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Supporting the Appropriation of ERP Systems in SMEs: A Practice-centred Approach

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Abstract. Enterprise resource planning (ERP) systems are pivotal in industrial settings, yet often underutilised due to users' inadequate training and understanding. Previous research has shown that this is to a certain extent due to current implementation practices of such systems, which focus on the go-live moment, rather on their continuous use afterwards. This research aims to address this gap by examining the ERPs appropriation process and designing practice-centred systems to facilitate their integration into work practices through facilitated training in SMEs. Drawing on a CSCW and business informatics perspective, this research seeks to bridge a clear gap in the literature through a practice-centred approach.

1 Introduction

Enterprise resource planning systems (ERPs) are among the most used operational software applications in industrial settings. ERPs are configurable software packages or multi-module software applications used to plan and control resources in a company (Xu et al., 2008). As they are complex systems, they are often not completely understood by their users and, consequentially, not used to their full potential, as demonstrated in the literature (Iskanius, 2009; Ben Laadar et al., 2019; Maas et al., 2014). This under usage often stems from limited system knowledge which, in many cases, lead to workarounds like using other tools, like Excel to accomplish things that could be accomplish from the ERP system itself (Rutz et al., 2023). This lack of knowledge, as this research suggests, often results from flawed training in the introduction phase and an absence of organised knowledge and expertise sharing (KES) during the usage phase therefore practice-centred digital support systems could be useful to facilitate these phases and enable users to overcome the hurdles that exists due to the SME context and the complexity of ERPs.

This research sets out to examine the appropriation process of ERPs and based on the findings design technologies to support the integration of ERPs into users work practices and facilitate the appropriation process in SMEs. Therefore, it proposes to shed light towards the following research questions:

- To what extent does current training processes contribute to the integration and appropriation of ERPs to work practices of SME workers?
- How can sustainable KES support the training of ERPs in SMEs?
- In what ways can digital technologies facilitate the introduction and appropriation of ERPs in the workplace?
- What should be observed in the design of such technologies so that they do not clash with the work practices of ERP users?

ERPs are highly cooperative systems and therefore present cases for many fundamental challenges in CSCW like high division of labour and articulation of cooperative work (Schmidt, 1994).Therefor this research connects to the established concepts in CSCW, like knowledge and expertise sharing (Ackerman et al., 2013; De Carvalho et al., 2018) and knowledge infrastructures (Karasti et al., 2010), and applies them, together with concepts from business informatics like critical success factors (Leyh, 2014), on the topic of ERPs which is underrepresented in CSCW (Valdebenito and Quelopana, 2018). It will focus on both sides of the documentation process to support the recipients as well as the data curators (Candello et al., 2022). In the following I will give insights into the chosen methodological approach and present the findings that emerged as to date followed by the current plan for future steps.

2 Research Context and Methodology

This research takes place within a governmental funded research project. The goal of the project is to use KES approaches for a more sustainable implementation and usage of ERPs with the aim to achieve a higher usage intensity. The projects consist of the university and four project partners spread over two industries; all partners are German SMEs. In each industry there is one ERPs consulting company and an ERPs application company. The two industries addressed in this study are from the metalworking and the beverage wholesale branches.

In general, the research design adopted is built upon the Design Case Study (DCS) framework proposed by Wulf et al. (2011). The framework consists of three phases that take place in the course of one design cycle. The cycle starts with the pre-study in which empirical methods are conducted to gather findings trough the analysis of the material. Based on these findings solutions and technologies are designed which are then evaluated in practice in the third phase the appropriation phase.

The contextual study carried out for the pre-study featured participants from different occupational roles to get a broader understanding of the underlying issues and get a deeper insight into the practices of members of the target group. This study brought together a wide range of stakeholders, spanning consultants, hot-line staff, project manager, key-users, end-users, and IT staff. This diversity allows for different perspectives to illuminate the research problem.

For data collection purposes, a combination of interviews, questionnaires, workshops and observations have been used. For the data analysis, the research has used Braun and Clarke's approach to thematic analysis (Clarke and Braun, 2017).

Following the analysis of the empirical data collected in the contextual study, I engage in a series of design activities concentrating on the training of ERPs. These activities led to the design a practice-centred e-learning platform for ERPs and involved interviews, observations and workshops with participants from the partner companies.

The appropriation study phase is currently ongoing in the two industries of the research project. Different use-cases were selected in which the designed prototypes could be tested in the field by the end-users. The two main use-cases will be described in more detail in the ongoing work section.

3 Findings

In this section, some findings concerning the contextual study carried out as part of the pre-study phase of the DCS framework are introduced. These findings are

the basis for the design of the practice-centred solution to address the research problem outlined above.

3.1 Issues of Implementing and Using ERPs in SMEs

During the contextual study it has been carried out in this research, observed the problematic ways in which ERPs are introduced in SMEs which leads to long term issues in the usage phase (Rutz et al., 2023). The findings stemming from the contextual study suggest that in German SMEs workers are often seen as *jack of all trades*, i.e., they are expected to work in different roles due to small departments and a lower degree of division of labour compared to bigger companies. These workers are knowledgeable about assorted work processes due to their engagement in various tasks, which in turn results in higher workloads.

Because of their extensive knowledge on work processes, they are often chosen as key-users for ERPs implementation projects to help to shape the system to the company's needs. Although the findings coming out of the contextual study show that ERPs consultants and ERPs selection consultants recommend choosing key-users based on various criteria, in practice they often get chosen by circumstances. This becomes even more problematic because, despite the fact that the introduction of ERPs is not a trivial task for key-users, demanding engagement and a high workload, key-users receive seldom support or dedicated time to deal with their implementation tasks.

Key-users not only have the role to shape the ERPs to the needs of their company but are also expected to teach the ERPs to their colleagues in preparation of the usage phase. Because of that, they usually receive special training. Nevertheless, the empirical findings gathered so far suggest that these training sessions are often unsatisfactory in regard to how they are conducted and how they are timed. Through the contextual study, it became clear that, both the consultancy companies as well as the application companies often put too less effort and value on training. Professional training usually only takes place during the implementation phase.

Furthermore, although ERPs are often used for long periods in which things like fluctuation happen, additional training for old or new employees is seldom conducted during the usage phase. Additionally, the findings of this research suggests that, when users receive training, they only have the time to engage with the learning content in the payed training which happen mostly in on-site full day events. Therefore, in these events trainers put as much content as possible. This, the findings suggest, leads to a lower level of ERP knowledge among the key-users than what is required. This low knowledge level is perpetuated in chain, as the key-users are the ones supposed to share the acquired knowledge with the end-users also through training.

To counteract the key-users have to rely on the documentation provided by ERP vendors. The findings indicate that this documentation is often useless because it often is highly technical and kept very generic although a customised and process-oriented documentation would be required. Therefore, when facing a problem with ERPs, users try to turn to direct colleagues for help instead of the documentation. If they can't help the users often try to find solutions on their own through trial and error or use workaround outside of the ERPs.

The findings presented above demonstrate how the implementation of ERPs is a knowledge intensive process. Knowledge has to pass through these different actors which bears a risk of it being altered or reduced which then can lead to a lower ERP system knowledge. To mitigate these effects, a KES oriented ERPs implementation model have been designed, taking account of these issues. The KES can arguably lead to a more sustainable ERPs implementation.

3.2 Complications from Work Practices

Because users usually do not have the time to learn this content after the training takes place most of the learning content gets lost in this process and users have to rely on flawed documentation. The research conducted suggest that to solve this conundrum, not only the initial training should be taken into consideration, but also the KES happening place in everyday work. The findings of this research indicate that knowledge owners often face high amount of articulation work since they have to teach their knowledge to new employees and help colleagues with their issues with the ERP system. The study showed that they therefore started to implement systems on their own like group-chats with self-produced how-to videos to reduce the articulation work.

4 Ongoing Work

Based on the findings of the contextual study carried out in the context of the pre-study, a prototype for a practice-centred e-learning tool has been designed: CoursERP. The prototype features a tree-like structure to visualise distinct learning units similar to skill trees in video games. These learning trees should give users the possibility to learn ERPs in a didactically organised manner if they do not receive proper training but also should support classical training by organising the phases before and after the training. Lastly it should also be a tool for experienced workers to freshen their knowledge and close potential knowledge gaps.

To assess the extent to what this demonstrator can be appropriated by SME workers, different use cases have been outlined for the appropriation studies. Currently the prototype is implemented in the two application companies to examine how the demonstrator is used in practice. Since it is not possible to

implement all ERP knowledge directly, it has been decided that CoursERP would for specific use cases which will be explained in the following.

4.1 Training of Market Employees: The Beverage Industry Case

The participating company from the beverage industry, a beverage wholesaler, has the issue of high fluctuation in their market staff which leads to high amount of articulation work for the market managers due to on-the-job training. Therefore, a learning tree has been developed together with market managers for new employees to give them the possibility to learn on their own and, therefore, reduce the workload for market managers. Since in the markets itself there are not enough computers to learn, CoursERP has been made available to them via tablets so that they can learn as close to their practice as possible.

4.2 Distribution of Post training Materials and Exercises: The Case of the Metal-Working Industry

The project partner from the metal industry is currently in the implementation phase of a new ERPs and close to its go live. Therefore, many training are being conducted. To support these training and give the users to enable learning the ERPs after they received training at an event in a guided way, CoursERP should be used as a platform to distribute the learning materials and give the users tasks to help them memorise the learned content.

4.3 E-Learning Platform for ERP Seminars

In addition to the two industry use cases the demonstrator was implemented as a teaching platform for a practice oriented ERP seminar. Based on the findings of the studies carried out as part of this research, a practice-oriented ERP seminar was designed and CoursERP was used as a platform for students to receive the learning materials and to help them learn the content using the didactic path.

5 Future Work

Based on the proposed use cases, a series of additional appropriation studies will be conducted with the goal to observe to what extend the system supports the users in their goal to appropriate ERPs and to further develop the tool based on the findings stemming from the analysis of the appropriation study.

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