A Frugal Support Structure for New Software Implementations in SMEs

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Abstract. During software implementations, budgetary and human resource constraints often make it difficult for small and medium sized enterprises (SMEs) to provide and maintain the required support. To overcome these constraints, this study describes a frugal support structure (FSS) to orchestrate available resources and to involve users as suppliers and co-creators of contextualized information. The FSS is conceptualized as a system that enables interaction and collaboration between the actors involved by using extant communication infrastructure wherever possible, systematizing and centralizing knowledge created and ensuring overall resource and time efficiency. Adopting a design science research process, development of the FSS combines a literature review and practical insights. Evaluating the challenges and benefits of FSS, the findings indicate that user involvement is necessary not only for contextualized and accessible support but to make support structures more frugal and sustainable in the long term.

Keywords: Software implementations, frugal, design science, user involvement, SMEs

1 Introduction

Software implementations have always interested IS scholars because of their high-risk and high-reward characteristics [1]. When introducing new software solutions, organizations commonly invest significant resources in change management practices and support structures to facilitate employees' gradual transition to the new business processes [2]. Unlike larger incumbents, resource-constrained small and medium-sized enterprises (SMEs) may find it challenging to support such transitions [6], as evidenced by the low success rates and sluggish adoption of new software in SMEs [1-2], [6].

Previous research on software implementations shows that post-project measures such as training, online support and IT help desks account for almost 90% of the total cost of implementation [6], [10]. Limited financial capacity, low human capital and fragmented governance structures [15] make it more difficult for SMEs to offer and sustain these employee supports over time. However, as the literature confirms, the importance of these support structures for successful software implementation [1], [6],

SMEs must balance the costs against the benefits of the new software, making it important to explore more resource-efficient and sustainable alternative supports.

Although user involvement is widely acknowledged as a critical factor for successful software implementation [17], it is rarely a feature of existing support structures [6], [19-20]. The limited attempts to facilitate user involvement have emphasized social structures such as advice networks and peer-to-peer collaboration [6], [19-20], which are said to provide contextualized information and better accessibility than traditional support structures (TSS). As this is a relatively new area of IS research, there are no clear design principles and little consensus in relation to the benefits of these social support structures in different organizational contexts [6]. The present study describes the design of one such structure to enhance user involvement, with particular reference to new software implementation in SMEs.

SMEs commonly face financial and human resource constraints, and a frugal approach is necessary to ensure the efficient utilization of available resources. The frugal approach involves developing cost-effective and accessible solutions by making creative use of resources at hand [21]. We argue here that involving users as consumers, suppliers and co-creators of information will be more cost- and time-efficient. To that end, the present study describes the design of frugal social support structures for SMEs to facilitate creative orchestration of available resources for higher benefits. In designing a frugal support structure (FSS) for SMEs and evaluating its benefits as compared to TSS, we addressed the following research question:

How can frugal support structures orchestrate available resources and influence user adoption within SMEs to overcome specific organizational constraints during IS implementation?

To design and assess the proposed FSS, we adopted the conceptual lens of service-dominant (S-D) logic, which specifies principles for the creative orchestration of interactional resources, including tangible (technological) and intangible resources (knowledge, skills and competencies) by structuring, bundling or leveraging these for competitive advantage [40]. Adopting a design science research (DSR) approach, the subsequent empirical study conceptualized the proposed FSS in terms of S-D logic, followed by ongoing evaluation of the effects on user adoption as compared to TSS. The study was conducted in collaboration with a German SME from the IT sector currently undertaking multiple new software implementations. Drawing on links between the principles of S-D logic and the frugal approach, we focused on user involvement and co-creation. As well as contextualizing S-D logic in a resource-constrained setting, the study describes design guidelines for FSS development and provides evidence of the tangible benefits of a frugal approach to software implementation.

The remainder of this article is structured as follows. After introducing the theoretical foundations of S-D logic, we go on to discuss the frugal approach. We then describe our methodology, which is based on design science research (DSR), along with insights gathered and iterative development and demonstration of the FSS. Following an explanation of the evaluation phase, the article ends with contributions and conclusions.

2 Background

2.1 S-D logic

In contrast to goods-dominant (G-D) logic, which is grounded in a "push" philosophy, S-D logic is based on a user-centric "pull" philosophy and focuses on value co-creation [23], emphasizing process and the exchange of services [24]. On this view, value is co-created by combining the unique resources (e.g., knowledge, skills) of the actors involved (e.g., employees, partners, suppliers, firms, customers) [25], and traditional goods become a mere vehicle for the exchange of value [26].

S-D logic combines tangible and intangible resources that are internal or external to the actors, referred to as *interactional* resources [23]. Technology and knowledge are important types of interactional resource; while technology provides necessary infrastructure, knowledge and specialized skills serve as the fundamental unit of exchange [26]. Actors orchestrate these interactional resources to help each other [26]. S-D logic has four meta-theoretical foundations: actor-to-actor networks, resource liquefaction, resource density and resource integration [24]. Altogether, they provide a strong conceptual basis to address the increasing challenges of systems design and implementation in the digital economy [27]. An actor-to-actor network includes all the relevant actors serving variously as producers, suppliers or users as potential co-creators of value. Resource liquefaction is the decoupling of information from users or technologies and enabling information sharing. Resource density specifies the mobilization of resources in terms of space, time and actors; density is optimized when contextually relevant information is shared in the most effective and efficient way. Resource integration is based on the fundamental idea that resources are less useful in isolation and must be combined with other resources to yield higher value [24].

2.2 The Frugal Approach

Derived from the Latin word *frugalis*, the concept of *frugal* has local equivalents around the globe, such as DIY in the US, Jugaad in India, Zizhu in China, Jua Kali in Africa and système d in France [29]. Scholars have defined frugal innovation as a bottom-up approach to innovation that creates accessible and affordable solutions for resource-constrained customers [30]. Beyond mere de-featuring or remodeling of existing solutions, frugal is a problem-solving approach to innovation whose underlying principle is to "do more with less" [34] – that is, to develop solutions with a higher performance-to-cost ratio [36]. Based on a clean-slate approach, frugal innovation involves re-designing the whole development process to eliminate unnecessary costs, yielding resourceful and easy-to-use solutions [30], [34], [36]. These simple, low-cost, high-benefit, local-focused, scalable, mass-market solutions are designed for the harsh conditions that prevail in emerging markets, responding to the unique needs of customers living in resource-constrained areas. As well as identifying core values and avoiding needless costs, the frugal approach is driven by the concept of *inclusivity* – involving users as suppliers – which is widely discussed in the literature as a means of overcoming particular local constraints [31]. In the context of information systems,

frugality is defined as a "*system which is developed and deployed with minimum resources to meet the pre-eminent goal of the client*" [42]. Watson et al. [42] highlighted ubiquity, uniqueness, unison and universality as the four drivers of frugal information systems.

A parallel is often drawn between "bricolage" theory [33] and frugal innovation because of the shared focus on the efficient utilization of resources [40]. While the theoretical foundations of frugal innovation remain contested, the approach is gaining momentum in both developing and developed regions. In developing countries, cost-effective and accessible innovations are needed to overcome extreme conditions and existing resource constraints [36]. In developed countries, companies are turning to frugal innovation in response to changing environmental conditions that include resource scarcities and changing demographics. In light of the close link between the frugal approach, bricolage and inclusivity, we argue here that S-D logic – and especially the fundamental principles of resource density and integration – are highly relevant in resource-constrained contexts. On that basis, the proposed FSS employs S-D logic to design supports for new software implementations in resource-constrained SMEs.

3 Design Science Research

In designing the proposed FSS, we followed the approach of Peffers et al. (2006), who described a design science research process (DSRP) model for iterative building and evaluation of the given artefact [35]. To begin, DSRP specifies the problem by combining insights from a literature review and practical experiences. Having identified the problem, the requirements and objectives of the proposed artefact are then specified. By means of an iterative process, the design is further developed, demonstrated and evaluated in the given context. Finally, the built artefact is communicated to the wider world.

In the present case, this approach was adopted to design and implement an FSS for a German SME (around 250 employees) in the IT sector, which was undertaking several new software implementations to achieve a common cloud-based IT infrastructure. The systems to be implemented included a new intranet, a novel travel management tool, MS Office 365 and a mobile device management system. While some of these were sourced from external vendors, some were developed in-house and required different support structures. Given the challenges of supporting the new IT strategy with limited resources, the company was looking for an integrated and efficient support structure, so providing an appropriate context for our research.

3.1 Problem Identification and Motivation

Literature Review

In a literature review of support structures for software implementations, peer-reviewed journal articles published after the year 2000 were searched across three databases (AIS, EBSCOhost and Science Direct) using the following search stream: ("software introduction" OR "software launch" OR "project launch" OR "project implementation"

OR "Enterprise Resource Planning System*" OR “Enterprise System*" OR “ERP” OR "change management") AND ("user adaptation" OR "effective use" OR “post-implementation” OR “pre-implementation” OR “support” OR “job stress” OR “impact on employees” OR “satisfaction" OR “knowledge management” OR “shakedown phase” OR “learning” OR “acquisition” OR “sense-making” OR "community platform" OR “communities” OR "software agent" OR “collaboration”). Appendix 1 summarizes the 33 articles selected to capture the benefits and challenges of existing support structures as a concept matrix [36]. Largely influenced by ERP implementations, the extant IS literature discusses five primary types of support structure (see Appendix 1), and the benefits and challenges of each are discussed next.

Training. In different forms (e.g., one-on-one, group, online), training is the most widely adopted support structure for new software implementation. Hands-on experience [37-38] and didactic knowledge transfer during training have been shown to impact significantly on user adoption [28]. While recent research links the convenience of online training to higher user acceptance [38-39], it also highlights some associated challenges [6], which include lack of contextual information, high cost and being time bound.

Online Support. Offering real-time support for users, this includes access to manuals, help files and, in some cases, online chat with technical advisors. Users can retrieve information regardless of location or time. However, like any knowledge management database, this type of support must be updated regularly. As well as being human resource-intensive, it lacks the contextual information that users need [6].

Peer-to-peer/Advice Network. This approach involves direct interaction among users with the goal of seeking or giving advice [6]. These networks commonly involve informal exchanges between actors [22], often fellow employees; benefits include ease of access, prompt responses and context-specific knowledge, which means that the information received is often more understandable and more readily applied [6].

Top Management Support. Usually seen as a more intangible support, this relates to resource provision and making the new software visible within the organization [11, 13-14, 16, 18]. Open communication and alignment of software implementation with company objectives have been shown to impact positively on user adoption [11]. However, because of its intangible nature, this kind of support is difficult to realize and is often overlooked [1], [7-9]

IT Helpdesk. Like online support, an IT helpdesk aims to provide generic support to users by facilitating access to manuals or other reference material as an intermediary between software provider and user [22]. Offering mainly technical assistance, this approach fails to provide contextual information; it is also time-consuming, as users must raise an IT ticket each time and then wait for assistance.

Aside from a consistent lack of user involvement, the literature review reveals distinct challenges for TSS in terms of timeliness, resource intensiveness and contextualization of information. While some recent research has sought to demonstrate the benefits of user involvement in the form of advice networks, further exploration is needed. The review also shows that support for new software is currently offered primarily during the pre-implementation phase. In contrast to the strong emphasis on training and top management support, there has been little exploration of other forms

of support to promote user involvement, such as peer-to-peer or advice networks. Although it has been identified as a critical factor for successful implementation, the issue of user involvement has been largely ignored. The review also reveals a lack of comparative studies of these support structures in terms of their individual cost and time effectiveness and their impact on user adoption.

Expert interviews

To integrate insights from the literature with practical understanding and for increased relevance [5], expert interviews and discussions were conducted around software implementations at the selected German SME [45]. The company, which was involved in multiple IT rollouts, was selected through convenience sampling [46]. SMEs are of great relevance to the present study for a number of reasons. First, SMEs are of great importance to Germany's economy, accounting for 35.3% of the total revenue of German firms and employing 58.3% of workers who pay social insurance contributions [43]. Additionally, SMEs often lack the financial and human resources of large firms and have different governance structures [16, 44]. To assess the SME's requirements, the authors conducted three detailed interviews and held discussions with key actors, including IT support and project management teams. We also participated in kick-off workshops and introductory sessions for the new software systems. In addition to monthly discussion meetings with the project manager, three further interviews were conducted with other relevant actors. All the interviews were recorded, transcribed and coded with QDA software. The research partner also granted us access to their internal portals to observe user adoption.

The SME started its transformation journey by rolling out off-the-shelf ERP software. Purchased from an external vendor, this software streamlines and integrates business processes across departments such as finance, marketing and sales. As an off-the-shelf product, there is little or no possibility of customization, and the provider offers only standard tutorials and limited training. Thirty lead users (department heads) were selected by the company for initial training, and they were then expected to support further roll-out in their respective departments. Within the company, one project manager was responsible for the entire roll-out and was the single point of contact for end users. Communication between lead users and the project manager mainly involved email exchanges and personal meetings. In the absence of a common communication platform or forum, the project manager often spent a lot of time answering repetitive questions from both lead and end users. The project manager was supported by an IT service desk managed by one full-time employee. For every support requirement, users had to raise a ticket and wait for manual confirmation of the estimated time. As well as being time-consuming, this process was inefficient in terms of utilization of available resources.

In parallel to ERP implementation and the Office 365 initiative, the company also introduced new software for travel and mobile device management. Supported by the same project team, the company continued to struggle to offer adequate support to end users. Interviews with the project team and management highlighted budgetary and human resource constraints and the lack of centralized knowledge management initiatives. While acknowledging the need for user involvement and bi-directional

communication, the interviewees expressed resistance to doing so because of the anticipated effort and cost, highlighting the need for a frugal solution that makes best use of extant communication infrastructure wherever possible.

Requirements of a Frugal Support System

Based on the literature review and the practical insights gleaned from the case study, we identified eight main requirements for FSS development on the basis of existing infrastructure. They can be broadly categorized as either conceptual or operational. The conceptual requirements are based on information gathered from the literature on frugal innovation and S-D logic while the operational requirements derive from the research setting.

Conceptual requirements:

1. To facilitate user involvement, a frugal support structure needs to identify the relevant actors.
   Research on frugal innovation emphasizes co-creation with end users and bottom-up development of solutions [32]. This aligns with the S-D logic perspective, which focuses on value co-creation involving all of the actors involved [25]. For that reason, it is important to identify all relevant actors, including end users, lead users and project and IT teams.
2. To increase the interaction between actors, a frugal support structure must establish an actor-to-actor network.
   According to S-D logic, actor-to-actor networks blur traditional provider-seeker relationships and enable co-creation [24]. It is crucial to activate or develop a network that enables the identified actors to exchange their knowledge in order to co-create value for themselves and others. This feature of peer-to-peer sharing is expected to enable the required flexibility and will provide contextual information to FSS.
3. To be cost-effective, a frugal support structure must be based on a universal and modular architecture that facilitates efficient utilization of interactional resources.
   Frugal innovation is about developing cost-effective solutions [36] and a universal platform to overcome the friction of technology incompatibilities [42]. In software contexts, a modular architecture enables the dynamic combination, replacement or replication of available resources.
4. A frugal support structure needs to mobilize and orchestrate resources to increase efficient utilization.
   According to both frugality and S-D logic, it is important to be resourceful as well as liquefying or mobilizing resources. Apart from acquiring and bundling of resources, the literature indicates that orchestration also involves leveraging resources through strategies such as mobilizing or modularizing [4]. This avoids additional costs for setting up isolated applications and ensures the best combination of mobilized resources for a given situation.

Operational requirements:

5. A frugal support structure should combine or provide a common interface for all new software introductions.
   Our interactions with the research partners confirmed that support for different software implementations should be integrated and centralized, as a common interface and consistent navigation makes access smooth and easy to understand. One-time authentication should be implemented to prevent additional hurdles.
6. For value co-creation, a frugal support structure should provide tools for collaboration, as well as distinct but connected communication channels.
7. For knowledge management, users need to be able to easily share and store the information generated.
   Collaboration tools and communication channels must be provided to facilitate both value co-creation and knowledge management. Facilities for sharing and saving user-generated information will co-create a common knowledge base that can be (re)used in certain scenarios.
8. To be time-efficient, a frugal support structure needs to be accessible anytime and anywhere.
   The structure needs to be lightweight and accessible regardless of time and location. It should be able to take account of the urgency level and offer the required support within a specified time.

3.2 Objectives of the proposed solution

Based on the literature review, frequently experienced challenges for TSS include a lack of contextual information, high costs, and time and resource inefficiencies (e.g., in relation to training, online support, IT helpdesk). Advice and peer networks, though better, are not necessarily seen as formal support structures. Based on the frugal and S-D logic approaches, the following objectives were formulated for the proposed FSS to overcome the limitations of TSS and to encourage user involvement. The objectives summarized in Table 1 reflect requirements identified from the literature and from practical insights.

1. Enable interaction between multiple actors through collaborative tools/communication channels
   The solution should enable the establishment of a network that includes all relevant actors and facilitates interaction between them – for instance, by means of a platform that supports both synchronous and asynchronous communication.
2. Provide a centralized and structured self-sustaining system
   The solution should provide a structure that helps actors to find what they are searching for, based on the establishment of communities and/or groups focusing on similar topics. These communities/groups should be managed by the actors themselves.

Table 1. Objectives of the intended frugal support structure

	Objective 1	**Objective 2**	**Objective 3**	**Objective 4**
Description	Enable interaction between multiple actors through collaborative tools/ communication channels	Provide a centralized and structured self-sustaining system	Ensure efficient knowledge management	Ensure resource and time efficiency
Underlying characteristics	R1: Facilitate user-involvement R2: Increase interaction between actors R6: Provide tools for collaboration	R5: Single /common Interface R8: Easy access	R7: Tools for knowledge management	R3: Cost-effective & resource efficient R4: Mobilization of resources

3. Ensure efficient knowledge management
   To facilitate the integration of actors' resources, the solution should support knowledge sharing and should be accessible 24/7. The solution should be overarching – that is, it should provide support across an extensive range of use cases within a single structure.
4. Ensure resource and time efficiency
   In line with the concept of frugality, the solution should be based on existing software and should support modular extension for resource efficiency. Additionally, the system should motivate users to provide solutions within a certain time limit.

3.3 Design and Development

The FSS was developed in four recursive iterations. The first design consisted of a draft based on the literature review and the interviews. Subsequently, a clickable mock-up was created using Atlassian software. In the third iteration, that mock-up was ported to the company's intranet portal. Focusing on the ERP implementation, a special group was created on the intranet website, with customized video tutorials and documents. However, the technical limitations of the platform in terms of collaboration tools and communication media meant that opportunities for user involvement were minimal. For that reason, the fourth iteration incorporated the Microsoft (MS) Teams platform to enable the envisioned support structure. As part of the Office 365 bundle, this digital platform provides a common environment for the formation of actor networks and for co-creation. The design requirements were then implemented on the platform.

3.4 Demonstration

The final design of the FSS on the MS Teams platform, which was available to the whole company, is shown in Figure 1.

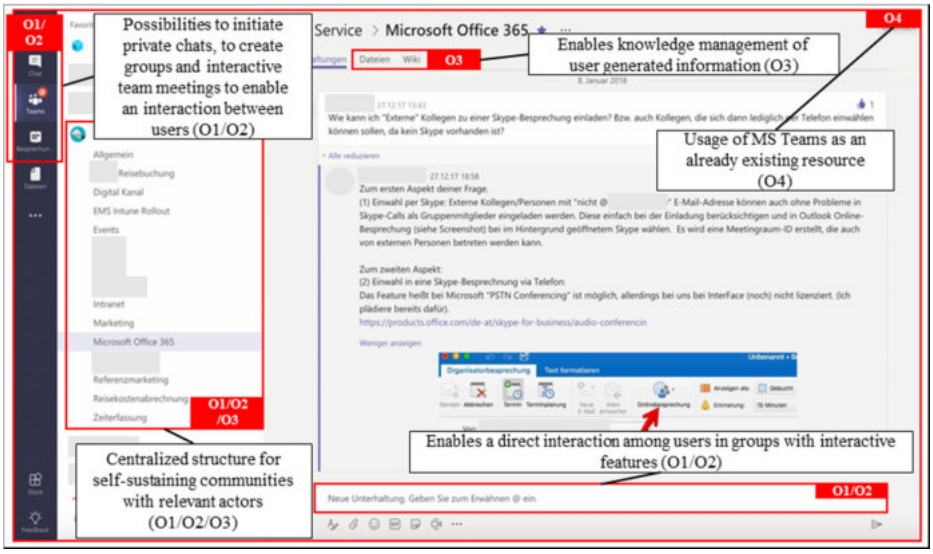

Figure 1. Frugal support structure in MS Teams

3.5 Evaluation and Communication

Evaluation of the FSS was based mainly on the analysis of usage metrics [36] as summarized in Table 2. Analysis of the log files showed that the new FSS was accessed by 163 of the approx. 250 employees from different departments, enabling them to interact and collaborate (Objective 1). Of these, 82 could be regarded as active users of MS Teams and were classified as publicly active, privately active or a combination of both. While only five users were only publicly active (i.e., their posts were accessible to all registered users), 15 employees were solely privately active, using only features like private chat messages to communicate. However, the largest group (62) used both private and public channels to interact with their colleagues. On average, publicly active employees created 34 public posts and 200 private chat messages per user (Objective 1).

The interaction between the different users for support reasons was organized in self-sustaining groups within MS Teams and was used by the employees to ask different questions, concerning the travel booking procedure, mobile device management, MS Office 365, time keeping, intranet, digital services or other general issues (Objectives 2&3). This area was frequently used by 27 users that created a total amount of 244 posts that could be divided into 200 on topic and 44 off topic posts. The employees asked 67 questions in this support structure and 61 of these were answered by other employees. On an average, three posts were created for each of the question asked on the platform.

The analysis of the resource availability showed that 46% of the users just seek information and 32% of them only responded to open questions. Nevertheless, 22% of the active users in the support area took both roles and searched for information as well as pro-vided useful comments on posted problems. While the traditional, ticket-based support clocked a response time of around one week, the frugal support system was able to respond to 90% of the posted questions/problems in less than one week time. Out of which, 73% of questions were answered within one day and 46% in less than two hours, validating a huge reduction of the standard response time through the FSS (Objective 4). However, it emerged that each of the support channels for travel booking, MS Office 365, etc. had one specialist who answered to the maximum number of questions. For example, for travel booking 39% of the posted questions were answered by a single specialist and in case of mobile device management the response from the specialist was as high as 83% of the posted questions.

Table 2. Summary of evaluation

Objective #	Achieved through…
1	•establishment of a wide and active user base •possibilities to communicate on a public and private level
2	•structured groups for different service topics
3	•knowledge sharing among users through their interaction
4	•usage of already established software •increase of response time in case of requests

4 Discussion

To assess the ability of frugal support structures to orchestrate available resources to address specific organizational constraints during IS implementation, the study included a design science research project. This revealed that establishing a frugal support structure can be related to the meta-theoretical foundations of S-D logic. The development of actor-to-actor networks fosters co-creation of value, both dyadic (between information seeker and support channel expert) and at extended network level, where other regular platform users try to help each other [3]. The platform itself supports liquefaction of resources through digital decoupling of single-user knowledge, making this information available to every member of the support structure [24]. High resource density is enabled by response rates that are achievable only by rapid mobilization of actors who can provide the relevant knowledge [4]. Finally, the frugal support structure helps to integrate resources through recombination of existing resources (in this case, IT infrastructure and knowledge), ensuring a level of utility for the whole organization beyond that of isolated resources [24].

The findings confirm that frugal support structures can be systematically developed to support the management of software implementation in SMEs or other settings where there are limited resources for training and change management. At the same time, the present case illustrates that frugal support structures are necessarily diverse and must be designed to ensure that implementation maximizes the potential benefits in each

case. Further research on the management of online platforms is needed to devise suitable intervention strategies for increasing traffic and productivity on the platform.

5 Conclusion and Contributions

This article proposes a frugal approach to enhance existing support structures for new software introductions in resource-constrained SMEs. The findings confirm the close links between the frugal approach and S-D logic, where users and their knowledge are the most widely available resource, and value is co-created through integration of the actors' resources. The study confirms that user involvement is crucial, not only in overcoming the challenges of existing support structures but to make support structures more frugal and sustainable in the long run.

To date, the frugal literature has focused on emerging markets and on bottom-up product development approaches, neglecting the developed world, especially in the context of information systems and software implementation. This study is among the first to explore the application of the frugal concept to information systems in developed markets. Using the principles of S-D logic in combination with the frugal criteria of being resourceful and user-driven, the study suggests guidelines for developing a frugal support structure for software implementation. The findings contribute to the S-D logic and frugal innovation literatures. While past research applied S-D logic to the development of efficient customer networks and marketing business solutions [23], the link to frugal innovation contextualizes S-D logic in resource-scarce settings. Along with design principles for developing a frugal support structure, the study clarifies how interactional resources (such as technology) can act as enablers for the development of frugal solutions in developed world settings. Both of these new insights invite further research. From the IS perspective, this study also contributes to the research on software implementation, and in particular to the issue of user involvement, providing evidence of its tangible benefits in the post-implementation process, which remains largely unexplored in the existing literature.

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