Success Factors in Business-Managed IT - A Case Study Analysis at a Large German Industrial Company

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Abstract: The terminology of Business-Managed IT refers to Shadow-IT systems which are operated overtly in the business units (BUs) and with the awareness from the IT department. They are a common phenomenon in corporations and usually emerge if the formal IT organization is unable to provide the BUs with solutions that meet their requirements. Because of this, Business-Managed IT is a highly significant area for an exploratory study, and both academia and practitioners can benefit from knowledge on how such systems can be successfully managed. In this present research, a case study analysis of five Business-Managed IT systems at a large German industrial company was conducted. Interviews with stakeholders involved in these systems were transcribed and analyzed to derive Critical Success Factors (CSFs) for Business-Managed IT. After a careful analysis of the data, a total of nine CSFs for Business-Managed IT systems were obtained. They fall into three dimensions: *Project Dimension, Organizational Dimension* and *System Dimension*.

Keywords: Business-Managed IT; Shadow-IT; IT-Organization; Critical Success Factors

1 Introduction

In recent years, many traditional Information Technology (IT) departments in corporations have been struggling with their role as an enabler for successful business activities by providing high quality IT services in a dynamic market environment [UA16]. Reasons for this are, amongst others, long project cycle times for too large and too complex IT projects as well as poor alignment between the business and IT departments within a corporation.
Many business units (BUs) have therefore started to build and develop their own "systems, services, and processes that are not part of the official corporate IT" [KW16a]. In some corporations, BUs even started to create their own (informal) IT organizations who are responsible for maintaining systems that are "autonomously established by [the] business units" [FR14]. Systems such as these which are decentrally and covertly operated by BUs and not part of the official corporate IT are generally referred to as Shadow-IT.
Until recently, academic research in the area of Shadow-IT has mostly been focusing on the negative aspects of Shadow-IT and its "lack of integration in the enterprise architecture" [Hu16]. Shadow-IT is furthermore seen as an "IT risk for organisational information security" [SB14] and considered to be of *covert* nature because "related activities are

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practiced in a hidden form" [Ko18]. Contrary to this, the concept of Business-Managed IT refers to the phenomenon of *overt* Information Systems (ISs) where "the related activities regarding . . . development and operation [of the IT system] are practiced openly" [Ko18] and are, to a certain extent, aligned with the activities of the IT department.
The intention of this research is to determine which factors contribute to the success of Business-Managed IT. First, the terminology is defined and related literature is reviewed. Next, the research methodology and the context of the case study is presented and following that, the resulting Critical Success Factors (CSFs) obtained from the case study are discussed. The paper is concluded with an outline of the limitations and opportunities for future research.

2 Definitions and Related Works

A comprehensive definition of Shadow-IT was found by Zimmermann, Rentrop and Felden who described it as a "business process supporting IT systems, IT service processes, and IT staff. Shadow-IT is deployed autonomously within business departments and by IT users. Thereby, Shadow-IT systems are involved neither technically nor strategically in the IT service management of the organization" [ZRF14].
However, and contrary to the common belief that Shadow-IT mostly entails negative consequences for the operation of a business, recent publications emphasize the positive consequences of allocating responsibility for IT systems decentrally in the BUs [Ko17]. Academia therefore proposed to differentiate between Shadow-IT and Business-Managed IT and defined Business-Managed IT as the practice of operating ISs within the BUs which are involved in the organizational IT management [Ko17] and operated in alignment with the IT department [Ko18].

Even though the term Business-Managed IT was presumably first introduced by Kopper in 2017, the idea to "reallocate responsibilities and share the tasks of identified Shadow-IT between the business and the IT units" [ZRF16] as well as the trajectory of "Central IT assumes Maintenance [of Shadow-IT systems]" [CSC14] has already been presented in previous works. To understand the existing body of knowledge and explore areas for future research [LE06], the first step of this research was to conduct an extensive literature review following the recommendations of Levy and Ellis (2016). First, the literature databases AISeL[2], EBSCOhost[3], IEEE Xplore[4] and ScienceDirect[5] were queried with a variety of keywords related to the concept of Shadow-IT, such as *Shadow-IT, Business-Managed IT* or *Shadow systems*. Next, and based on the publications yielded from the search in literature databases described above, a backward and forward references search was conducted [LE06]. As a result, 26 publications related to the concept of Shadow-IT were obtained.
The majority of previous research in the field of Shadow-IT has focused on analyzing

[2] AISeL - Website `http://aisel.aisnet.org`
[3] EBSCOhost - Website `https://www.ebsco.com/`
[4] IEEE Xplore `https://ieeexplore.ieee.org`
[5] ScienceDirect - Website `https://www.sciencedirect.com/`

literature to "identify motivators, enablers, and missing barriers as causes for Shadow-IT" [KW16a] as well as to create a "taxonomy of Shadow-IT related concepts" [KW16b]. Less research has focused on the empirical consequences of Shadow-IT and what kind of measures organizations should implement to manage Shadow-IT.
A promising approach was taken in 2017 by Zimmermann, Rentrop and Felden who conducted several case-studies amongst three corporations to study the "nature of Shadow-IT in organizations" and to determine how "organizations [can] manage identified Shadow-IT instances" [ZRF17]. Another recent publication from Kopper presented "exploratory interviews with 16 executive/senior IT managers" [Ko17] and "revealed different perspectives on Shadow-IT and related organizational practices" in organizations [Ko17]. In 2018, Kopper, Fürstenau et al. furthermore carried out a study using four case examples to study the differences between Shadow-IT and Business-Managed IT and proclaimed that Business-Managed IT has a high potential to "balance the tension between speed/autonomy and cost-effectiveness/safety/risk" [Ko18].
This present research used the CSF approach to determine factors that contribute to the success of Business-Managed IT. The CSF method is frequently used within IS research because it allows the researcher to determine CSFs that "are useful in prioritizing potential information systems projects by identifying those information services that address critical organizational concerns" [BB94]. In particular, the study conducted by Chow & Cao (2008) which obtained "five factor categories, namely Organizational, People, Process, Technical, and Project" [CC08] proved to be a highly valuable resource and was used as a reference for deriving the CSF dimensions from the case study results presented in this paper.

3 Research Methodology

3.1 Case Study

This paper performs an exploratory case study analysis on the subject of distinct Business-Managed IT systems at a large industrial company. The research method of a case study is deliberately chosen due to the fact that conducting a case study analysis can be especially useful when the objective is to create an "extensive and 'in-depth' description" [Yi09] of a specific subject. If no established body of knowledge in the research area exists, case studies can furthermore be used for theory building with the purpose of creating "theoretical constructs, propositions and/or midrange theory from case-based, empirical evidence" [EG07].
At the beginning of the case study, the propositions to be examined were developed and the case to be studied was selected. As described in Section 4, the research context of this paper were Business-Managed IT systems at a large industrial company. In order to obtain a better understanding of Business-Managed IT systems at the company, five in-depth interviews with stakeholders who were involved with these systems were conducted. They were recorded using a recording device and transcribed by using the software f4transcript [6]

[6] f4transkript - Website https://www.audiotranskription.de/f4

to allow the researcher to "focus on the interview content and the verbal prompts" [Ja14]. Based on the transcripts of the interviews, explanation building, i.e. an approach that tries "to "explain" a phenomenon . . . [by stipulating] a presumed set of causal links about it, or how or why something happened" [Yi09] was used to derive CSFs for Business-Managed IT systems. With the purpose of analyzing the data, the transcripts were coded by using the software f4analyse [7]. As a result, a more detailed description of the analyzed Business-Managed IT systems was derived and appropriate themes were created. These themes are presented in Section 5.

3.2 Critical Success Factors

The CSF method used in this paper was presumably first introduced by Rockart in 1979 and has evolved to be one of the most prevalent themes for the identification of factors for success in both research and practice. According to the definition by Rockart (1979) "critical success factors . . . are, for any business, the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization" [RA79]. In the context of this paper, a Business-Managed IT system was considered to be successful if the system was able to provide value for the business while at the same time complying with quality criteria for software systems. The criteria that was used to assess the quality of the studied software was derived from the ISO/IEC 25010 norm for Systems and Software Quality Requirements and Evaluation (2011). According to this norm, software product quality is achieved if the software possesses the following characteristics: *Functional Suitability, Performance Efficiency, Compatability, Usability, Reliability, Security, Maintainability* as well as *Portability* [IS10].
During the case study, it was left to the interview partners to determine whether the Business-Managed IT system was able to provide value to the business and did satisfy the quality criteria presented above. In case the aforementioned requirements were met, the system in question was considered to be a success.

4 Case Company and Business-Managed IT Systems

This paper conducted a case-study analysis of five Business-Managed IT systems at the KRONES corporation. KRONES is an Industrial Goods company which specializes on "lines for the beverage industry and food producers: process technology, filling technology, packaging machines . . . to IT solutions"[KR18]. The company currently employs ~14,500 employees [KR16] worldwide and generated a sales revenue of 3.4 billion € in the financial year 2016. Even though 90% of KRONES's revenue was generated outside of Germany, the majority of the production facilities with a workforce of over 10,000 people are still located in Germany.

[7] f4analyse - Website `https://www.audiotranskription.de/f4-analyse`

Name	Business Area	Location	Number of Users	Number of Developers	Critical for Business	Years of Existence
System A	Sales	Germany	~500	N/K	no	1 yr.
System B	Service	Belgium	124	1	yes	8 yrs.
System C	Manufacturing	Germany	~650	3	yes	7 yrs.
System D	Corporate Development	Worldwide	~300	N/K	no	1 yr.
System E	Manufacturing	Germany	N/K	1	no	6 mths.

Tab. 1: Key characteristics of studied Business-Managed IT systems at KRONES

Between October and December 2017, the author of the paper at hand performed a case study of five Business-Managed IT systems at KRONES and conducted interviews with stakeholders related to these systems. The systems subject to the analysis presented were already known to the IT department at KRONES since they were operated more or less "overtly" by the BUs and therefore account for Business-Managed IT. For every Business-Managed IT system, at least one key stakeholder from the responsible BU was interviewed. During the interviews, key characteristics for the studied systems were obtained from the interview partners. This data is shown in Table 1. All of the interview partners stated that they were very satisfied with the results accomplished by the respective Business-Managed IT systems. Based on the success characteristics proposed in Section 3.2, Table 2 classifies each system on whether it was able to provide value for the business and if an adequate level of Software Product Quality was met. [IS10] As the table shows, all of the analyzed Business-Managed IT systems at KRONES fulfil the proposed quality requirements for a successful Business-Managed IT system and even though some of the studied Business-

✓: Present ×: Not present	System A	System B	System C	System D	System E
Value for Business	✓	✓	✓	✓	✓
Functional Suitability	✓	✓	✓	✓	✓
Performance Efficiency	✓	✓	✓	✓	✓
Compatibility	✓	×	×	✓	✓
Usability	✓	✓	✓	✓	✓
Reliability	✓	✓	✓	✓	✓
Security	✓	✓	×	✓	✓
Maintainability	✓	✓	✓	✓	✓
Portability	✓	×	×	✓	✓

Tab. 2: Evaluation of Success of Business-Managed IT systems

Managed IT systems were not able to achieve satisfactory results regarding all of the quality characteristics described in Section 3.2 (such as *Compatibility* or *Portability*), the overall software quality of said systems can be considered to be sufficient for their use case.

5 Critical Success Factors Analysis

5.1 Research Results

This section describes the overall research results that were obtained from the case study conducted at KRONES. As a result from the analysis of the case study, nine CSFs for Business-Managed IT systems were obtained. They fall into three dimensions (*Project Dimension, Organizational Dimension* and *System Dimension*) and are presented in Table 3. The following sections contain parts of the original quotes from the interview partners and have been marked as such.

Project Dimension (P)	**Organizational Dimension (O)**	**System Dimension (S)**
P.1 Agile Development Methodology	O.1 Dedicated Product Team	S.1 Data Integration
P.2 High Management Commitment	O.2 Transparency	S.2 Compliance with Security Policies
P.3 User Participation and Involvement		S.3 Well Documented System Architecture
		S.4 Elaborate Vendor Management

Tab. 3: CSFs Overview

5.2 Project Dimension

The Project Dimension describes CSFs that relate to factors influencing the project methodology and characteristics of project management used for conducting the implementation of the Business-Managed IT system. Three CSFs are part of this category: (P.1) Agile Development Methodology, (P.2) Management Commitment, and (P.3) User Participation and Involvement.

P.1 Agile Development Methodology:
Two out of five studied projects deliberately chose an agile development methodology in which "parts of the software that was implemented were split up into smaller increments" (Systems A and C). The major advantage of this approach was that it "enabled the BUs to frequently develop prototypes which could be used by the key users to provide feedback to the development team" (System A). In addition to this, the software characteristics of *Functional Suitability* and *Usability* were also able to benefit heavily from using an agile development methodology. Moreover, the stated perception during the interviews was that following an agile methodology improved the overall flexibility of the BU, in particular because it allowed the developers to achieve a "high implementation speed" (Systems A, C and E) of the desired software.
P.2 High Management Commitment:
Newly implemented Business-Managed IT systems usually require some form of corporate investment, for example regarding either personnel- and / or financial resources. All of the studied five systems from the case study presented in Section 4 therefore sought to obtain the commitment of upper-level management representatives in a rather early stage of the system's implementation.
By obtaining management commitment, the interview partners stated that they were more likely to succeed "with allocation of new resources (e.g. project funding)" (System E) and in "convincing their end-users to use the newly developed software" (System B). In addition to this, support for the system amongst co-workers also increased because there was "more awareness about the project within the respective BU" (System A).
P.3 User Participation and Involvement:
To achieve success in Business-Managed IT systems, it also became apparent during the interviews that participation and involvement of users and other affected stakeholders of the system has to be practiced from early on by the people responsible for creating the Business-Managed IT systems.
Several interview partners stated that they were frequently meeting with their future users from the BUs to collect feedback and give their users updates about the current progress of the implementation. They also stated that "the barrier for interactions between the developers and the Business-Managed IT users is usually lower than in comparison to formal IT systems operated by the IT department" (System C).

5.3 Organizational Dimension

The Organizational Dimension describes CSFs which relate to the organizational circumstances under which the project is carried out. Two CSFs are part of this category: (O.1) Dedicated Product Team and (O.2) Transparency.

O.1 Dedicated Product Team:
As a major observation from this case study analysis, it was observed that the teams for Business-Managed IT systems at KRONES are usually assembled by key personnel from

the BUs themselves. All team members had a very specific background knowledge of the business processes in the BUs and, according to the interview partners, were thus able to make "carefully considered decisions regarding the utility of newly requested features" (System C).
Since the aforementioned projects were highly successful, the creation of dedicated, cross-functional product teams can be seen as a major factor that contributes to the overall success of Business-Managed IT systems. The formal objective of these product teams should not be to "deliver some piece of software which is then considered to be completed" [LF14], but instead to "own a product over its full lifetime" [LF14] where the capabilities of the team should ideally include "the full range of skills required for the development: user-experience, database, and project management" [LF14].

O.2 Transparency:
A common theme that was perceived in all of the analyzed case study interviews was the desire to be transparent towards both end-users as well as upper-level management about the activities of the Business-Managed IT systems. The reasoning of the interview partners in this particular case was that they perceived transparency to be useful because it allowed them to "collaborate more efficiently with other members of the team" (System A) and "to better understand the outcome of their actions as well as their influence on the overall performance of the project" (System C).
In particular, all of the five studied Business-Managed IT systems at KRONES tried to maintain a high level of transparency. One of the studied projects even made use of its own project management tool called *Jira* [8] (System A), a web-based project management software. Since every project member "can see what tasks are currently being worked on" (System A), the interview partner considered this to be a highly beneficial factor in creating a shared understanding of the desired system features amongst team members.

5.4 System Dimension

The System Dimension describes CSFs which relate to the technical characteristics of systems implemented by the Business-Managed IT systems. It consists of four CSFs: (S.1) Data Integration, (S.2) Security and Compliance, (S.3) System Architecture and (S.4) Vendor.

S.1 Data Integration:
A common observation from the Business-Managed IT systems that were analyzed at KRONES was that all of the implemented systems were accessing data stored in KRONES's Enterprise Resource Planning (ERP) system SAP. Data integration was of major importance for the implemented systems, and the design and quality of the system architecture heavily depended on having access to a dedicated interface for accessing and extracting data from the SAP system. In one case, the interface used to access KRONES's SAP system was described to be "rather shady" (System C). Most probably, the interview partner wanted

[8] Jira - Website `https://www.atlassian.com/software/jira`

to allude to the fact that a variety of other systems were involved in accessing the data in SAP, transforming it and finally storing it in the Business-Managed IT system. Due to these characteristics, data integration is considered a CSF for Business-Managed IT systems.

S.2 Compliance with Security Policies:

One of the product quality characteristics used for evaluating the success of Business-Managed IT systems was the criterion of *Security*. In the context of this study at hand, it is considered to be an important factor to take security and compliance into consideration when a new IT system is implemented decentrally in the BUs.

A positive example of an adequate assessment of security and compliance risks in a Business-Managed IT entity was the implementation of System A in which the responsible department did corporate closely with the IT department and external suppliers to ensure that all security and compliance requirements were met. Other projects however, especially those which were implemented more covertly and without the assistance from the IT department or external suppliers, failed to properly consider security and compliance risks and therefore pose a significant risk for the business which could result in data leakage and data loss.

As a result of these observations, Security and Compliance is considered to be a CSF for Business-Managed IT systems. Achieving adequate performance in this area makes the Business-Managed IT system highly beneficial for an organization and contributes positively towards the perceived success of the project, especially within the IT department.

S.3 Well Documented System Architecture:

Another CSF that was identified during the case study is the architecture of the newly implemented Business-Managed IT system. A well-designed and suitable system architecture usually results in a "low failure rate of the system" (System C) and increases the users' confidence towards the Business-Managed IT system. To achieve success of Business-Managed IT systems, it is therefore necessary to put sufficient effort into planning and elaborating the design of the system and profoundly documenting its architecture.

S.4 Elaborate Vendor Management:

During the interviews, the importance of an elaborate vendor management between KRONES and its suppliers was identified to be a CSF for Business-Managed IT systems. As stated by one interview partner, the fact that the "implemented solution was not specific to them" (System B) gave them the assurance that the software vendor had advanced knowledge regarding the implementation of the product and that KRONES could therefore benefit from lessons learned from the implementation of that product in other organizations.

6 Conclusion

6.1 Summary and Discussion

The case study presented in this paper at hand has theoretical implications for the research done in the field of Business-Managed IT and its impact on the ongoing "reorientation of IT" [Ko17] in corporations. To the best of knowledge of the author of this paper, no empirical research of CSFs in Business-Managed IT systems has been carried out so far. This present

paper therefore is the first publication to analyze this subject in an empirical study. As a result of the research at hand, it was shown that there are nine CSFs in Business-Managed IT systems which fall into three dimensions, namely *Project Dimension, Organizational Dimension* and *System Dimension*. In addition to this, the insights obtained from this research can be used by both academia and practitioners to evaluate the "controlled use of Business-Managed IT" [KWS17] in organizations.
The CSFs presented in this research were obtained from an empirical study of Business-Managed IT activities and it is possible that substitutes for the CSFs exist. Regarding for example the CSF "P.2 - High Management Commitment", it is questionable whether support by the management really fosters the acceptance of the system by the employees or if the same level of support could also be obtained by using other methods to raise awareness.

6.2 Research Limitations

Several limitations apply to the research presented in this paper. First, the case study that was used to derive CSFs in Business-Managed IT systems was exclusively focused on only one corporation. KRONES is an Industrial Goods company from Germany which operates its business from its corporate headquarters in Neutraubling. Even though the case study that was conducted during this research also analyzed systems that were located in other subsidiaries of KRONES (e.g. in Belgium), it can not be denied that the company is operating with a certain influence from German culture and mentality. This could have influenced the perception of successful leadership in Business-Managed IT systems and might also have biased the interview partners to stress certain aspects of the Project Dimension and Organizational Dimension of the CSFs for Business-Managed IT systems more than others.
As part of the case study, only systems which were already known to the IT department at KRONES were studied. These systems, by their nature, are relatively *overt* in the organization and might therefore not allow to draw conclusions about the nature of *covert* Business-Managed IT systems which are operated without any knowledge from external departments.

6.3 Future Work

The main objective of this paper was to study CSFs in Business-Managed IT. For future research, more work is required with regard to the procedures of identifying Business-Managed IT applications in organizations. A variety of publications were presented that evaluate and assess the criticality of the identified Business-Managed IT applications, but unfortunately only relatively little information is available regarding the first initial identification of applications and systems operated covertly within the BUs.
One approach was proposed by Fürstenau and Rothe whom employed network analysis visualizations to develop "a method to identify Shadow-IT system's [sic] and assess their importance with respect to their architectural embeddedness" [FR14]. The authors

followed a manual procedure which required skilled professionals with "business analysis competencies [...] to align IT and business perspective" [FR14]. Future work in this area could investigate the feasibility of automatically identifying Business-Managed IT systems within the network. Such an approach could leverage existing network scanning tools such as *nmap*[9] in combination with network traffic analysis techniques to automatically discover new systems which are deployed covertly in the BUs.

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