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Towards a Taxonomy of Concepts Describing IT Outside the IT Department

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Towards a taxonomy of concepts describing IT outside the IT department

Full research paper

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Abstract

Due to technological advances, IT is increasingly introduced and managed outside of (or even hidden from) an organisation's IT department. As a result, researchers and practitioners have created multiple concepts describing different facets and trends of this development. While the individual concepts typically focus on different aspects, there are overlaps between these concepts. This effect hampers research progress as it creates redundancies and separate streams of knowledge development. We propose a taxonomy of the concepts Lightweight IT, IT Consumerisation, Bring Your Own Device, Shadow IT, and Business-Managed IT to solve this research problem based on a systematic literature review. For this purpose, we derive characterising dimensions of each concept from existing studies and analyse literature according to the usage of terms. As a result, we can describe and delineate the concepts. Thus, we contribute a taxonomy of IT outside the IT department to improve the transfer of research results between research streams.

Keywords: IT outside the IT, Taxonomy, Lightweight IT, Shadow IT, IT Consumerisation

1 Introduction

The deployment and use of software, hardware, and IT services outside the IT department have grown significantly in the last few years (Godefroid et al. 2021; Kopper and Westner 2016; Zimmermann and Rentrop 2014). For instance, 30- 50% of IT spending in large enterprises occurs without the involvement of the IT department (Everest Group 2017; Gartner 2017). However, this *IT outside the IT department* has multiple compliance, security, and data integrity risks on top of a loss of synergies through scale effects (Kopper et al. 2018). Despite these negative aspects, multiple positive aspects are discussed, too, e.g., an increase in an organisation's agility, a higher innovation potential (Bygstad 2015), or overcoming shortcomings of corporate IT systems (Kopper et al. 2018). Furthermore, IT outside the IT department leads to increasingly empowered users for IT-related decisions, i.e., users decide which approved or not approved IT systems they use (Mokosch et al. 2015). This empowerment challenges the sole responsibility of the IT department for IT (Junglas et al. 2019).

In recent years, multiple concepts have emerged describing IT outside the IT department: Lightweight IT (LW IT), IT Consumerisation, Bring Your Own Device (BYOD), Shadow IT, and Business-Managed IT (BMIT). However, these concepts have (to the best of our knowledge) never been systematically integrated or delineated from each other, leading to the call of Godefroid et al. (2021) for further research to integrate the concepts. A lack of integration leads to dispersed contributions and complexities in identifying and building on previous papers in this field (Šmite et al. 2014). To increase the understandability and transferability of knowledge (Nickerson et al. 2013; Šmite et al. 2014), an analysis of concepts' use is required. Hence, we investigate the following research question (RQ):

RQ: How can the concepts of LW IT, IT Consumerisation, BYOD, Shadow IT, and BMIT be delineated?

By answering the research question, we contribute by building a taxonomy of concepts describing IT outside the IT department. Such a taxonomy enables the transfer of knowledge between different research streams. We conducted a systematic literature review using bibliographic databases and citation indexing services (vom Brocke et al. 2015). The identified literature was then used to develop a taxonomy based on the methodology proposed by Nickerson et al. (2013). The remainder of this paper is structured as follows. First, we provide a short introduction to related research. Then we present the approach for the literature review and the taxonomy development followed by the results, which we discuss in the final section.

2 Conceptual Background

In this section, we introduce the five main concepts in the context of IT outside the IT department: LW IT, IT Consumerisation, BYOD, Shadow IT, and BMIT. The common characteristic of these five concepts is that they describe IT outside of the IT department. The selection of the respective concepts was based on expert discussions on descriptive aspects of IT outside the IT department. However, how these concepts are tied together is not clear from the literature.

When introducing the term *LW IT*, Bygstad (2015) argued that the concept is not a collection of new technologies (e.g., apps, robotic process automation) but is a new socio-technical knowledge regime where users and vendors do the development by using cheap and easy-to-use IT systems (e.g., tablets, mobile phones) (Bygstad 2015, 2017). LW IT fosters a development culture that relies on innovation and experimentation. Moreover, LW IT focuses on systems for process support and business intelligence (Bygstad 2015). In contrast to LW IT, heavyweight IT is a knowledge regime where development is done by IT professionals using systematic specification and proven digital technology (e.g., servers, databases) (Bygstad 2017). The development is realised using software engineering methods and a development culture focusing on systematics, quality, and security (Bygstad 2015). Examples of heavyweight IT systems are transaction systems like enterprise resource planning systems (Bygstad 2015).

The trend of *IT Consumerisation* is the diffusion of consumer hardware, software, and services in the workplace (Mokosch et al. 2015; Niehaves et al. 2013). IT Consumerisation originates from employees expecting to use consumer devices for business purposes (Yan et al. 2016) and from redefining an employee's role from an enterprise IT consumer to an IT decision-maker (Junglas et al. 2019). Köffer, Ortbach et al. (2014) define IT Consumerisation along with the dimensions of market origin, ownership, and organisational approval. However, they regard IT Consumerisation as the use of IT systems for work that were originally designed for the consumer market (Köffer, Ortbach, et al. 2014). Hence, for them, the dimensions of ownership or organisational approval are of minor importance for defining the concept. Building on this conceptualisation, *BYOD* is a specific form of IT Consumerisation. *BYOD*

covers employees bringing privately owned hardware into the organisation (Köffer, Junglas, et al. 2014; Ortbach 2015).

The use and development of IT systems (software, hardware, and services) by individuals or business units (BU) without the alignment or awareness of the IT department is referred to as *Shadow IT* (Fürstenau et al. 2016; Köffer, Junglas, et al. 2014). A taxonomy for Shadow IT and related concepts (e.g., workarounds, feral practices) was developed by Kopper and Westner (2016). They use the novelty, perspective, artefact, infrastructure, and scale as dimensions to delineate the concepts and classify Shadow IT as unofficial IT encompassing devices and applications. Moreover, Shadow IT is deployed on Shadow or official infrastructure by a group or individuals.

Research on Shadow IT has a terminological problem. If Shadow IT is detected (i.e., not in the Shadow anymore) and integrated into the organisational IT management, it no longer fits the definition of Shadow IT (Kopper et al. 2018). To solve this terminological problem, Kopper et al. (2018) introduced *BMIT*. Here BUs manage IT overtly, i.e., the creation, procurement, and operation of all software or hardware by the BUs are done in alignment with the IT department. Kopper et al. (2018) see that the IT task responsibility (e.g., development and maintenance of infrastructure or architecture planning) for BMIT resides either in the BUs or in a shared responsibility model with the IT department (Kopper et al. 2018).

3 Methodology

Taxonomies structure and organise the knowledge of a field and enable researchers to examine the relationships between concepts (Glass and Vessey 1995). However, Nickerson et al. (2013) criticise that most taxonomies are developed ad-hoc without an empirical or theoretical foundation. Nickerson et al. (2013) proposed a taxonomy development process to avoid this and achieve high verifiability and replicability. They base their process on the idea of classifying concepts based on comprehensive and delimiting characteristics to clearly and rigorously delineate them. This process consists of four steps: (1) determining a meta-characteristic, (2) deciding on ending conditions, (3) iteratively identifying characteristics, and grouping them into dimensions. Finally, process step 3 is repeated until (4) all objective and subjective ending conditions are met. We followed this approach in the creation of the taxonomy for IT outside the IT department.

To identify the concepts, we conducted a sequential literature review using bibliographic databases and citation indexing services (vom Brocke et al. 2015) to retrieve relevant publications in the domain of interest (Hanelt et al. 2015). As shown in Figure 1, we chose a keyword-based approach as it is the most established in IS research (vom Brocke et al. 2015). The keywords were selected based on the research question and refined multiple times in expert discussions. Since the goal was to identify established concepts, we only considered completed research publications from the Senior Scholars' Basket of Eight, and key IS conferences (ICIS, ECIS, PACIS, AMCIS, ACIS). We concentrated on these outlets, as they can be taken as a representative sample of IS research (Gogan et al. 2014; Sørensen and Landau 2015). Moreover, the papers had to be in English and needed to be published between January 2000 and May 2021. To ensure full coverage, we then conducted a backward search by checking the citations of identified literature and a forward search using Google Scholar (Webster and Watson 2002). Finally, we manually screened the identified 156 publications for relevance, which led to a final set of 67 publications.

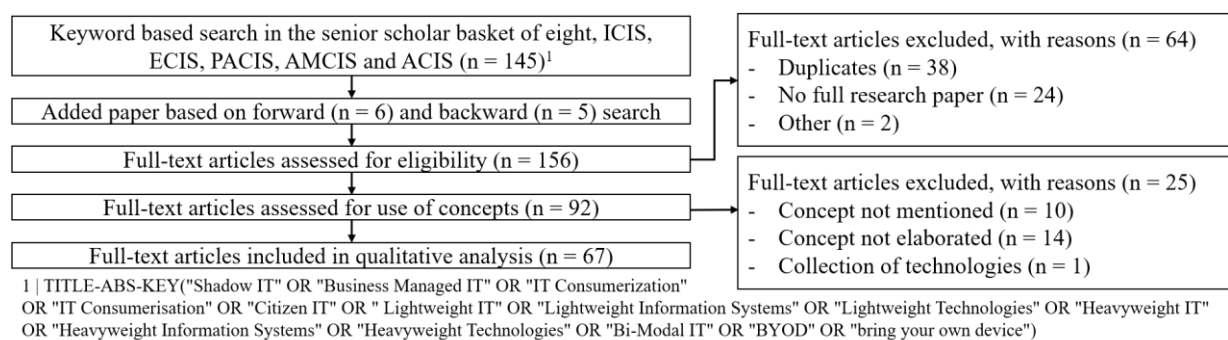


Figure 1: Literature Search Process and Results in Number of Publications

In the following, we have developed a (1) comprehensive meta-characteristic and then screened all identified publications. As stated by Nickerson et al. (2013), the meta-characteristic should reflect the users and purpose of the taxonomy. Intended users of our taxonomy are mainly researchers who are interested in the characteristics of the different concepts. Hence, the purpose of the taxonomy is to distinguish concepts describing IT outside the IT department. Therefore, we defined the meta-characteristic as characteristics to integrate or delineate concepts describing IT outside the IT department and the respective research streams. We decided to set (2) all objective (e.g., we added no new dimensions, each cell is unique and not repeated) and subjective (i.e., robust, comprehensive, extendible, explanatory, concise) ending conditions proposed by Nickerson et al. (2013). The selection of the meta-characteristics and ending conditions were done similar to Kopper and Westner (2016) in discussions with subject matter experts. From the final set of publications, we (3) extracted how the concept is used in each of the publications. We then iteratively went through these concepts, identified common characteristics in usage and grouped them into dimensions. We coded the identified literature based on these dimensions and characteristics and grouped them according to the corresponding concepts included. We analysed whether the authors explicitly stated the concept's characteristics, the characteristics can be implicitly concluded, or are not mentioned. If the allocation was unclear, we applied a consensus-building discussion within the group of researchers. During the process, we discarded irrelevant characteristics and added new relevant ones, resulting in multiple re-groupings. For aggregation, we applied a quantitative measure, following the majorities criterion, meaning that in the case of ambiguous findings, the most widely found description of the corresponding concept in the literature was chosen to guarantee maximum support for the taxonomy by previous research. If the number of supporting papers was equal for two characteristics, we decided for the characteristic *both*. This procedure is justified as this characteristic is the union of the dimension's other two characteristics. The process ended when (4) all ending conditions defined in step 2 were met.

4 Results

Using the taxonomy development method of Nickerson et al. (2013) described above, we suggest a taxonomy with six dimensions, as shown in Table 1.

Dimension	Characteristic	Description
Artifact	Hardware	The object of observation is hardware
	Software	The object of observation includes software and services
Scale of use	Individual	The object of observation is used by an individual
	Group	The object of observation is used by a larger group (e.g., teams, BUs or whole organisations)
Ownership	Personal	The object of observation is owned by the user
	Corporate	The object of observation is owned by the company
Trans- parency	Covert	Relevant stakeholders (e.g., in the IT department) are not aware of the object of observation
	Overt	Relevant stakeholders are aware of the object of observation
Market Origin	Professional	The technology was developed for professional purposes
	Non-Professional	The technology was developed for non-professional purposes
Respons- ibility	IT Department	The IT task responsibility is mainly within the IT department
	BU	The IT task responsibility is mainly within the BU

Table 1: Dimensions and Characteristics

In 7 papers, researchers explored more than one concept. In these cases, each concept was classified individually. An overview of the coding results of all papers can be found in the online-appendix¹. Table 2 provides an overview of how many papers mention the characteristics of the respective concepts. By

¹ Details on coding results can be found here: [10.6084/m9.figshare.16879414](https://doi.org/10.6084/m9.figshare.16879414)

analysing the results, we discovered that each concept has constituting characteristics (grey boxes). We define constituting characteristics as key characteristics for the definition of the concept.

The taxonomy (outlined in Figure 2) was then developed by analysing in how many papers the characteristic was attributed to the respective concept. In most cases, the classification was clear apart from IT Consumerisation (ownership, transparency), where the number is equal. Here, we decided on the classification *both* for logical and content-related reasons, which are outlined below.

Concept (% of occurrences)	Artifact			Scale of use			Ownership			Transparency			Market origin			Responsibility		
	Hardware	Software	Both	Individual	Group	Both	Personal	Corporate	Both	Covert	Overt	Both	Professional	Non-Professional	Both	IT Department	BU	Both
LW IT (7 %)			5			5			5		2	3			5		5	
IT Consumerisation (34 %)	3		21	1	10	14	11		11	1	10	10		24	1	12		6
BYOD (27 %)	19				17	2	20				16	3		20		8	1	1
Shadow IT (28 %)		4	17	1	7	13	2	8	9	21			1	3	11		10	11
BMIT (4 %)			3		1	2		2	1		3				3		3	

Table 2: Concept Matrix (constituting characteristics in grey)

LW IT

Constituting characteristics for LW IT are the clear business responsibility and the ownership that can be both personal, e.g., own tablets, and corporate, e.g., whiteboards. The papers that characterise the concept of LW IT as overt both analyse the same case of Østfold Hospital (Bygstad 2017; Bygstad and Øvreid 2020). The integration was mainly driven by the users and vendors, however, in interaction with the regional and local IT departments. In his multi-case study, Bygstad (2017) defines LW IT as “bypassing IT departments” (p. 180), but later also highlights the integration with heavyweight IT and the IT department, hence for our taxonomy, we conclude it can be both. Moreover, in this study, it is stated that LW IT uses “consumer technology” (Bygstad et al. 2017, p. 182). Still, later the professional hospital software “Imatis” (Bygstad et al. 2017, p. 182) is used for lightweight representational purposes. LW IT can be both hardware, e.g., sensors (Bygstad 2015), and software, e.g., robotic process automation (Penttinen et al. 2018). Thus, LW IT can have both a professional and non-professional market origin.

IT Consumerisation

IT Consumerisation comprises the use of consumer (non-professional) devices, applications, and services for business purposes (Ortbach et al. 2013; Yan et al. 2016) driven by changing expectations of employees who want to use their well-known private applications also for work purposes (Gregory et al. 2018). It differs from the other concepts in that it is seen as a trend, challenging traditional workplace concepts (Dernbecher et al. 2013; Köffer, Anlauf, et al. 2015) and also being the enabler for other concepts, e.g., LW IT (Bygstad 2015). For authors using the market perspective (e.g., Junglas et al. 2014; Ruch and Gregory 2014), the original design for the non-professional market is most important, and both private and corporate ownership are acceptable (Ortbach et al. 2013). Other authors following the individual perspective (e.g., Chen 2014; Niehaves et al. 2012) see private ownership as the constituting

element. However, for these occurrences, the term BYOD might be better suited. In the analysed literature, the transparency of IT Consumerisation was either seen as both (10), overt (10), or covert (1). The market perspective places the concept in a broader context and sees it as overt and covert (e.g., Junglas et al. 2014; Mueller et al. 2016; Ortbach et al. 2013). Papers using IT Consumerisation as overt focus on policies (e.g., Dernbecher et al. 2013) or the redefinition of the relationship between business and IT (e.g., Ahuja and Gallupe 2015). Hence, market origin can be seen as a constituting characteristic. Most authors see the scale of use either on a group level (10) or both (group and individual level) (14). Examples of IT Consumerisation on a group level are group policies and programs (e.g., Köffer, Fiel, et al. 2015).

BYOD

BYOD is commonly known as a sub-trend of IT Consumerisation, comprising concepts where privately owned hardware originally intended for the consumer market is used for business purposes (Ortbach 2015; Ostermann and Wiewiorra 2016; Weeger and Heiko 2014). Thus, market origin (non-professional), artefact (hardware), and ownership (personal) are the constituting characteristics. Companies usually encourage employees to bring their own devices through policies, allowing the overt use of these devices (Zain et al. 2017). Ortbach (2015) states that individuals' covert use of their own devices can also fall under the concept of BYOD. However, this contradicts Weeger and Heiko (2014), who argue that companies implement BYOD programs to prevent the rise of Shadow IT. Researchers have already extended the concept of BYOD to the umbrella term BYOX encompassing BYOD and Bring Your Own Service and related terms. BYOX includes, for example, private cloud storage services (Welck et al. 2018). Other researchers report that this concept is already out of date, and companies now aim to provide employees with devices that follow their exact preferences, e.g., through strategies like Choose Your Own Device (Yin et al. 2014). However, the term BYOD is the most commonly used in literature.

Shadow IT

Shadow IT describes all IT systems which are autonomously deployed and used by BUs and users without the involvement of the IT department (covert) (Fürstenau and Rothe 2014). Shadow IT can occur both on an individual level, e.g., employees use their devices (Chua et al. 2014), and on a group level, e.g., building a department-wide knowledge-sharing platform (Klotz et al. 2019). In the literature, there is a certain disagreement regarding ownership of Shadow IT. The concept was used eight times with corporate ownership (e.g., Fürstenau et al. 2016; Klotz et al. 2019), nine times with both ownerships (e.g., Györy et al. 2012; Klotz et al. 2019), and two times with personal ownership (e.g., Gozman and Willcocks 2015). Corporate ownership often appears in the form of spreadsheets (Zimmermann and Rentrop 2014), self-developed applications (Mallmann et al. 2018), cloud solutions (Khalil et al. 2017; Zimmermann et al. 2016), or BU self-procured IT hardware, e.g., servers, printers, network routers (Kopper and Westner 2016; Niehaves et al. 2012). Authors assuming individual ownership of Shadow IT mostly see it in the form of devices, which employees take to the company, e.g., personal mobile phones (Kopper and Westner 2016) or platforms for knowledge sharing, e.g., Dropbox (Gozman and Willcocks 2015).

BMIT

The concept of BMIT comprises IT systems that share characteristics of Shadow IT, but with the key difference that they are not covert (i.e., alignment with the IT department is given) (Klotz et al. 2020). In BMIT, a high degree of responsibility for IT components and tasks resides within BUs (e.g., architecture planning). However, the components are overt to the IT department (Kopper et al. 2018).

Relationship among concepts

To summarise the results shown above, we can state that each concept has constituting (shown with a triangle in Figure 2, e.g., covert for Shadow IT) and other characteristics. For the constituting characteristics, most papers explicitly mention the characteristic (e.g., private ownership for BYOD). In contrast, for the other characteristics, there was often no clear majority (e.g., at IT Consumerisation in the dimension transparency the characteristics both and overt).

Moreover, the developed taxonomy shows two hierarchies between concepts (1) IT Consumerisation subsuming BYOD and (2) LW IT subsuming BMIT. The first hierarchy is already discussed in the literature (e.g., Ortbach 2015). The second hierarchy emerges, as the concepts LW IT and BMIT have the same characteristics in all dimensions apart from ownership and transparency. However, for these dimensions, the characteristic *both* in the case of LW IT subsumes the BMIT characteristics *corporate*

and overt. Therefore, apart from the two hierarchies mentioned above, no global hierarchy can be determined that encompasses all concepts within the analysed dataset.

The dimensions in which the concepts differ the most are ownership and transparency, with all three characteristics occurring for at least one of the concepts. Interestingly, except for IT Consumerisation, all concepts have at least one constituting characteristic (triangle in figure 2) in these dimensions. However, quantitatively only 11 % of the analysed papers mention the concept of BMIT or LW IT, whereas 89 % mention the concepts Shadow IT, IT Consumerisation or BYOD.

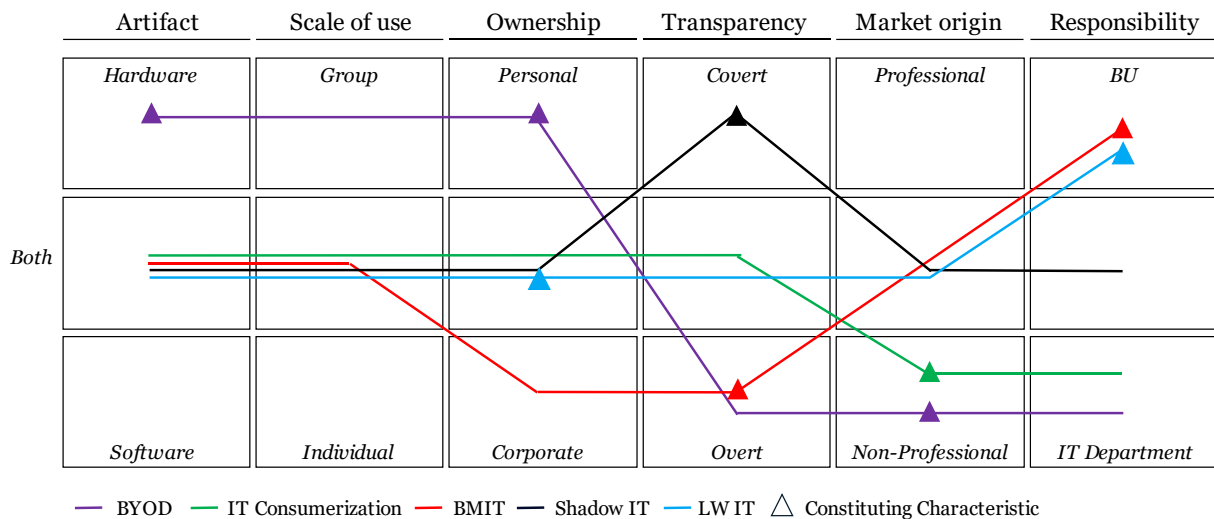


Figure 2: Taxonomy for concepts describing IT outside the IT department

5 Discussion, Outlook, and Limitations

Our paper creates transparency concerning the use of the concepts in the academic literature, leading to four theoretical contributions. First, we were able to structure the concepts and discuss their relationships. The structuring of the concepts may lead to consolidation and simplification of knowledge. However, we could not show that there is an overarching hierarchy for all concepts. Instead, we showed that the concept LW IT subsumes BMIT, which confirms the hypotheses of Godefroid et al. (2021), who see a large phenomenological overlap between LW IT and BMIT. Additionally, we confirmed the hierarchy between IT Consumerisation and BYOD, which is already discussed in the literature. Second, for each concept, a set of constituting characteristics required for the concept's definition were identified. Third, we can conclude that the concepts are not always used in the same way, e.g., seeing ownership for IT consumerisation as private and both. Hence, we call for a more accurate use of the concept in future research. Finally, all of these concepts look at IT outside the IT department from a different angle. However, our taxonomy showed that all concepts are required for a complete understanding of the phenomenon.

Practitioners can also be supported, as the taxonomy enables them to recognise related concepts and clearly distinguish between them. Moreover, since the relationship between the concepts was outlined, practitioners can now transfer knowledge between them (e.g., between LW IT and BMIT).

Three main limitations can be addressed by further research. First, for the literature review, we chose publications in the Senior Scholars' Basket of eight journals or key IS conference proceedings and thereby excluded all other journals and conferences. Second, since the initial literature search was based on keywords, new, not yet established concepts in papers that did not make use of these keywords could not be identified with this approach. However, we tried to minimise this limitation by using forward and backward searches (Webster and Watson 2002). Third, although we used a rigorous and proven method, the general validity of the results cannot be ensured. However, as Nickerson et al. (2013) point out, it is not the goal to find the "best" but rather a "useful" taxonomy for the objects under observation. Moreover, using this approach enables taxonomy updates, revisions, and extensions as research progresses.

Since BMIT and LW IT are the newest concepts, our outlook will focus on the research related to these concepts. Within the papers on LW IT, only one case study was outside the health sector. Hence, the

question arises which other sectors and organisations would particularly benefit from the use of LW IT (e.g., in the form of low-code / no-code platforms). Case studies outside the health sector could enable a more comprehensive understanding of LW IT's potential and could contribute to further generalise previous findings. Building on this, research into the identification of critical success factors, required skills, and capabilities can further improve and broaden the practical applicability of LW IT. Moreover, trajectories of IT systems that show how systems emerge as instances of one of the concepts and then - by changes in transparency, responsibility, or ownership - may become an instance of one of the other concepts, could be analysed. In this case, it is of particular interest when and why certain trajectories, e.g., from BMIT to LW IT, occur. Moreover, since the concepts of LW IT and BMIT have been coined recently, most publications view IT outside the IT department as negatively connotated Shadow IT. Since LW IT and BMIT lead to multiple benefits, enterprises might increasingly adopt these concepts. To do so, governance mechanisms need to be implemented. However, these governance mechanisms are still an area for further research. Moreover, a closely related area for future research could be how to effectively and efficiently manage the often dispersed IT outside the IT department.

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