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IT outside of the IT Department: Reviewing Lightweight IT in Times of Shadow IT and IT Consumerization

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Abstract. A plethora of theoretical perspective on the phenomenon of IT outside of the IT department exists. One recent perspective is lightweight IT as introduced by Bygstad [1]. It is interesting as it takes a positive view on this phenomenon and contrasts lightweight from heavyweight IT. To reflect on the current understanding of lightweight IT this paper presents a systematic literature review. Publications are assessed regarding their contribution to the conceptualization of the interplay of heavyweight and lightweight IT and the benefits and corresponding risks of lightweight IT in practice. Based on these insights, drivers, benefits, and risks of lightweight IT are derived. This allows a comparison with the parallel research streams of IT Consumerization and Shadow IT as the two other dominant perspectives on the phenomenon of IT outside of the IT department. The comparison shows significant overlap, but also conceptual differences. As a result, six questions for further research are derived.

Keywords: lightweight IT, literature review, IT Consumerization, Shadow IT

1 Introduction

One of the main concerns in the discussion on the implications of digitalization for the IT department is the future integration of digitalization efforts outside of the Information Technology (IT) department – especially in the context of technologies such as Robotic Process Automation (RPA) or Mobile Applications [2]. To date there are different perspectives regarding the phenomenon of IT outside of the IT department – the dominant ones being the rather favorable view of IT Consumerization [3] and the more cautious view of Shadow IT [4]. Both perspectives look at slightly different aspects of the phenomenon: IT Consumerization focuses on the use of privately owned IT resources for business purposes [3] and Shadow IT describes the covert autonomous use of IT by business entities and the appropriate reactions of the IT department [4]. The overall judgment remains divided, but even the literature on Shadow IT sees desirable qualities like innovation potential and a source of creativity in this

phenomenon [4, 5]. So the question remains if organizations should allow IT outside of the IT department and how to integrate it into their overall IT efforts [2].

One of the concepts that tries to solve this problem is lightweight IT introduced by Bygstad in 2015 [1]. The main idea of the concept is that new "lightweight" technologies require a different knowledge regime and should therefore be developed and run outside of the IT department [1]. In the past 5 years, several research contributions have added to this concept and tested its practicability. But so far, no literature review on the topic exists and the concept has not been placed into the context of other parallel research streams. This paper therefore aims to close this gap and derive a better overview of the different perspectives on the phenomenon of IT outside of the IT department in the literature. Starting from the new concept of lightweight IT we ask the following research questions:

- RQ1: Which contributions have been made and which practical insights have been gained regarding the lightweight IT concept since its original introduction by Bygstad in 2015 [1]?
- RQ2: What are overlaps and differences of the lightweight IT concept and the parallel research streams IT Consumerization and Shadow IT already established in information systems (IS) literature?

To answer these questions, we first detail the lightweight IT concept. The concepts of IT Consumerization [3, 6] and Shadow IT [4, 7] have already been exhaustively described in the literature, therefore they will only be presented briefly here. Next, we document our methodological approach to review the literature. Then we present the findings with regard to the initial questions. Finally, these results will be discussed together with a reflection on limitations and further research ideas.

2 Background

2.1 Lightweight IT

The concept of lightweight IT was developed based on two trends: The growing size and interconnectedness of IT systems and IT Consumerization. The effects of IT Consumerization – the use of privately owned resources (hardware or software) for business purposes – are understood to be a major driver in the redefinition of the relationship between the IT department and its consumers, the employees [3].

Bygstad's case studies on Norwegian e-health innovation successes led him to postulate the need for "a socio-technical knowledge regime driven by competent users' need for IT services, enabled by the consumerization of digital technologies." [1, p. 2] To put it simply, Bygstad introduces the notion that new technologies (tablets, electronic whiteboards, mobile phones, etc.), i.e., lightweight IT, require a new knowledge regime with a development culture that focuses on innovation and experimentation. So, the focus is on business owned resources being used for business purposes. Bygstad builds here on the knowledge regime idea from sociology and political science that includes the connections between all actors involved from IT

professionals to vendors, the work practices, and the collective conventions like the shared knowledge on development and use of technologies [1, 8, 9]. For this paper the shorter and more general definition of "the overall approach to how IT can be used in work practices, and the collective conventions on the appropriate use" [8, p. 185] later introduced in the same paper will be used.

Bygstad compares lightweight IT with heavyweight technologies which he defines as "[a] knowledge regime, driven by IT professionals, enabled by systematic specification and proven digital technology and realized through software engineering" [8, p. 182]. Examples include traditional ERP systems that are managed by the IT department. In contrast, lightweight IT is characterized as supporting frontend process work, being owned by the business side, and consisting of non-invasive solutions [8]. Due to these characteristics they require a loose coupling to heavyweight IT regarding technology, standards, and organization [1]. Examples for lightweight solutions are:

- Mobile apps used for information or simple acquisition processes in everyday life or as part of a work routine – e.g., a mobile application to support the treatment of patients with high blood pressure [10].
- RPA supporting work processes – e.g., a Norwegian bank using RPA for the entire accounts-opening process for young home buyers in their mobile bank [11].
- Whiteboards, tablets and sensors supporting welfare technology solutions, often from start-up firms - several cases report on the lightweight Imatis solution that introduces whiteboards and mobile phones into the work processes of hospitals [12].

2.2 Related concepts already established in IS

In the following we briefly present the neighboring concepts IT Consumerization, Shadow IT, and Business IT with a focus to drivers, benefits and risks:

IT Consumerization. According to Niehaves et al. [3], IT Consumerization refers to the use of privately-owned IT resources for business purposes. An example is the employee who checks his business e-mail on a private phone [3]. The most current literature review on the topic defines it more broadly as the use of consumer IT for work purposes [6]. This phenomenon is driven by consumers and their individual needs, e.g., employees that are used to a certain degree of efficiency and enjoyability of consumer IT now demand it in their business environment. This is enabled through the increasing number of knowledge workers and more tech-savvy staff. This comes in combination with a shift to a bottom up innovation approach in IT [3].

IT Consumerization has several benefits and risks. It has been shown to increase employee satisfaction. As employees are already well acquainted with the technology it has a very high speed of adoption. The example above indicates one of the reasons for increased employee availability and for the organization it is also beneficial, that the IT investment is done by the employee. Finally, this phenomenon has been shown to increase customer focus. At the same time IT Consumerization also carries specific risks. The use of private resources can lead to security issues, as these are not managed and monitored by the organization's IT department. Often it is also not clear how support should be organized and supporting every employee device can lead to a high

level of complexity. As the organization doesn't control the complete IT used in the process anymore this can also lead to a loss of process control.

Shadow IT and Business IT. The autonomous deployment, procurement, and management of IT by business representatives without alignment with the IT department is a common phenomenon. If it happens covertly it is defined as Shadow IT and if it is overt as Business IT [4]. The business managed IT concept emerged in the context of Shadow IT research, but it is probably phenomenologically closer to lightweight IT in many instances. Therefore, we carve out this phenomenon from our comparison as it requires an in-depth discussion. The use of Shadow IT is driven by several factors. There is a set of drivers that are inherent to the business function. There is the technical accessibility and IT user competence e.g., businesspeople being more knowledgeable on IT topics than before. Then there is the employee motivation, impact orientation and the peer behavior e.g., the motivation of business representatives to use IT to further their own goals. Motivational factors can also occur on the business level i.e., business environment uncertainty and BU power loss. Another set of drivers stems from the business-IT relationship. Non overt use of technologies can also be caused by IT organization and BU non-alignment. This can be amplified by IT system shortcomings, IT organization slowness, competence lack, or resource scarcity in IT organization. Finally, drivers can also be lack of restriction or awareness as well as a beneficial cost structure anticipation [4].

Shadow IT has several benefits and risks. In line with the business representative's motivation a key benefit is productivity gain and innovation increase. This can facilitate agility and flexibility of business operations for example by enhancing collaboration. Better business operations can improve user or customer satisfaction. The lack of collaboration with the IT department comes with severe security risks and can lead to a lack of data privacy. Shadow IT solutions are typically not integrated with the other systems of the organization and thereby can cause data inconsistencies. This might also lead to architecture insufficiency. The co-existence of several solutions can also lead to loss of synergies and can create inefficiencies. Finally it can lead to loss of control and cause a lack of continuity [4].

3 Method

The literature review was conducted following a sequential process [13] with the aim to create synthesis of existing knowledge [14]. We selected a keyword based approach to retrieve relevant publications on the topic as this has been identified as the most established approach in IS [13]. In a first step, publications were identified based on a keyword-based search in the key IS outlets and then by a forward search on the identified publications. Based on the lightweight IT concept postulated by Bygstad [1] we searched for "lightweight IT" OR "lightweight information systems" OR "lightweight technologies" OR "heavyweight IT" OR "heavyweight information systems" OR "heavyweight technologies". We searched in the senior scholar basket of eight as well as in proceedings of the key AIS conferences focusing on title and abstract of the publications: European Journal of Information Systems (EJIS), Information

Systems Journal (ISJ), Information Systems Research (ISR), Journal of Association of Information Systems (JAIS), Journal of Information Technology (JIT), Journal of Management Information Systems (JMIS), Journal of Strategic Information Systems (JSIS), Management Information Systems Quarterly (MISQ), International Conference on Information Systems (ICIS), European Conference on Information Systems (ECIS), Pacific Asia Conference on Information Systems (PACIS), and Americas Conference on Information Systems (AMCIS). The identified publications were then manually screened for relevance. Next, a Google Scholar based forward search was conducted for those pertaining to the topic. In the three last steps, the identified 164 publications were manually screened for relevance [15]. Please refer to figure 1 for the review process. This allowed us to identify 33 publications for a more detailed analysis. Following the suggested procedure for qualitative literature reviews, the different mentions of lightweight IT in these publications were coded by the authors based on their use of the concept [15]. This was done in two iterations to ensure consistent use of the categories.

Figure 1. Approach used to identify relevant publications to the lightweight IT concept.

The findings of the literature review and the subsequent comparison with IT Consumerization and Shadow IT are presented along the two research questions.¹

¹ Details on the 33 papers that were considered for this literature review can be found at https://www.dropbox.com/s/xisnntihxqzf7j2/WI2021_Table%20IT%20outside%20of%20the%20IT%20Department.pdf?dl=0. They are also marked with an (*) in the reference list.

4 Findings

In the following, we briefly present an overview of the results of our literature review in table format which we then discuss in more detail in the subsequent chapters. These were analyzed regarding (1) industry area, (2) featured technology, (3) governance model (4) drivers, (5) benefits, and (6) risks. Due to limited space we present the results of the industry area (1) and featured technology (2) in textual format and therefore limit our table overview to those publications identifying governance aspects as well as drivers, benefits, or risks. The full table can, however, be found online.¹

Table 1. Selection of results from the literature review on lightweight IT.

Publication	Governance model	Drivers	Benefits	Risks
Bygstad [1]	The governance of lightweight IT is unresolved	User needs, IT-Consumerization, vendor cooperation, need for a different knowledge regime	Low costs, Innovation, Time to market	Security, Lack of integration, Scalability
Bygstad [8]	-	User needs, IT-Consumerization, vendor cooperation, need for a different knowledge regime	User satisfaction, Low costs, Innovation, Time to market, Non-invasive, Organic growth	Scalability, Security
Bygstad and Bergquist [16]	-	Vendor cooperation	Innovation, Non-invasive	Security
Bygstad and Iden [17]	4 governance models (Central control, Bimodal IT, Laissez faire, and Platform model)	User needs IT-Consumerization	Easy to implement, Innovation	Security and data privacy issues
Bygstad and Øvrelid [12]	-	User needs IT-Consumerization	Innovation	Security, Lack of integration
Bygstad et al. [18]	-	User needs	Innovation, Time to market	Lack of integration
Hallberg et al. [10]	Centralized IT governance for lightweight IT	-	User focus	Lack of integration
Hertzum and Simonsen [19]	-	-	User satisfaction, Easy to implement	-
Hevner and Malgonde [20]	Governance model platform	-	Innovation	-
Kopper et al. [7]	Governance model platform	-	-	-
Mitrakis [21]	Governance model Bimodal IT	-	-	-
Osmundsen et al. [22]	2 governance strategies to mitigate lack of control mechanisms	User needs	Low costs, Easy to implement, Time to market, Non-invasive	Synergy loss

Publication	Governance model	Drivers	Benefits	Risks
Øvrelid [23]	-	User needs, IT-Consumerization, vendor cooperation	User focus, Innovation, Easy to implement, Time to market	Security, Lack of integration Scalability
Øvrelid and Bygstad [24]	-	User needs, IT-Consumerization	Low costs, Innovation	Security, Scalability
Øvrelid and Bygstad [25]	Decentralized IT governance for lightweight IT	-	Low costs, Innovation	-
Øvrelid and Halvorsen [26]	-	-	Increased employee satisfaction, Innovation	-
Øvrelid and Halvorsen [27]	-	-	Increased employee satisfaction, Innovation	Lack of integration
Øvrelid et al. [28]	Governance model Bimodal IT	-	Innovation	-
Øvrelid et al. [29]	Governance model Bimodal IT	-	-	-
Øvrelid et al. [30]	-	-	Innovation	-
Øvrelid et al. [31]	-	User needs IT-Consumerization	Innovation	-
Øvrelid and Kempton [32]	-	IT Consumerization	Innovation, Non-invasive	Lack of integration
Penttinen et al. [33]	-	IT Consumerization	Low costs, Innovation, Non-invasive	Security, Lack of integration
Stople et al. [11]	-	User needs	Low costs, Easy to implement, Innovation, Non-invasive	Lack of integration, Support complexity
Torkilshøy and Hertzum [34]	-	User needs	User focus, Easy to implement, Innovation	-
Urbach and Ahlemann [35]	Systematic separation of backend- and frontend development	-	-	-
Willcocks et al. [36]	Centralized IT governance for lightweight IT	User needs, vendor cooperation	Low costs, Easy to implement, Innovation	Security, Scalability

The five publications Aanestad et al. [37], Asatiani et al.[38], Bygstad and Hanseth [39], Halvorsen et al. [40], Klotz et al. [4], and Urbach and Ahlemann [41] are not mentioned here as they do not detail the governance model, drivers, benefits, risks of lightweight IT. Please refer to the full table online. ¹

4.1 General Application Areas and Industries

From the 33 publications reviewed in depth, two main contributions regarding the lightweight IT concept were identified: First, the interplay between lightweight and heavyweight IT was conceptualized further and, second, benefits and corresponding risks were explored through a number of case studies. These case studies focused mainly on the healthcare industry (22 out of 33) and a few others like financial services

(3), telco (3), government services (2), utilities (2), electronics, engineering, IT services and retail. Five publications did not include a case study or a specific industry. Also, the case studies looked at different types of lightweight applications: Mobile phones (15), whiteboards (14), tablets (6), RPA (5), touch screens (3), other applications (3) and only one publication looked explicitly at the use of sensors (IoT).

4.2 Governance Models

Different contributions have dealt with the question how heavyweight and lightweight IT can be technically and organizationally integrated ranging from four proposed governance concepts to the special requirements of RPA. Firstly, four governance models are being proposed as a kind of repertoire, that can be mixed and used as needed: the Central Control, the Bimodal IT, the Laissez-fair and the Platform Model [17]:

- **Central Control Model:** Often used by heavyweight IT vendors that add mobile apps to their solutions. The (heavyweight) IT department decides over and prioritizes lightweight IT initiatives. This ensures a focus on integration and security, but constrains innovation [17].
- **Bimodal IT Model:** Following Gartner's notion a separate IT department is installed for lightweight IT. Heavyweight standards are enforced as soon as solutions are set into production, which can lead to the heavyweight IT departments resources being the constraining factor for innovation. This idea was for example discussed by Urbach and Ahlemann [41], who recommend a systematic separation of backend- and frontend development, because the later tends to be lightweight and thus demands for a more agile and user centric development approach. But they consider this as a transitional solution. As no part of the organizations of the future is going to remain untouched from digitalization, they foresee a much closer integration of business and IT departments [41]. They assume that the organizational boundaries between business and IT might not remain as separate organizations: Application-related IT experts will work directly together with users in the specialist areas, which will lead to interdisciplinary teams [35]. This model is also favored in the context of modern IT Service Management (ITSM) to allow for digitalization [21]. The practical value of this approach was proven in the context of the Digital Renewal mega-program in the Norwegian healthcare sector where a special unit was able to start several lightweight projects and infuse innovation into the large-scale integration and standardization effort. Further research also highlighted the innovation discourse in such mega-programs [28, 29].
- **Laissez-fair Model:** Lightweight solutions are allowed to be developed as standalone solutions with the support of vendors or the heavyweight IT department. This optimally uses knowledge, abilities and monetary resources in the business for innovation, but can have drawbacks regarding security and scalability [17].
- **Platform Model:** The heavyweight solution becomes a platform for the lightweight solutions, which are typically integrated via application program interfaces (APIs). Several publications looked at the lightweight IT concept in this context ranging over

different topics: The modular implementation of lightweight IT to be used to compliment a core infrastructure, which is grown as an extension of the existing base and designed and developed over its whole life cycle, [7] the usefulness of the concept in context of a new innovative development approach for applications on digital platforms, [20] its part in a platformization process [39] and its potential regarding platforms that embrace end-user IT development to enable Shadow IT becoming overt business IT [7].

Secondly, special attention has been placed on RPA as a lightweight solution, especially when compared with heavyweight backend automation [33]. For example a closer coupling of RPA initiatives to the central IT department [36] or a more decentralized approach [38] are being proposed. An in-depth study of the latter revealed building enthusiasm for digitization and local ownership as advantages and lack of control mechanisms and end-to-end process view as disadvantages. Two mitigation strategies were proposed: Tightening the loose coupling after an initial innovation period and introducing a central body for control coordination and prioritization [22]. The notion of a tighter coupling also appears regarding mobile phone systems [10].

4.3 Drivers, Benefits, and Risks of lightweight IT

Drivers. The case studies detail several drivers for lightweight IT. User needs are mentioned as the main driver of lightweight IT across publications [1, 8, 11, 12, 17, 18, 22–24, 31, 34, 36]. Several publications also mention that this is enabled by IT Consumerization² e.g., the availability of consumer devices and applications for the use in work context as detailed above [1, 8, 12, 17, 23, 31–33]. Apparently, it is helpful if expert users cooperate with the vendors of these devices or applications [1, 8, 16, 23, 36]. Finally, Bygstad [1] explicitly mentions the need for a different knowledge regime for lightweight IT as a driver [1, 8].

Benefits and Corresponding Risks. The case studies also highlight several benefits and related risks of lightweight IT. These additional insights allow a better understanding of the concept:

- User focus, satisfaction improvement & lack of scalability – solutions focus on users' immediate needs (short-term usefulness of solutions) [23] and can even be deployed in a design-in-use approach, where the solution is initially incomplete by design and then developed further by the users [34]. It could even be shown that employee satisfaction with their work environment could be improved, for example when a new lightweight solution significantly reduced interruptions of work through telephone calls of other wards for nurses [18]. But this comes at a cost: Because solutions are so highly tailored to a particular environment and not built with scalability in mind, typically they do not scale well. Some solutions have to be reconfigured from scratch for additional users [8].
- Low costs, easy to implement & support complexity – Typically, lightweight solutions work with simple applications on cheap technology [1]. Moreover, their

² Explicitly mentioned by Bygstad [1], but has also differences later discussed in the comparison.

implementation is relatively cheap as they do not require specialized IT staff [19] and have limited training needs due to intuitive design and workflow focus [17]. But costs can arise later in the lifecycle, when changes in the underlying heavyweight infrastructure can lead to increased maintenance needs. For an RPA implementation team this was especially bitter as they were not always aware of changes in advance, which lead to unplanned downtime [11].

- Innovation increase, short time to market & lack of security – Several case studies looked at the application of lightweight IT solutions in the context of process innovation [12, 16, 18, 23, 26, 27, 30–32]. Three characteristics of lightweight IT were hereby identified to be especially helpful:
 - Usability and implementation speed, which allows for a fast introduction of the new systems – also based on the ability to bypass the existing infrastructure [23].
 - Availability of the solutions on the market and vendors’ ability to support pilots, and implementations in an agile way including experimenting, prototyping and testing which leads to short development cycles [26].
 - Modular structure and layered architecture that allows for a loose coupling to other system components [16].

But this approach has also drawbacks: nearly all studies found that security and data privacy issues arise, because they are not sufficiently covered in the initial iterations of solutions, as the focus is on fast and innovative solutions [17].

- Non-invasive, lack of integration, organic growth & synergy loss – solutions are often non-invasive as they only act as a presentation layer [8] like for example a BI solution that supports clinical processes across boundaries with data from different heavyweight systems [16]. But dependability on heavyweight IT and the necessary interfaces remain an issue [12]. Solutions can grow organically as users’ needs change [1]. Such often decentralized efforts can lead to redundancies and local optimization as there is no central perspective on long-term synergy effects [22].

4.4 Comparison to IT Consumerization and Shadow IT

To facilitate the discussion of the differences we created a Venn diagram. As lightweight IT is, however, still a recently discovered concept we ask our readers to treat this rather as an indication than an absolute comparison.

Figure 2. Visualization of the lightweight IT, IT Consumerization and Shadow IT comparison.

Bygstad and Iden refer explicitly to parallel research streams: “The responses from IT departments [to the arrival of smartphones and other technologies] have been mixed but have generally been negative. For instance, bring-your-own-device (*BYOD*) frequently creates unexpected problems, and parts of the IT industry have tried to stop the lightweight trend, naming it *shadow IT* [...]. We believe that this approach is futile, mainly because user-driven IT is now an important source of business innovation.” [17, p. 385]³ In the following IT Consumerization and Shadow IT as the two dominant other perspectives on IT outside of the IT department are compared to lightweight IT. Following Briel et al. [42] we now discuss each sector of the Venn diagram briefly:

(1) Lightweight IT. The drivers, benefits and risks explicitly mentioned for lightweight IT may not appear in the two other concepts due to different perspectives. IT Consumerization focuses rather on the effects of using existing consumer IT for work purposes [3]. In contrast lightweight IT focuses on building new solutions which leads to the focus on benefits like non-invasive, and organic growth [8]. Shadow IT focuses more on the relationship to the IT department [4] which might explain why expert user cooperation with external vendors is not a focus.

(2) IT Consumerization. For IT Consumerization the increased number of knowledge workers is mentioned as a driver. The literature on lightweight IT only mentions the (process) knowledge contributions and configuration efforts by the users [19]. This could be explained with the focus on (technical) vendor support instead of “more tech savvy” expert users, which depends largely on the lightweight solution in question. For example to implement RPA solutions inhouse employees need to acquire new (technical) skills [22]. The benefits speed of adoption, employee availability and employee investment cited for IT Consumerization [3] do not appear for lightweight IT as they are in part due to employees using private resources for business purposes, which is not the case for lightweight IT [8].

³ In this paper BYOD will be included in IT Consumerization to avoid conceptual overlaps.

(3) Shadow IT. The drivers IT organization and BU non-alignment, employee motivation /impact orientation & peer behavior, business environment uncertainty, BU power loss, restriction lack, and awareness lack mentioned for Shadow IT do not appear for lightweight IT. One reason could be the positive focus on solutions and their innovation potential [1]. The benefit collaboration enhancement was not explicitly mentioned, as the focus was rather on organizational level process improvement [26]. The risk lack of continuity appears only with the reverse interpretation that lightweight IT is only used as long as it is beneficial to users and that it grows organically [1].

(4) Lightweight IT, IT Consumerization and Shadow IT. Bygstad [1] even cites IT Consumerization as an enabler in his definition of lightweight IT and technical accessibility is also mentioned regarding Shadow IT [1, 4]. In combination with that individual needs of consumers/users are mentioned for all three concepts [1, 3, 4]. Therefore, it seems to be the same technical progress that drives all these phenomena. Typically this is mentioned in close proximity with enabling innovation that all three concepts also cite as a benefit [1, 3, 4]. Customer focus or customer satisfaction as both mentioned for IT Consumerization and Shadow IT was also shown to improve through internal process optimization. The same was found for making the lightweight solution directly available to customers. For example patients could self-check-in and avoid or at least manage queues with the Imatis solution in a Norwegian hospital [18]. The risks caused by security and privacy issues are also cited as one of the main concerns regarding lightweight IT. For example Medicloud's strategy for security and privacy was challenged by Microsoft and other heavyweight players [24].

(5) Lightweight IT and IT Consumerization. IT Consumerization looks at the use of private IT resources for business purposes [3]. In contrast, lightweight IT looks at the use of business resources for business purposes, the difference to the established IT research is the type of technologies used [1]. But here also lies the similarity as both concepts look at the use of new technologies like mobile services provided by 3rd party vendors for business. Some of the drivers, benefits, and risks described in the literature were also identified in the case studies on lightweight IT. Regarding drivers the new technologies (sensors, apps, tablets, etc.) lightweight IT focuses on also play a large role in consumer IT and IT Consumerization is mentioned as an explicit driver for lightweight IT [1]. The e-health mega-program case in Norway clearly showed the shift to a bottom up innovation approach in IT as a starting point for lightweight IT [28]. The benefit of increased employee satisfaction due to lightweight tool support was observed for example when nurses in a hospital reported an improved atmosphere as communication was done via the system instead of continuous phone calls [18]. The loose coupling of lightweight IT to the underlying infrastructure can lead to support complexity for example the maintenance of RPA robots at a Norwegian bank, that had to be changed in reaction to every change in the underlying systems, was perceived to require an ongoing and increasing effort [11].

(6) Lightweight IT and Shadow IT. The Shadow IT concept deals with IT run by business outside the IT-department [4]. Lightweight IT does the same, but focuses on specific solutions, that require a different knowledge regime and therefore should be developed outside the heavyweight IT department as Bygstad argues [1]. This differs significantly from Shadow IT, where the focus is on policy setup, awareness training

and IT systems gap resolution [4]. In most cases lightweight IT is overt, but there are also cases where solutions are implemented without the prior knowledge of the IT department for example when RPA was deployed without prior knowledge of the IT department [43]. For Shadow and business-managed IT several causing factors, benefits and risks have been identified, which show interesting overlaps to lightweight IT. Here the different framing is to be noted: Causing factors implies a negative connotation, which is not the case for lightweight IT and IT Consumerization [1, 3]. Technical accessibility is one of the key aspects of lightweight IT. Not only is it easily available, but also often its deployed directly by users or vendors, bypassing the (heavyweight) IT departments [1]. Issues with the existing heavyweight IT- be it system shortcomings, organizational slowness or lack of resources - do not appear as explicit drivers for lightweight IT. They are only mentioned as circumstantial, rather the need for a different knowledge regime due to different characteristics is stressed [8]. But there are examples like the lack of interoperability between systems in a Norwegian hospital [18], an EPR (Electronic Patient Record) system provider repeatedly telling his customer to wait for an upgrade to receive new features or functionalities [31], or the lack of resources for local innovation due to a centrally driven mega-program [44]. But the effects of the setup, skills and capabilities of the IT department on lightweight projects does not appear in research. Finally, the cheap underlying technology such as smartphones or tablets contribute to a beneficial cost structure anticipation [1]. Several benefits also overlap. Productivity gains and the short time to market are also cited as main benefits of lightweight IT solutions [17]. Lightweight IT has been found to foster especially process innovation and thereby lead to an innovation increase [26]. Depending on the established governance regime lightweight IT can lead to a significant agility enhancement and an increase of flexibility [18]. But with these benefits also come related risks like the integration into the existing heavyweight systems architecture and scalability. For example a hospital scheduler solution was not integrated with the EPR system as this was not build for integration and there were data privacy concerns [37]. Depending on the governance concept the lightweight IT approach can also lead to synergy loss and inefficiencies. For example a decentral introduction of RPA lead to optimization of sub-processes without a focus on overall value [22].

(7) IT Consumerization and Shadow IT. As the overlap in figure 1 shows, interestingly both IT Consumerization and Shadow IT mention more tech savvy staff/ IT user competence, which does not appear as a driver in the lightweight IT literature (yet). Also, the loss of (process) control, which is cited as a risk by IT Consumerization as well as Shadow IT is not mentioned by lightweight IT literature. The reason might be that the lightweight IT concept does not take the perspective of the existing (heavyweight) IT department and its control aspirations [1]. But both assumptions would have to be tested further.

5 Discussion, Outlook and Limitations

This paper contributes to the current IS research along its two research questions: Firstly, the research contributions regarding interplay of heavyweight and lightweight IT and benefits and corresponding risks of lightweight IT in practice were detailed. This allows an overview of the insights gained in the different research streams regarding the different aspects of the lightweight IT concept. On this basis drivers, benefits and risks of lightweight IT could be identified. This leads us to propose that the main benefit of the lightweight IT concept is to enable organizations to fully use the innovation potential outside their IT departments and gives them a toolset to integrate these new solutions with their existing heavyweight IT.

Secondly, these drivers, benefits, and risks of lightweight IT were compared to those drivers, benefits, and risks of the parallel research streams IT Consumerization and Shadow IT. This comparison showed significant overlap, but also conceptual differences. As a result of these discussions we identified six questions for further research which we present along the structure of the chapters in the findings:

Sector and Technologies

1. For which sectors or types of organizations outside of the healthcare sector is the innovation potential of lightweight IT also interesting? – The literature focuses lightweight IT in healthcare, it would be interesting to also look at other industries.
2. What can be learned from further case studies regarding the value of the lightweight IT concept for other lightweight technologies like RPA or IoT? – The literature review showed that the case studies that developed the concept further focused on whiteboards and mobile technology. It would be helpful to widen the technology focus to test the concepts applicability.

IT Governance

3. What effect have the setups, skills and capabilities of the existing heavyweight IT department on the use of lightweight IT? – It could be helpful to understand for what kind of organization and IT department the lightweight IT concept is helpful. Here, it would be also interesting to assess what effects organizational governance, e.g., business process management governance, has on the use of lightweight IT.
4. How can the lightweight IT concept be developed to serve as a stepping stone into the direction of the convergence of IT and business as envisioned by Urbach and Ahlemann [41]? – The lightweight IT concept calls for a loose coupling of knowledge regimes, this does not yet harness the full potential of IT specialists working directly with business experts in interdisciplinary teams as envisioned.

Comparison to Other Concepts

5. What relevance do practitioners see in the IT Consumerization, Shadow IT and Lightweight IT concepts and what implications do they derive from them? – The comparison with the IT Consumerization and Shadow IT research streams showed theoretical overlaps, but their implications in practice have not been addressed yet.

6. How does the concept of business-managed IT fit into the picture of lightweight IT, IT Consumerization and Shadow IT? - In the context of Shadow IT the notion of business-managed IT (overt use of IT by business entities) has emerged, but was not explored separately here, because the underlying perspective is similar enough to compromise them both in the same framework of drivers, benefits and risks [4]. Nonetheless further research would allow to consolidate insights on governance.

These findings come with several limitations: They are still on the conceptual level and need to be tested regarding their practical value, e.g. through discussions with IT-department representatives for example in an interview or focus group format. Also, certain aspects of the lightweight IT concept like its popularity in healthcare, or its implications for innovation and/or current IT governance concepts were not explored further as this would have exceeded the scope. Nonetheless a more in-depth exploration of these aspects could enhance the understanding of the reception of the concept itself in addition to the identified research questions.

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