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Guiding Digital Transformation in SMEs

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Abstract
The rapid development of digital technologies have created unprecedented opportunities for the industrial world. Enterprises, especially small and medium sized companies, struggle to successfully implement these technologies, and there is scant literature to support this endeavor. The authors hypothesize that ERP (Enterprise Resource Management) implementation, being a mature field, can guide digital technology implementation, taking into considerations the similarities. A systematic literature review was conducted to determine the critical success factors (CSF) of ERP implementation in SMEs that were used to derive guidelines for digital technology implementation case study. The results of the case study is another list of CSF that more correctly mirror the digital technology implementation needs. They are: "digitalization strategic plan"; "project sponsor/leader"; "commitment to the workplace"; "involvement of top management"; "reasonable project scope"; "compatibility with existing processes/systems"; "progressing with small steps"; "use of correct competencies"; and "involving the users".

Keywords
Digital transformation, Critical success factors, Industry 4.0, Digital technology implementation, ERP implementation, SMEs.

Introduction

The constant growth in computing power has always corresponded with the development and emergence of new technologies. However, the monumental increase in internet speed in the last decade has presented new opportunities in improving the industrial world and optimizing it to suit the emerging digital trend. The industry 4.0 movement was prompted, which is characterized by new technologies, high level of adaptability, and digital transformation among other things (Culot et al., 2020). Digital transformation represents the change that takes place in industry and society with the use of digital technologies (Majchrzak et al., 2016). Bharadwaj *et al.*, (2013) defines digital technologies as a combination of information, computing, communication, and connectivity technologies. As a result, Vial, (2019) created a conceptual definition of digital transformation as "a process that aims to improve an entity by triggering significant changes to its properties through combination of information, computing, communication, and connectivity technologies".

Understanding digital transformation involves understanding its phases (Verhoef et al., 2021). *Digitization* is when information is encoded into a digital format so that it can be used by a computer (Loebbecke & Picot, 2015). Sometimes, digitization also refers to change from analog to digital tasks or integrating IT with existing tasks (Lai et al., 2010); (Vendrell-Herrero et al., 2017). *Digitalization* refers to alteration to business processes (Rachinger et al., 2019) like communication, distribution, business relationship management through the use of digital technologies, usually creating new value e.g., enhancing user experience (Pagani & Pardo, 2017). *Digital transformation* refers to companywide change, sometimes leading to new business models (Iansiti & Lakhani, 2014), taking place as a result of implementation of digital technologies (Sebastian et al., 2017), (Li, 2020). All the phases concern themselves with using digital technologies. We will further use digitization, digitalization, and digital transformation interchangeably to best fit the context, because this research focuses on implementation of digital technologies not on particularities between the three phases.

In our research project we collaborated with a multitude of Small and Medium Sized Enterprises (SMEs) on a plethora of diverse topics, including digital technology implementation. SMEs argue that digital technology implementation is difficult because companies lack the necessary knowledge and capital to invest in

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exploring digital transformation. Moreover, it is difficult for them to align their existing information or infrastructure legacy with these new digital technologies, an operation that even Large Enterprises (LEs) struggle with, although they as a rule have necessary IT competencies (Becker & Schmid, 2020). In contrast, SMEs are characterized by a low level of IT knowledge and cultural opposition to the implementation of new technologies, thus it becomes noticeably harder for SMEs to take advantage of these technologies.

To minimize the failure rate for digital technology implementation in SMEs we look to identify the main factors that establish the success of a project, also called Critical Success Factors (CSF) (Freund, 1988). Thus, the scope of this research is "the identification of CSF for digital technology implementation projects, targeted at SMEs."

Small and medium sized enterprises

SMEs are defined in the European Union as companies with less than 250 employees and a turnover of less than 50 million EUR. SMEs represent 99% of all businesses in the EU (European Commission, 2003).

SMEs experience difficulties implementing digital technologies, even more so than LEs on account of their innate traits (Buer et al., 2021), and they lack an extensive IT infrastructure (Blili & Raymond, 1993), (Zach et al., 2014). SMEs have modest financial resources, thus are less reluctant to take the risk and initiate a change, especially into an unknown solution (Raymond & Uwizeyemungu, 2007), (Seethamraju & Seethamraju, 2008). Another crucial characteristic of SMEs is limited knowledge pertaining to Information Systems (IS) and IT in general (Blili & Raymond, 1993), (Shiau, 2009), (Talluri & Vasu Deva Reddy, 2019) which forces them to rely more on external partners like vendors and consultants and spend more money. Last but not least, the role of owner/manager is often cited as the most important characteristic (Buonanno et al., 2005), (Rauch et al., 2019), (Kurnia et al., 2019).

Digital transformation in SMEs

There is a lack of research presenting CSF in digital technology implementation in SMEs. The state-of-the-art research concerns itself with barriers and enablers of digitalization/digital transformation of SMEs that is presented further:

Amaral and Peças, (2021) established lack of skilled labor and clear economic benefit as the hurdles to digitalization in the two cases conducted. Hulla *et al.* (2021) identified barriers: lack of strategy/ roadman to digitalization; recognizing the potential of digitalization; lack of digital skills and competencies; lack of monetary and personnel resources; lack of knowledge in state-of-the-art digital technologies; mindset of employees toward digital technologies; and needed competencies/qualifications: process know-how to digitalization; recognition of digital potentials; creation and execution of a digital roadmap; data analytics and interpretation; communication; basic knowledge on digital technologies as a result of conducted survey. González-Varona *et al.* (2021) conducted interviews with experts and diagnosed management support; information culture; reliable technology adapted to the needs of the company; training employees; development of digital capabilities; a clear commitment reflected in the vision and strategy of the company; and external competitiveness as factors affecting success of digital transformation. Shevtsova *et al.* (2020) identified some barriers for implementing digital technologies as a result of a questionnaire in Ukraine. They are the high cost of software and hardware; lack of funds; undeveloped infrastructure; and unwillingness of staff to gain new knowledge. Bollweg *et al.* (2019) described barriers: lack of understanding the start of digitalization; lack of available resources; low perception of external pressures, low intentions to use digital technologies; and drivers: positive attitude toward digitalization as a result of a survey.

There is a lack of use cases in academic literature, which can be attributed to the taxonomy of digital technologies. A way to surpass this obstacle is to define all the digital technologies, which are in the number of dozens, and conduct a systematic literature review. This method, however, doesn't guarantee success on account of diversity and heterogeneity in the terminology of digital technologies. An alternative was presented by Kilimis *et al.* (2019), who found that SMEs overwhelmingly regard ERP implementation as their highest priority in digitalization, which was also seconded in our research project. Because ERP implementation is an established subdiscipline we hypothesize that CSF in ERP implementation projects corresponds with CSF in digital technology implementation projects, or at least can help derive them more thoughtfully.

ERP implementation in SMEs

Enterprise Resource Planning (ERP) is an Enterprise Information System (EIS) and management tool used to collect, store, manage and interpret data related to business processes. It is used to track enterprise resources like capital, materials, employees, etc.

It was developed as a response to the need to integrate business departments and minimize silo infrastructure in organizations. ERP implementation can be considered a digitization project, as it converts data to digital form, but the functions inherent in the solution themselves enable digitalization by providing a means to optimize business processes.

The implementation of ERP is a mature field, both in research as well as industry. It can be seen by the decreasing number of research papers in the current years and the decreased failure rate when it comes to ERP implementation. Moreover, there are similarities between ERP implementation and digital technology implementation that create arguments why it makes sense to migrate the knowledge from one field to the other, or at the very least assert the need to research the hypothesis.

First, ERP was one of the first interdepartmental tools in the time when it was a norm to work in silos, whereas digital technologies now also span different departments when considering the users. Second, ERP was a new digital tool based on the paradigm of connectivity, very much like digital technologies are. For these motives it makes sense to investigate how ERP implementation projects were conducted, extract relevant data, and test it on digital technology implementation projects.

Methodology

We investigate this question using two stages in our methodology. First, we conduct a systematic literature review (SLR) to answer the question: "what are the CSF for conducting an ERP implementation project?". As part of the review we synthesize, analyze, and interpret the data. The result is a list of CSFs grouped in clusters. Second, from these CSF we derive guidelines that are presented as part of our research project using action research. An interview is conducted, using a Likert scale questionnaire, in the beginning of the project to assess the state of the company with respect to the Critical Success Factors identified through the SLR. At the end of the project a semi-structured interview is conducted to corroborate the observations and answer our research question: "can CSF from ERP implementation project be used to guide digital technology implementation projects?".

In the next section we present the methods used throughout the report, followed by findings in section 3, validation through a use case in section 4, discussion in section 5 and conclusion in section 6.

Methods

Systematic literature review

Systematic Literature Review is a tool consisting of a well-defined and rigorous criterion to identify and synthesize relevant literature (Thoméet al., 2016). We seek to conduct a meta-analysis, to identify patterns in primary research papers related to ERP implementation and analyze them. The method used is an 8-step approach as presented in Thomé *et al.* (2016). Each step was followed to ensure rigorousness of findings. A team was constituted of two individuals, to ensure the transparency of collected data and adherence to the protocol. Scopus was used as the selected database because it includes most of the journals in Information System, Operations Management, and Supply Chain Management research, as this is where our primary research would be published. The keyword search was conducted using the four elements: enterprise resource planning (1); small and medium sized enterprise (2); implementation (3); critical success factors (4). Table 1 presents those four elements with all the forms of the terms that were considered. The function "AND" is between the rows.

The initial search produced 185 results. First, the abstract was read, and the paper classified according to the relevance to the research scope. The reason for classifying the papers is to ensure that we read first the most relevant papers and thus create a code that more correctly mirrors the scope of the research. After reading the abstract 100 papers were excluded. From the rest 85, 49 were excluded for reasons like, inability to access the file (12), being a duplicate (11), being written in a different language than English (2), irrelevance to the research question (18), and no new primary data, as in data was derived from other research and analysis was done unto it (6). The search was further extended beyond the keyword search as suggested by Greenhalgh and Peacock (2005) by doing backward search, which identified 13 more papers of which 6 were relevant and included new primary data. In the end 42 papers were identified and coded (Fig. 1).

The coded scheme was derived from the information gathered and notes were taken as to the meaning of each identified construct to better understand and synthesize the information (Durach et al., 2017). Three most common biases were considered throughout the research to maximize the quality of the research. Those biases are: (I) publication bias, that refers to the selective exclusion of relevant studies (Cooper et al., 2009); (ii) incorrect methodology; and

Table 1
The keywords used for search

Enterprise Resource Planning *OR* Enterprise system *OR* Enterprise Information System *OR* ERP *OR* ES *OR* EIS	Small and medium-sized enterprise *OR* Small and medium-sized business *OR* Small and medium sized enterprise *OR* Small and medium enterprise *OR* Small and medium sized business *OR* OR small and medium business *OR* small and medium manufacturing enterprise *OR* SME *OR* SMB *OR* SMME	Implementation *OR* Implementing	Critical success factors *OR* Barrier *OR* Enabler *OR* Challenge *OR* requirement

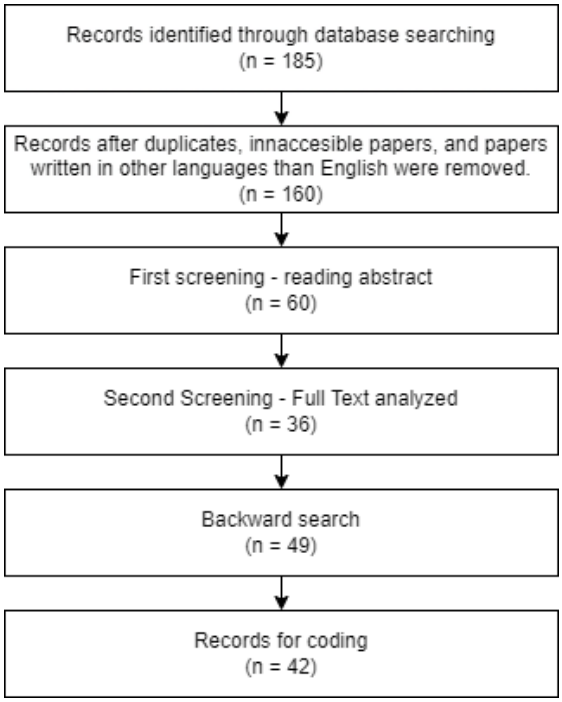

Fig. 1. Screening of the records as part of SLR

(iii) bias during reporting of primary studies. Multiple team members were used to ensure the reliability of the results and to minimize the biases by making judgements on prominent issues, such as identification of studies for inclusion/exclusion and extraction/analysis of data (Thomé et al., 2016). The common factors present in primary research were identified. Some drastically differ from the known critical success factors in the operations management community but we believe those factors more correctly display the need and focus exhibited during these projects.

Action research

Action research is a generic term which covers many forms of interactive action-oriented research. It is recognized for its grounded, iterative, and interventionist nature (Westbrook, 1995). It differentiates from traditional positivist research methods in 6 dimensions: aim of research, type of knowledge acquired, nature of data, validation, researcher's role, researcher's relationship to the setting (Table 2).

Action research is best used in a scenario where a managerial issue is identified, and a group or enterprise is embarking on a mission, with an uncertain outcome, with the expectation to analyze the case, and implement a solution. The researcher has an active role in the project, in that he is both an actor in the project, meaning he is actively trying to find a solution, and an observer, meaning he has a role to document and analyze the process, while at the same time gathering data for his research, which can be separate of the project, and not correspond to the project scope (Coughlan & Coghlan, 2002).

Table 2
Comparison between positivist science and action research (Coughlan & Coghlan, 2002)

	Positivist Science	Action Research
Aim of research	Universal knowledge Theory building and testing	Knowledge in action Theory building and testing in action
Type of knowledge acquired	Covering law	particular
Nature of data	Context free	Contextually embedded
Validation	Logic, measurement Consistency of prediction and control	Experiential
Researcher's Role	Observer	Actor Agent of change
Researcher's relationship to the setting	Detached	Immersed

Action research was used to test the Critical Success Factors found in the literature review. The researcher had an active role in both creating a solution for the identified issue and guide the project management considering the identified CSF. The results can be found in the next section.

Findings

Through synthesis we identified 45 critical success factors. Initially we counted the number of mentions of CSF in the research papers to discern the most important ones, but soon realized that this method will not present the truth accurately because sometimes the CSF were judged as especially important or negatively impacting the implementation. To account for this depth in the research we developed a simple weight scheme where the most important factors would have the weight "2", the mentioned factor would have weight "1", and the negative factor would have the weight "-1". Lastly, we deleted the CSF that had less than 5 points, which meant that they were mentioned in a couple of research papers and completely missing from the rest, thus we argue that they do not represent a Critical Success Factor. This resulted in 37 CSF. We observed that these CSF were not independent but had interdependencies between one another thus we decided to use Leavitt's Diamond model to guide the grouping of the CSF. The model identifies four components **STRUCTURE, TASK, PEOPLE,** and **TECHNOLOGY**. These represent the classes into which the CSF were grouped. **STRUCTURE** refers to the underlying structure of the organization that influences events. **TASK** refers to the process of digital technology implementation. **PEOPLE** refer to the employees of the organization. **TECHNOLOGY** refers to the digital technology that is under discussion. Table 3 presents the CSF grouped into the four classes.

Table 3
Classes and themes of the Critical Success Factors

STRUCTURE	Business Plan Vision for future 12 Culture Open and Honest 14 Flexible 12 Adaptive to new technologies 5 Infrastructure • Standardized 5 • Business and IT alignment 5 • Integration 5 • IT readiness 5 • Data Management 13 • Knowledge Management 6
TASK	Project Management • Scope and goal 19 • Implementation strategy 25 • Risk Management 4 • Monitoring and Evaluation 10 • Budget and period 16 Top Management Support • Active participation 6 • Support and sponsorship 25 Change • Change management 21 • BPR 20
PEOPLE	Team • Project Leader 15 • Roles and responsibilities 14 • Cross-functional 6 • Balance 5 • Skilled 15 • Key user involvement 20 • Key user training 25 External participation • Vendor 14 • Consultant 14

Table 3 [cont.]

TECHNOLOGY	Development Strategy • User Requirements 5 • Alignment with business processes 9 • Functional Requirements 6 Technology Specification • Qualitative 5 • User Friendly 5 • Minimum customization 20 • Compatibility 7

Critical success factors

From the company class we observed that having a vision about the future of the company and being future ready has some impact on the success of the implementation, however more important is the culture of the company. If the workers are open and honest, not only between departments but also the management to the lower ranks, it creates an environment of trust. This CSF was derived from another one called effective communication, which is part of the project class. Even though in the primary papers, the data was classified as effective communication, from the explanation it was clearly referring to an enterprise culture of communication, and not only to the effectiveness of communication related to the project. Flexibility is an obvious CSF, as presently not only the manufacturing but all the industries can only be described as changing in nature. The last prominent CSF is the presence of a data management or data governance entity as working with data is paramount presently and most of the delays and failures in these implementation projects are due to incorrect management of data.

From the task class multiple factors were identified as being the most critical. The presence of an implementation strategy is an obvious factor, as well as training the key user and top management support and sponsorship. Although, for the latter, most of the papers were vague about what exactly it means. In SMEs, the top management plays a special role as often it is also the owner of the company, thus it has more stakes both in the results of the company and decisions made. Having control over the budget, the top management has control over the project within a company, thus it is implied that without believing in a project an owner/manager would not fund it. Some of the papers suggested that active participation of the owner/manager in the project drastically increases the success chance, as it has multiple benefits such as bringing transparency to the project by managing the expectations, facilitating the discussion aligning with the business goals, improve vendor/consultant – enterprise relations, etc.

Other CSF is preparing the company for change, this implies either having a change management and/or business process re-engineering (BPR) action plan. Although it was often mentioned, BPR struck a controversial note because some research suggested that it is wrong to do BPR and that the technology should be developed in such a way as to be aligned with the business processes, and some suggested it is imperative to do BPR. Although SMEs usually do not have an extensive legacy system and thus it should not be difficult for them to change the business processes, this is still an ongoing debate. Change management is also related to a flexible culture presented earlier.

Other CSFs that were mentioned in approximately half the papers are: having a project team with a leader and assigned roles and responsibilities for everyone involved; the presence of technology skilled individual on the project team; a clear and dynamic project scope and objectives; as well as a clear budget and timeframe. The importance of altering the budget and timeframe was stressed in some papers. One more CSF that yielded many results is involving one or more key users into the project, which would ensure understanding of the needs of the user. It may be viewed that top management and key user are two extremes that bring opposing but equally important elements to the table, both in understanding the company needs (big picture vs user requirement) and aligning technology capabilities with business processes. An extended relationship, close with the vendor, and the use of skilled external consultant are also mentioned often. Since SMEs lack an understanding of the technology, they require external knowledge to manage the implementation and post implementation issues. It was also suggested that using academia as consultancy is a cheaper but viable solution.

From the technology class, minimum customization was mentioned the most. This can be justified from the fact that SMEs lack internal capabilities to manage technologies, and a modified version requires more money for maintenance, thus using a vanilla version of a technology that is supported by the vendor may be best. From our findings, only nine papers were discussing the technology aspect of the ERP implementation, and they point out that there should be a synergy between user requirement and functional requirement, and how those are aligned with the existing business processes. Moreover, it was stated that the technology should be qualitative, with a user-friendly interface and compatible with the existing systems.

Guidelines

The identified CSF were used to develop a series of guidelines that are presented further. We hypothesize that these can guide enterprises to a more successful implementation. They are grouped into four classes, and the *italic* font presents the most important guidelines based on the weight of each CSF. These guidelines were used in the use case that is presented in the next section.

Structure

1. *Have a clear digital vision for the future*
2. *Create an open and honest culture in the enterprise*
3. *Encourage flexibility in the workplace*
4. *Have a data management entity*
5. Encourage exploration of new technologies
6. Consider your standardization level and how it relates to the project
7. Align your business with your IT capabilities
8. Consider modularization and integration
9. Know your IT maturity level
10. Have a knowledge management entity

Task

1. *Make a clear scope and objectives*
2. *Have an implementation strategy*
3. Do a risk assessment
4. Monitor and evaluate the progress of the project
5. *Be flexible in budget and timeframe*
6. *Support active participation of top management in the project*
7. Use progress reports and clear tools to manage communication within the project team
8. *Prepare a change management action plan*
9. *Create a strong relationship with your vendor/consultant*

People

1. *Create a team and assign clear roles and responsibilities*
2. *Choose a project leader that has the most influence on the project.*
3. Use members from different departments to balance the team.
4. *Find skilled people for the team and prioritize this project for them*
5. *Involve one or more key users*
6. *Allocate time for training key users*

Technology

1. *Align the technology with existing business processes*
2. Create the requirements by synthesizing user and functional needs
3. Concentrate on creating a qualitative result
4. Consider user friendly interface to maximize the use of said technology post implementation
5. Consider the compatibility with your existing systems

Use case

Company A is a salt processing industrial enterprise that is at the beginning of the digitalization journey. It took part in our research project where it identified a digital opportunity, designed, constructed, and implemented a digital technology. The data gathered is the result of interpretive action research during the project and a semi-structured interview at the end, which was structured like open-ended questions about the success or failure of the digital technology implementation project. In the action research part, the researchers used the aforementioned guidelines as a directory, specifically in project management. Next the company is presented from the lenses of the four classes identified earlier.

The company has a vision for their digital future, putting a lot of emphasis on the structure and transparency of data and data management systems. They encourage exploration of new technologies which suggests that top management supports those kinds of projects, and they prioritize modularization and integration suggesting an understanding of digitalization paradigm (Ustundag & Cevikcan, 2018). However, they identify themselves as being at the beginning of the digitalization journey with a lot of legacy systems and misalignments between business processes and IT capabilities, which they try to correct.

Regarding the task, the company does not have a specific universal strategy but adapts to maximize the chance of success. Nevertheless, there are some core requirements that they always take into consideration. A clear scope as well as an implementation strategy is defined. Success is maximized by monitoring and evaluating the progress of the project and making a risk assessment before the project starts. Finally, the role of top management is important. It is common for top management to take more interest in the details of the project, but to a minimum they understand what the project is about and its importance, which leads to the support of top management.

Regarding the people, the company values an open and honest culture which translates into better cooperation in the project group (Choo, 2013). In the project, a leader is consciously chosen, the most skilled people for the team are identified (but the final team is negotiated based on prioritization and possi-

bility), and clear roles and responsibilities are assigned to team members. The key users are always involved in the project, usually from the beginning, and time is allocated for training those key users.

Regarding technology, the company is conscious of many pitfalls and considerations, however most of them are not incorporated into their way of doing things. For example, they try to align the new technologies with existing business processes, but in the absence of a clear method of conducting the project the result may not be the optimal way. Moreover, creating a friendly interface to maximize the use of technology only recently became a priority.

The outcome of the second part of the interview was identification of CSFs and barriers for digital technology implementation project. The first factor was the presence of a sponsor for the project, who could argue to the top management about the importance of the project and ensure resources and time are adequate, as well as create the platform for the project. This sponsor usually takes the role of the project leader as well, and sometimes is part of the top management retinue. Another factor was the involvement of the users as early as possible, specifically in the design phase, to maximize the use of the technology after the project ended. Another factor was the identification of a reasonable scope and creation of strategy to allow for small steps to go forward, and enough flexibility to shift the scope or methods. Moreover, the identification and use of correct competencies was also diagnosed as a factor. Finally, the high commitment in the workplace which was displayed as passion for the project, flexibility from people and strong team spirit was a major factor in the success of the project.

However, the factors that diminished the progress were identified as either a rigid approach to project governance, like waterfall method, or an extremely flexible approach in exploration phase. The anchoring in a specific technology and prototyping is important and "exploring to infinity" damages the chances of success. The balancing of the two is the key. Another barrier cited was bureaucracy and the classical governance structure. A lot of reporting creates a burden when not used properly. Moreover, the direction of progress for the company is a key factor, because if that direction changes the noise created is reflected in the project as well.

Discussion

In this section we will discuss the differences between the results of the literature review and the use case, then compare the identified CSF to the state-of-the-art to present the advances to theory. Further we use those advances for practical applications within manufacturing. Finally, we compare these with the knowledge from Digital Technology implementation in LEs to contrast the two and consider other technology implementation paradigms like Industry 4.0 and advanced manufacturing technology (AMT).

In the use case the participants identified the following factors as having a considerable effect on the success of their project: (1) "a clear vision of the future/digitalization strategic plan"; (2) "project sponsor/leader"; (3) "high commitment to the workplace"; (4) "involvement of top management"; (5) "reasonable project scope"; (6) "progressing with small steps"; (7) "identifying and using correct competencies for the project"; and (8) "involve the users". Figure 2 presents these CSF and their counterpart from the ERP implementation.

Three CSF are identical in the digital technology implementation and ERP implementation: (1) presence of a clear vision/digitalization strategic plan; (2) presence of a project leader/sponsor; and (3) involvement of top management. The rest of CSF from digital technology implementation are more complex and aggregate CSF from ERP implementation.

High commitment to the workplace is a very vague factor, it may imply having an open and honest culture, flexible workplace, and encouragement to explore. McElroy, (2001) argues that commitment to an organization comes with shared values, involvement, and identification with the target (which in this case represents the digital technology implementation project). Moreover, they argue that sharing information in an organization and having a flat hierarchy, strategies that are researched more in (Choo, 2013) and are linked to open culture and flexible workplace, lead to a higher commitment.

Reasonable project scope is another vague term that refers to multiple factors. SMEs by their nature need to consider ambidexterity, which is the ability to balance between exploration and exploitation (Katic et al., 2021). Thus, they need to consider the standardization level with respect to the project, how aligned their business processes are with the IT capabilities and how the new technology may change that. They also need to consider the compatibility and integration with existing systems (e.g., ERP, MES) and consider both functional and user requirements for the solution.

Moreover, we found that progressing with small steps having specific usable deliverables is crucial because it presents a progression of the report and allows flexibility in pausing the project if there is another priority. At the same time, small step progression is

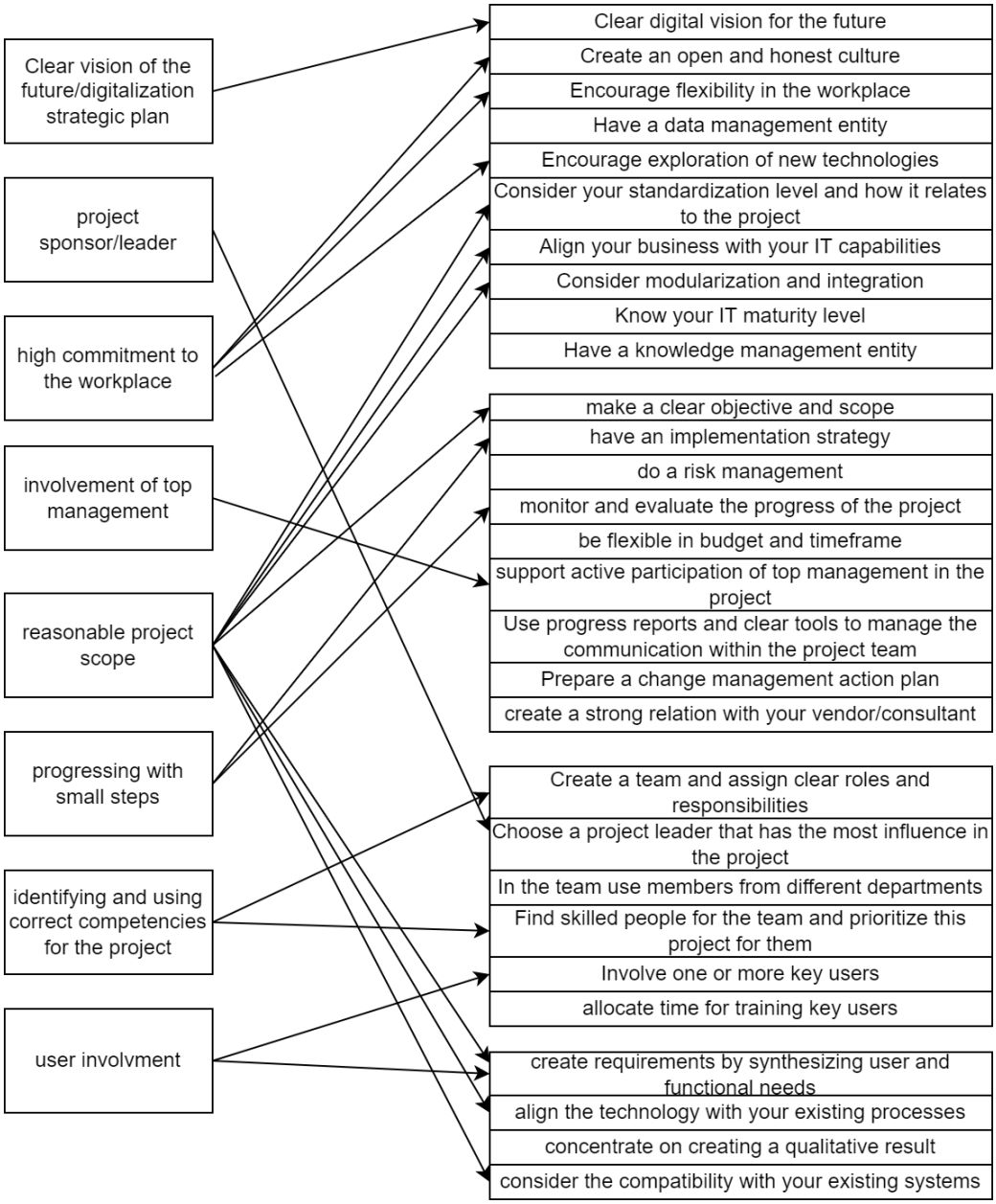

Fig. 2. Visual representation of how CSF for digital technology implementation (left) refer to CSF for ERPimplementation (right)

in accordance with the agile methods that should be used in digital technology implementation undertaking. Identifying and using the correct competencies for the project was stated as being crucial, because the failure to do so may lead to spending a lot more on consultancy or vendors. Finally, the importance of user involvement is crucial because it gives a sense of ownership and thus maximizes the chance the technology will be used after. Involving the user also helps to identify the correct user requirements.

When comparing the identified factors with the research related to digitalization in Large Enterprises (LEs) we have found some overlap. Vial, (2019) conducted an extensive literature review and presented structural changes that are required to create value and capture processes when doing digitalization. They are (1) organizational structure – a flat hierarchy enables digitalization; (2) organizational culture – relating to digital culture and could lead back to information culture as presented by Choo, (2013); (3) leader-

ship which refers to creating a digital mindset – associated with having a digital strategy for the future and digital culture; (4) employee role and skills stating that employee should be ready to assume roles outside their normal functions – part of creating commitment to the workplace, specifically by involving employee more, and giving them flexibility.

It is also of interest to compare the identified CSF with those of Industry 4.0 implementation as industry 4.0 represents a natural progression of advancement in digitalization. Moeuf *et al.*, (2020) employed specialists to identify critical success factors which are presented further. First, they communicate the importance of training employees because lack of expert support is an element often cited, and training employees is a solution to mitigate the risk of failure. The fact that expertise in a domain drastically improves the chance of success is not a novel idea, but as the saying goes "the devil is in the details". It is important to understand who the employees are that need to be trained, and what kind of training is needed. Ghobakhloo and Iranmanesh, (2021) argue that "external support for digitalization is the steppingstone for ensuring Industry 4.0 transformation success within the SME sector", because it brings expertise into the equations. This external support is best used to help create "a clear vision/digitalization plan" which can only be designed by having the necessary expertise. Next, Moeuf et al, (2020) argues about the need for conducting a prior study, which is defined as a study to delineate the industrial performance target and linked technologies, and the use of available data. These two combined point toward our identified factors "having a reasonable scope" which includes aligning existing systems (thus using the existing data) and considering integration and standardization (industrial processes linked with technologies). Next the paper points out the importance of communication, and alignment along a hierarchical line, as well as the participation of management, which corresponds with our findings.

Kumar *et al.*, (2018) presented the key success factors of advanced manufacturing technology (AMT) implementation. AMT refers to new technologies, both soft and hard, in the manufacturing sector that represents an innovation in the way a process is conducted. We can argue that any technology can be classified as advanced if it brings changes to business processes or operations. With respect to this we need to consider digitalization. AMT encompasses a range of computer-controlled technologies; thus, it relates to digital technologies. Kumar et al., (2018) argue that we need to consider critical success factors in order to achieve the benefits of AMT, and they propose the next factors: (1) "educating and training employees" which corresponds to one of our CSF; (2) "organizational structure" which refers to the low level of complexity and decentralization. This differs from our finding in organizational structure which suggests that a flat hierarchical structure is favorable for digital technology implementation. However, these factors are not mutually exclusive, and we need to ask ourselves, does a flat hierarchy lead to a low level of complexity and decentralization, or is it the other way around?; (3) "manufacturing strategy" which refers to having an action plan with respect to project management when implementing the technology. Our findings are more concrete and suggest having a small step progression, and a clear vision, as well as a progress dissemination medium.; (4) "technical and management know-how" which refers to the knowledge about analytical methods for risk-taking and decision making, as well as commitment from top management, which is partially supported in our findings.

Conclusion

In this research we explored the factors that affect a digital technology implementation project in a Small or Medium Sized Enterprise. In our research project with SMEs, we identified that they lack guidelines to maximize their success when doing digitalization projects. From an initial literature review we identified papers that present challenges and opportunities that affect digital transformation. However, they didn't accurately solve our problem, so the research question arose: "what are the CSF that affect digital technology implementation projects". From our imperial work we determined that ERP implementation is the first and most important digitalization project, and it being a mature field we hypothesized that knowledge from ERP implementation projects can be transferred to other digital technology implementation projects.

A systematic literature review was conducted to identify the CSF for ERP implementation, then those CSF were used in a use case for digital technology implementation. The findings were collected as observations during the project and used in an interview at the end of the project. Nine CSF were identified: (1) "a clear vision of the future/digitalization strategic plan"; (2) "project sponsor/leader"; (3) "high commitment to the workplace"; (4) "involvement of top management"; (5) "reasonable project scope"; (6) align the technology with existing processes and consider compatibility with existing systems"; (7) "progressing

with small steps"; (8) "identifying and using correct competencies for the project"; and (9) " involve the users". We also identified 3 factors that positively affect project success but are not critical: (1) "making a risk assessment"; (2) "consider modularization and integration"; (3) "consider standardization and how it relates to the project", and 3 factors that critically negatively impact the project: (1) fixed vertical hierarchy; (2) too much flexibility in exploration; (3) rigid approach to project management.

Some of the CSF are not as clear as would be preferable, for example having high commitment to the workplace brings follow-up questions: how we measure commitment and how do we increase commitment to the workplace. It is also fair to ask oneself, does the national culture make a difference in the strategy taken to increase commitment? From our initial understanding, we can link commitment with shared values (with the enterprise), feeling of involvement in the growth/survival of the enterprise, and honesty within the enterprise. This needs to be further evaluated with research on leadership.

In regard to further research, we need to further validate the identified CSF with more use cases, which is planned within our research project, and expert opinion with the use of a Delphi study. The findings should be triangulated to gain a more wholistic and correct understanding of the phenomena, resulting in a quantitative data set to use further. Since the identified CSF are not independent variables, there are clearly relations between them that may represent correlation or even causation. Further research should focus on identifying these relations and the details of said links. The collected quantitative data set can be used for statistical analysis to understand relations, pattern, and trends with respect to digital technology implementation tasks.

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