable factors. Based on this situation, the following research question is derived:

How can the agility of the IT application systems landscape, as an important part of the IT-agility of a company, be measured and actively managed, based on objectively observable characteristics?

In the following, the development of a corresponding measurement instrument is outlined.

4 Method

4.1 Design Science Approach

The design science research (DSR) approach as a methodological framework seems well suited to answer the research question described. On the one hand the lack of measures of IT-agility and, more specifically, the agility of IT application systems landscapes is a relevant issue that comes from business practice. On the other hand, the development of a key figure system for measuring the agility of application landscapes is a design activity [15]. The specific sequence of the research activities in our investigation follows the popular DSR Methodology Process Model of Peffers et al [26]. From a scientific perspective, our contribution is the developed hierarchy of goals (and associated key figures) as a comprehensive model to explain the relationships between architecture principles and the agility of IT systems landscapes. The corresponding key figure system is the tool for measuring and actively managing IT-agility. In the following, we describe essential components and results of the iterative design process, which is grounded in a structured literature review, expert interviews and case studies. We report on results from the last design cycle.

4.2 Development of a Goal Hierarchy

First, the relevant parameters were determined for the design of the performance measurement system, i.e. those properties of IT application system landscapes that have an impact on the IT-agility. This was done through a structured literature review following Webster and Watson [36], not detailed here for reasons of space. The full description can be found in [29]. It revealed 29 relevant papers from which design input could be derived for measuring the agility of IT application systems landscapes, describing objectives in the context of IT flexibility and IT-agility, to be achieved with suitable measures. The goal network in Figure 1 shows the goals that were repeatedly mentioned. Bold relations are dominant. These are discussed frequently in the literature and have been further confirmed in a series of semi-structured interviews with 18 experts in the field. Suggestions obtained therefrom were incorporated into the final design of the goal hierarchy and associated indicators. In the semi-structured expert-interviews we followed [3] and questioned both IT top managers as well as IT architects. Moreover, in order to complete the picture, and also to get an external IT view, managers from the business were included that have a strong link to IT. Finally, some IT-related business consultants were also interviewed.

Along the dominant goal relations a goal hierarchy is constructed starting from the top goal. The goals connected by relations are adopted in the goal hierarchy. In addition, goals are further sharpened or detailed (Figure 2). Very few elements from the literature have not been incorporated, since they do not satisfy one or more of the required quality criteria. An example is the goal of high parameterization of the application landscape, meaning the ability of an application system to implement a business change without programming. For this goal the necessary data can in practice not be collected with reasonable effort, as was revealed in both the expert interviews and several practical case studies [24] [29].

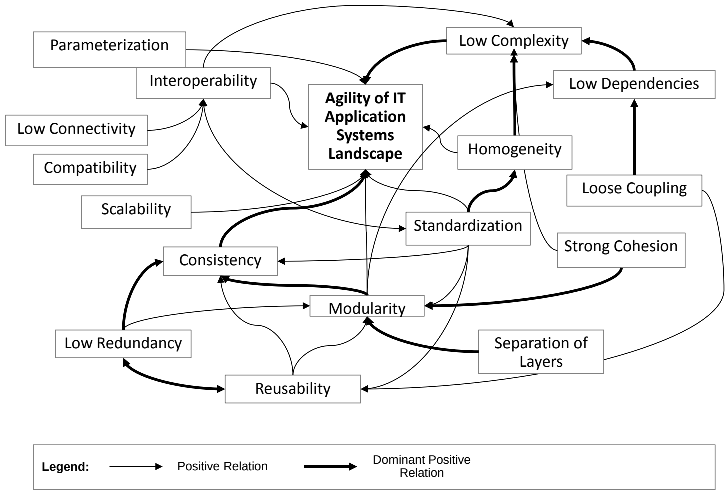

Figure 1. Goal relations from the analyzed literature

The goal hierarchy consists of five levels. On the first level is the overall goal "high agility of the IT application systems landscape." This is divided into the goals "high functional agility" and "high capacitive agility". The process is continued to the fifth level containing nine elementary goals, briefly characterized below.

Low Connectivity: The entire IT application systems landscape is regarded as a network of connected application systems. Low connectivity requires that in an application landscape as few application systems are interdependent as sensible.

Adequate Coupling: Adequate coupling requires that domains are internally closely and externally loosely coupled.

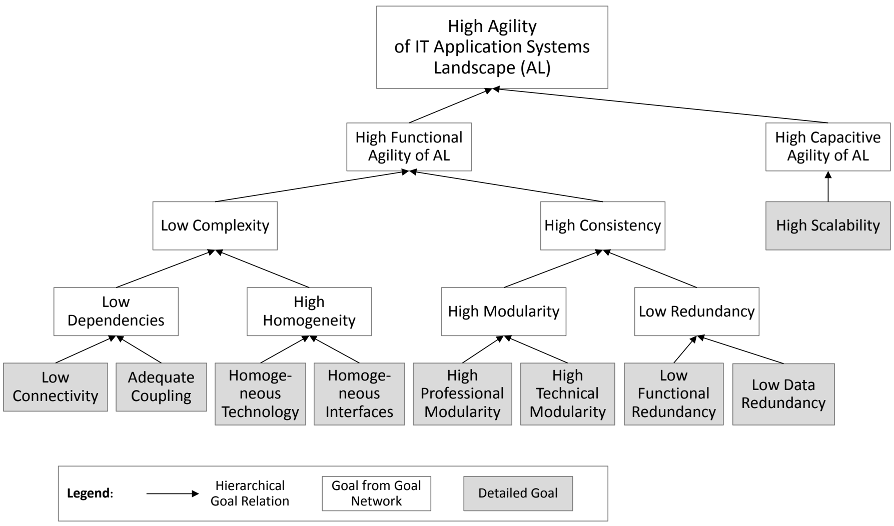

Figure 2. Goal hierarchy for the agility of an IT application systems landscape

Homogeneous Technology: The uniform application of few, dominant technologies facilitates the portability and compatibility of application systems. Functions can be easily re-used, which enables changes and contributes to IT-agility.

Homogeneous Interfaces: Uniform interface technologies reduce complexity. Data can easily be exchanged between applications.

High Professional Modularity: The structure of the application landscape of the company should be based on the company's business (processes and organization). The more two business processes, business functions or departments are linked together, the closer should be coupled the supporting application systems.

High Technical Modularity: Each application system should have a clear unambiguous technical purpose. Engels et al. differentiate four categories [11]: interaction components, process components, function components, inventory. High technical modularity requires that each system of the IT application landscape can be assigned to precisely one of the four established software categories.

Low Functional Redundancy: Ideally, a professional function is implemented only at a single point in the application landscape. If this function is used elsewhere, the existing implementation should be re-used. Multiple efforts for the implementation and for ongoing maintenance can thus be avoided.

Low Data Redundancy: Databases should be managed each by a single application system and all applications that require these data need to access the respective application system. Low redundancy of data is only required at the logical level.

High Scalability: Both the ability of the application system for parallel execution of processing steps as well as the capability of the technical infrastructure to scale horizontally should be evaluated jointly. The structure of the application landscape has only a supportive indirect influence on scalability. The direct factors affecting scalability can be found in the architecture of individual applications as well as in the nature of the technical infrastructure.

5 Artifact Description

5.1 Key Figure System

In order to manage the development of an IT application systems landscape towards a high agility, the attainment of the goals set out must be made measurable. To this end, we follow the approach suggested by Kütz [18]. For the documentation key figures profiles are used. Table 1 gives an example. The full key figure system is depicted in Figure 3.

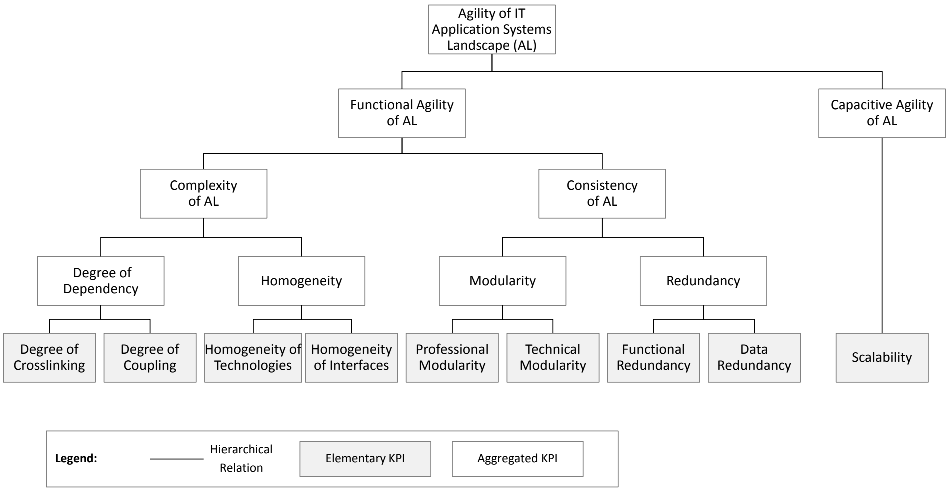

Figure 3. Key figure system to measure the agility of an IT application systems landscape

Table 1. Example of a key figure profile

KPI	
Technical Modularity ($MODU_{TECH}$)	
Supported goal	References
High technical modularity	[14, 15]
Question	
How well can the application systems of the IT application systems landscape be assigned to a unique technical software category?	
Description	
Technical modularity measures how well the application systems can be assigned to software categories. Software categories characterize different tasks (e.g. interaction, function or inventory) of application systems. Each application system should, ideally, be assigned a unique software category.The technical modularity sets the number of software category overruns of application systems in relation to the number of all application systems of the application landscape. The fewer overruns exist, the higher the value of the measure.	
Calculation	Standardization
$MODU_{TECH} = \frac{\sum(\mathrm{SK(a)} - 1)}{\mathrm{ELEM(AL)}}$	5 – $MODU_{TECH} < 0.2$ 4 – $0.25 > MODU_{TECH} \geq 0.2$ 3 – $0.35 > MODU_{TECH} \geq 0.25$ 2 – $0.5 > MODU_{TECH} \geq 0.35$ 1 – $MODU_{TECH} \geq 0.5$
Data	
SK(a) = number of software categories application system „a“ can be assigned to ELEM(AL) = number of application systems in the entire application landscape	

A company needs to set target values, in accordance with the importance of IT-agility and after consideration of other strategic goals, and track the achievement of these target values. The performance measurement system can be used not only for measuring entire application landscapes, but also for parts of it. For clarity, the figures are, however, always defined for the whole IT application systems landscape. If, for example, the KPIs should be used for the measurement of individual domains, the concept of the application landscape must be replaced with the appropriate domain name. The potential user base of the performance measurement system is the top leadership circle of the IT organization as well as the enterprise architects of a company.

Below the elementary KPIs are briefly described. The indicators and thresholds in standardization were presented as part of the iterative design process in the expert interviews and used in several case studies, and have been intensively discussed.

Degree of Crosslinking: With the degree of crosslinking, the degree of internal dependencies of the application landscape under consideration is measured. The actually existing links between the application systems are set in proportion to the maximum possible number of links. The degree of crosslinking measures the complexity of the application landscape based on the connections between the application systems. The more application systems are connected together, the higher are the dependencies, and thus also the complexity of the application environment.

Degree of Coupling: The application systems or sub-domains contained in a domain should be more closely linked than the domains are connected to each other. Interfaces of a domain can be measured by the "coupling ratio", weighted by the number of application systems. The coupling ratio for a domain determines the ratio between the number of interfaces within a domain and the number of application systems contained therein. The average coupling ratio of the domains is assessed in relation to the coupling ratio of the entire application landscape. The greater this ratio, the stronger the domains are linked internally and the higher the degree of coupling.

Homogeneity of Technologies (Applications): The homogeneity of application systems technology measures the complexity that arises because different technologies are used in parallel in the application landscape. In addition to the number of different technologies also their distribution in the IT application systems landscape is measured. A high number of used technologies results in low technology homogeneity and thus leads to a high complexity of the application landscape.

Homogeneity of Technologies (Interfaces): The technology homogeneity of interfaces measures the complexity that arises when different interface technologies are used in parallel. In addition to the number of different interface technologies also their distribution in the application landscape is measured.

Professional Modularity: The professional modularity is the measure of the unambiguous assignment of application systems to domains. It sets the number of domain overruns of application systems in relation to the number of all application systems of the application landscape. The fewer domain overruns, the higher the value.

Technical Modularity: for details see Table 1

Functional Redundancy: The functional redundancy measures how many business functions have been implemented several times (and to what extent) in different applications. For this, the sum of all redundancies of functions in the application landscape is set in proportion to the total number of IT-supported functions.

Data Redundancy: The data redundancy measures how many data are maintained multiple times in different application systems and to what extent. For this, the sum of all redundancies of data stores in the IT application systems landscape is assessed in relation to the total number of data stores.

Scalability: This KPI measures the proportion of the application landscape, which is designed scalable. For this purpose, the proportion of the application systems is measured, where scalability was explicitly specified as a non-functional requirement in the implementation. This is then multiplied by the ratio of scalable infrastructure (hardware) components. The interviewed experts considered this KPI useful, but noted that the necessary data are rarely available in the required quality and completeness in practice. This has also been confirmed in the case studies conducted.

5.2 Aggregation of Key Figure Values

The hierarchical aggregation runs along the described goal hierarchy. Since the assessment of all key figures is carried out in an identical manner and standardized to the value range [1 ... 5], the calculation is made simple. The lowest level consists of the already explained elementary KPIs. The aggregate indicators in the levels above are always put together by the same aggregation rule, a weighted additive aggregation of subordinated key figures.

The weighting factors of the indicators have values between 0 and 1, and their sum in an aggregation is always equal to 1. As a result, the lower-level KPIs can be weighted relative to one another, and the result is always on a scale between the values 1 and 5. Through the weighting factors, companies can set priorities, if they consider parts of the goal hierarchy to be particularly desirable. For a benchmarking of various companies or parts of the same company, however, the weighting factors must be kept constant, otherwise the comparability of the results is not given

6 Discussion

The motivation of our research and the problem to be solved is the lack of instruments to measure and actively manage the IT-agility (not only) in the field of the IT application systems landscape. This problem is of considerable practical importance across industries, since the IT-agility can be seen as an integral part of the value contribution of IT in an enterprise [34]. Our research makes contributions on the scientific as well as the practical side of this problem.

From a scientific point of view, our contribution is the developed hierarchy of goals (and associated key figures) While we acknowledge that agility as a research topic has been treated in a sizable number of contributions in the literature, the agility of the IT architecture is rarely discussed [14]. To our knowledge, we provide the first comprehensive model to explain the relationships between architecture principles and the agility of IT application systems landscapes.

The applicability and usefulness of the key figure system was tested in several case studies in practice. Here, the approach followed recommendations of Yin [38] and Benbasat et al. [2]. In selecting the companies studied emphasis was placed on finding relatively different companies in order to examine a wide range of possible scenarios for the key figure system. For reasons of space, the case studies cannot be presented here. However, details can be found in [29]. In order to ensure the validity and reliability, different data sources were used in the companies, such as architecture data bases, architecture graphs, architecture concepts and interviews with enterprise architects. In addition, a database has been set up for each case study that includes, separated from the raw data, a comprehensible analysis and calculation of key figures.

In our work, case studies and expert interviews were combined to evaluate the performance measurement system. This combination of evaluation methods is frequently used in application-oriented work when no similar model exists [20]. It turned out that through the developed indicators the agility of the IT application systems landscape can be measured and controlled over time, thus making a substantial practical contribution.

We now compare our approach with the DSR guidelines as provided by Hevner [15, p.83]. Guideline 1 (Design as Artifact): A key figure system is an artifact in the sense of Hevner. Guideline 2 (Problem Relevance): The measurement and management of IT-agility are issues of substantial relevance that add to the value contribution of IT in practice. Guideline 3 (Design Evaluation): Although, because of a lack of space, the evaluation had to be largely omitted from this paper, the goal hierarchy and associated key figure system have undergone substantial evaluation through expert interviews and practical case studies. Guideline 4 (Research Contribution): The key figure system and the goal hierarchy provide scientists with a new basis for the concept of IT-agility in the IT architecture of organizations. Guideline 5 (Research Rigor): We used a mixed-method approach combining a structured literature review with semi-structured expert interviews and practical case studies. All methods were designed after established methodology references as mentioned in the text. Guideline 6 (Design as a Search Process): Our research required several design cycles to come up with the final artifacts as presented here. The research on IT-agility in our group is an ongoing process since 2008. Guideline 7 (Communication of Research): This paper is our attempt to communicate the current results to the scientific community.

7 Conclusions

IT-agility is attributed a strong value proposition to corporate success, however, the required level of IT-agility is seldom achieved in companies. According to our expert interviews, the demand for IT-agility is considered particularly high in companies with a strong IT penetration, complex and diverse products with short product life cycles, a strong end customer orientation and dynamic competitive environments. Based on design principles and with appropriate measuring instruments the IT-agility can be improved in practice.

In our research, a goal hierarchy and a derived performance measurement (key figure) system was developed to measure and actively manage the agility of IT application systems landscapes. This measurement model is scalable from the measurement of individual domains to the entire IT application landscape.

The key figure system was developed with a focus on the part of the application landscape that supports the core business processes of a company. In particular in the field of Business Intelligence, which often accounts for a significant portion of IT budgets, questions concerning the applicability of the suggested KPIs to the field of analytical applications may be of interest. Also interesting is whether the performance measurement system can be applied to enterprise networks (value chains).

Methodically, it would be desirable to quantitatively evaluate the key figure system. For this purpose, however, a large number of participating companies is necessary. A large-scale quantitative survey would also enable the validation of the proposed standardization (normalization of indicator results).

Also, the question of the cost of the build-up of IT-agility is not yet considered. Only when this has been clarified, together with the demand question (How much IT-agility is actually needed?), a statement about the optimum level of IT-agility in a company can be made.

While in this contribution the IT architecture was the focus, appropriate considerations are also required with respect to the other pillars of IT-agility, namely the IT organization and IT processes as well as IT staff and management. This represents a current focus of our research with the ultimate goal to make IT-agility measurable and manageable in all fields of action.

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