

Shadow IT Evaluation Model

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Abstract— Shadow IT describes the supplement of “official” IT by several, autonomous developed IT systems, processes and organizational units, which are located in the business departments. These systems are generally not known, supported and accepted by the official IT department. From a company’s, IT governance and IT management’s perspective it is necessary to find a way to deal with this phenomenon. As a part of an integrated methodology to control shadow IT, this paper presents an evaluation model for identified shadow IT instances.

I. INTRODUCTION

THE “official” IT infrastructure, developed, managed and controlled by the IT department, is supplemented in most companies by an unofficial IT. Business departments have a multiplicity of other hardware, software and IT employees. Generally these exist without the awareness, acceptance and support of the IT department. The resulting, autonomous developed and supplied systems, processes and organizational units are usually characterized as “Shadow IT” [1].

For the definition of shadow IT it is necessary to differentiate the term from end user computing (EUC). EUC is a concept where the development of applications is delegated to the end users. Compared to shadow IT it is officially initiated and supported. Primarily EUC is applied for the development of very easy IT solutions based on offered platforms or for the users’ possibility to configure their application individually [2].

Due to new technologies, young employees with a strong bond to the usage of IT [3] [4] and an increasing focus on compliance and risk management in the companies, shadow IT is gaining in importance. Besides several risks caused by shadow IT, opportunities can be found in the user-driven, innovative potential and its high process orientation. So, from companies’ and IT management’s perspective the question arises, how to deal with this phenomenon, its risks and its opportunities [1]. Especially as shadow IT evades the official structures of risk management, it is absolutely essential to identify and evaluate shadow IT.

To give organizations an orientation on the controlling of shadow IT a balanced set of instruments is necessary. Our study (www.schattenit.in.htwg-konstanz.de) aims at the analysis of best practices and the development of an integrated methodology to handle shadow IT [5]. The first step in this methodology is the identification of specific shadow IT instances and their mapping to the business processes. Afterwards it is necessary to analyze and evaluate these instances. The evaluation establishes a foundation to control shadow IT and derive effective strategies for this topic.

In [5] we presented the basic structure of our shadow IT evaluation model based on a weighted point system and the portfolio technique. In this paper we will deepen the criteria and backgrounds of this model in detail and deploy it for a shadow IT example from practice.

In our research methodology we initially analyzed literature on specific information system portfolios which could be used for shadow IT. As shadow IT is a very special problem with different facets compared to official information systems, it was necessary to combine different existing portfolio models and adapt their criteria on shadow IT. Therefore the IT asset portfolio by [6] could be used as a starting point. This portfolio maps the technical quality and the business value of information systems. Another information system portfolio model by [7], considering the technological suitability, complemented our approach. The further evolved criteria are based on discussions with IT managers and field reports on the existence of shadow IT in several companies. Furthermore, existing references about the risks and the opportunities of shadow IT have been regarded [1] [8] [9].

For the description of the shadow IT evaluation model different criteria are presented in Chapter II. Chapter III examines the evaluation procedure and based on this the representation of the results. Chapter IV concludes with a brief outlook and next steps of the study.

II. EVALUATION CRITERIA

The main target is the definition of aggregated characteristics to evaluate each identified shadow IT instance. Based on several examples in literature and discussions with companies and due to analyzed interactions of shadow IT with risk management, IT governance and IT service management topics, the following parameters can be derived as evaluation criteria.

A. Relevance

The criterion relevance describes for each shadow IT instance its significance and its importance for the processes of the company. It contains business value [6] characteristics but also risk aspects concerning different subjects. Thereby this main criterion consists of several sub-criteria:

- **Strategic relevance:** It is necessary to assess how shadow IT affects the strategy of the company and strategic decisions on the IT infrastructure. This impact can be in a supporting or undermining manner for strategic guidelines and specifications. E.g., the strategic decision on using a specific, central IT system could be undermined by developing and using local shadow IT instead.

- **Criticality:** An erratic behavior of a shadow IT instance can lead to several effects, e.g., risks in IT security and compliance or inefficiencies in business and IT- processes. The assigned significance of an erratic behavior, considering a specific subject, shows the criticality of a shadow IT instance. Therefore this criterion refers to the following subjects: business process, IT security, compliance and IT service management. An erratic behavior can impinge these subjects in different levels: The higher the criticality level, the more serious and riskier are the effects of an erratic behavior [10] [11].

B. Quality

Another major role for the evaluation is the quality of shadow IT. This quality refers on the one hand to the technical system quality [6] itself, the corresponding IT services and the generated information. These sub-criteria represent the major dimensions of quality in the information system success research [12] [13]. On the other hand, it is necessary to regard the quality concerning the handling of business processes when shadow IT is used. The mentioned sub-criteria can be described as follows:

- **System quality:** The system quality is a measure for the performance of the information system from a technical and design perspective [13]. Regarding shadow IT, the quality of hard- and software and the quality of the engineering and design processes can be differentiated. Maturity models, e.g., Capability Maturity Model Integration (CMMI) [14], and quality standards can help to evaluate these aspects generally. In case of software the quality can be derived from the characteristics functionality, reliability, ease of use, efficiency, portability, adaptiveness, maintainability and security [15]. In assessing the shadow IT engineering

processes the question is, how far recognized quality assurance procedures are deployed. This includes documentation, testing and proper engineering methods [16].

- **Service quality:** This criterion refers to IT services, which occur in connection with a shadow IT instance and which are normally provided by the official IT department. The service quality is evaluated based on ITIL [17]. By using this set of best practices in IT service management, a reasonable comparison to the existing service processes can be ensured. Especially the core processes in service design, transition and operation are relevant, as they are very common in connection to shadow IT [9] [18] [19].

- **Information Quality:** The criterion information quality describes the quality of the data output, e.g., in reports [13]. This includes the integrity and consistency of data generated by the shadow IT.

- **Quality of business processing:** This criterion of quality evaluates indirect, process-related issues in using shadow IT. Manual efforts in processing tasks with shadow IT, e.g., redundant work and data entry [20] [21], is one central point to analyze. Also the multi-user capability needs to be viewed, to assess possible media disruptions with other organizational units. Furthermore, the process maturity is of interest to look at. The process should be documented, stable and repeatable. For the evaluation, maturity models, such as the Business Process Maturity Model (BPM) [22], can be applied.

TABLE I.
SHADOW IT EVALUATION CRITERIA [5]

Shadow IT evaluation criteria		
Mayor criteria	Sub-criteria level I	Sub-criteria level II
Relevance	Strategic relevance	
	Criticality	Business process
		IT security
		Compliance
Quality	System quality	Hard-/Software
		Engineering process
	Service quality	
	Information quality	
Quality of business processing		
Size	Use of resources and professionalism	
	Number of users	
	Shadow IT components	
	Shadow IT service processes	
Innovative potential		
Parallelism		

C. Size

The size of shadow IT refers to its use of resources and professionalism, its distribution and its penetration with components and service processes. By evaluating this, it is possible to estimate the extent of a specific shadow IT instance in the company. The sub-criteria are:

- Use of resources and professionalism: The question is how many employees, technical resources and applications are needed to implement and maintain the regarded instance. Also it is necessary to assess how professional the shadow IT is operated and how qualified employees are for shadow IT tasks.

- Number of users: This parameter shows how widespread the shadow IT instance is used in the company.

- Shadow IT components: By this criterion the involved components of shadow IT are evaluated. A shadow IT instance can consist of software, of hardware or of a combination of several components.

- Shadow IT service processes: This criterion regards the IT service processes, which exist in connection with the shadow IT instance. It should be determined in what dimension the ITIL [17] core processes service strategy, service design, service transition, service operation and continual service improvement are provided.

D. Innovative potential

It is essential to evaluate the innovative potential of the shadow IT instance. On the one hand shadow IT offers the opportunity to introduce new technologies or process improvements into the company [1] [8]. On the other hand a specific shadow IT instance might be a regression and not

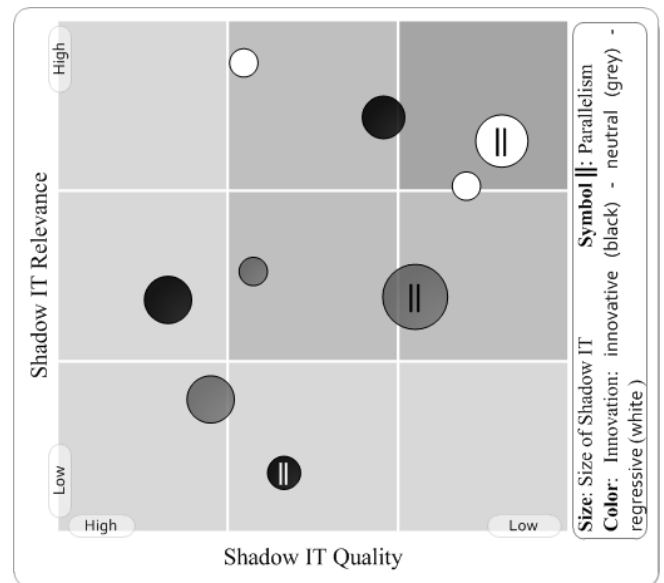


Fig 1. Shadow IT Evaluation Portfolio – Example [5]

technologically suitable [7]. This criterion also considers user satisfaction and other benefits [12] for the organization through the regarded shadow IT.

E. Parallelism

Finally it is of interest to judge, if shadow IT is operated parallel to an existing, official IT-System [20] [21]. This means, the identified shadow IT instance replaces official IT solutions in those departments where it is used. In contrast to this, shadow IT can be additional and complementary to the officially offered IT services. Table I summarizes the different major and sub-criteria of the evaluation model.

TABLE II.
SHADOW IT EVALUATION – FIELD REPORT: SHADOW IT FOR TRAVEL EXPENSE REPORTS

Shadow IT Relevance	Strategic relevance	Criticality			
		Business process	IT security	Compliance	IT service management
Weighting	0.2	0.3	0.15	0.25	0.1
Rating 0 (low) -10 (high)	3	7	5	9	5
weighted	0.6	2.1	0.75	2.25	0.5
Sum		6,2			
Shadow IT Quality	System quality		Service quality	Information quality	Quality of business processing
	Hard-/Software	Engineering process			
Weighting	0.15	0.15	0.2	0.25	0.25
Rating 0 (low) -10 (high)	3	1	2	3	2
weighted	0.45	0.15	0.4	0.75	0.5
Sum			2.25		
Shadow IT Size	Use of resources and professionalism	Number of users	Shadow IT components	Shadow IT service processes	
Weighting	0.25	0.25	0.25	0.25	
Rating 0 (low) -10 (high)	5	7	5	7	
weighted	1.25	1.75	1.25	1.75	
Sum				6	
Innovative potential	Regression (compared to the official product, its technology and its processes)				
Parallelism	Exists parallel to an official system				

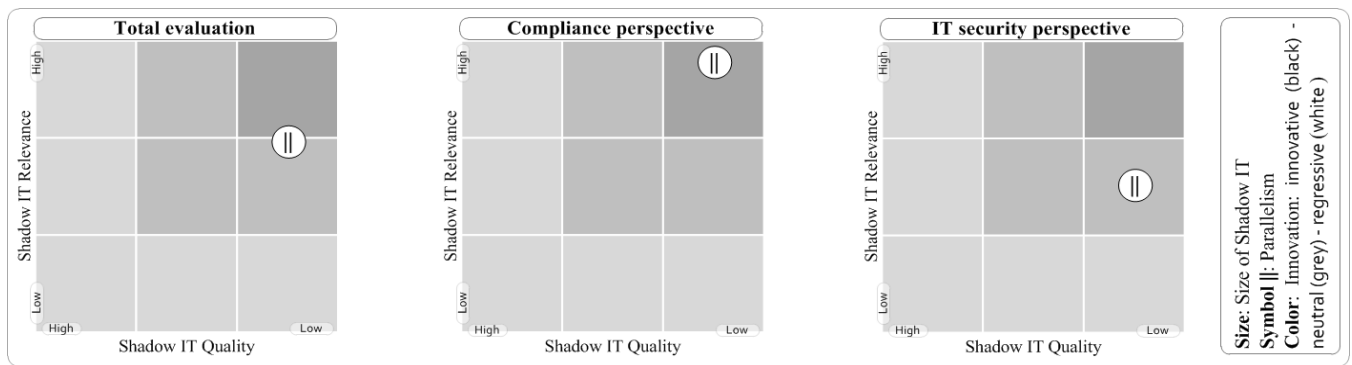


Fig 2. Shadow IT Evaluation Portfolio with different Perspectives – Field Report: Shadow IT for Travel Expense Reports

III. SHADOW IT EVALUATION PORTFOLIO

All described criteria need to be evaluated. Therefore it is necessary to collect basic information about the policies and strategies of the regarded organization and its IT department. During the evaluation procedure, relevant members of the organization and their opinion should be considered.

Within the major criteria relevance, quality and dimension the listed sub-criteria are weighted individually for the regarded company. In total, the weights on each level add up to one. Afterwards, for each identified shadow IT instance the sub-criteria are evaluated from 0 to 10, with 10 as the highest rating. The weighed ratings of all sub-criteria are accumulated to the evaluation rating of the belonging major criterion. The criteria innovative potential and parallelism are assessed with regard to the individual case of the shadow IT.

Based on the results each shadow IT instance is transferred into a portfolio as exemplarily shown in Fig. 1. The portfolio consists of the two axes relevance and quality, the size for an instance and the color for the innovative potential. An instance, which exists parallel to an official solution, is marked with a symbol of two parallel lines. The portfolio representation indicates which shadow IT instance has to be addressed with a high priority. From the risk point of view the shadow IT in the upper right corner is particularly crucial.

An example for this procedure is presented in Table II. The example refers to an identified shadow IT instance from a field report in an industrial company: Instead of using the officially IT-supported, web-based and externally assigned service for travel expense reports, an Excel-based shadow IT spreadsheet was developed and disposed company-wide by members of the central account staff. Changes due to amendments are manually adapted and new versions are published on the intranet of the company. Table II shows the evaluation of the criteria for the regarded shadow IT. Especially the rating for the compliance-related criticality is very high.

IV. CONCLUSION

In this paper an evaluation model for shadow IT is presented. Based on several weighed and evaluated criteria the identified shadow IT instances can be allocated in a portfolio. The results of this enable the derivation of first needs of action and build up a foundation for further strategies to handle shadow IT.

For the next steps of our study the discussed model needs to be applied, validated and enhanced in practice. Based on this assessment it is necessary to clarify what to do with the classified shadow IT in the different sectors of the portfolio. Additionally, best practices for the handling of shadow IT will be investigated in several companies involved. The target is to develop an integrated methodology to control shadow IT, reveal its innovative potentials and develop it further to a “User-driven IT” [5].

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