The critical success factors’ investigation during knowledge management implementation within SME enterprises: a Participatory Design opportunity

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Abstract
Knowledge management (KM) is currently an important driver to develop dynamic capabilities for businesses, on behalf of competitiveness. Nonetheless, some critical success factors are hampering KM implementation, such as a lack of a KM strategy, cultural aspects, leadership, and technology. In this paper, we focused on the KM implementation within Small and Medium Enterprises (SMEs) by exploring Participatory Design potential to KM implementation in SMEs, by focusing on information technology as a critical success factor and exploring some organizational culture characteristics that can help in this context. To achieve this goal, we conducted an ethnographic study in the real environment of a consulting firm which is starting its own KM project. Our results show that Participatory Design might be recommended to SMEs’ KM implementation, by taking advantage of already available, but underused technological tools.

Keywords Technology · Implementation · Collaborative working · Cooperative working

Introduction
SMEs are important drivers of economic growth and local development [1], comprising 90% of businesses around the world [2]. In Brazil, for instance, 99% of companies are SMEs, corresponding to 52% of private sector signed jobs and 30% of Brazilian Gross Domestic Product [3]. Nonetheless, they are constantly striving to develop dynamic capabilities, aiming at strengthening their competitiveness in a rapidly changing market and boosting innovation, which requires the creation of new knowledge [4].

More recently, SMEs intrinsic vulnerability concerning financial resources, limited managerial capacity associated with technological and knowledge gaps become even more stressed due to the challenges posed by coronavirus pandemic. The rapid digital transformation and changes in customer behaviour transformed the way companies operate [5]. One way for SMEs to fill this gap is using

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knowledge as a resource, placing it at the center of their activities and in the decision-making process [6].

SMEs searched for fast digitalization and collaboration between each other to adapt to a new reality concerning supply and demand, as illustrated by the intensification of e-commerce, which required new investments and creativity to potentialize entrepreneur solutions to the crisis, such as hackathon competitions [5].

In this context, knowledge was given a role of prominence in firms as it helps to understand how to respond to changes in the environment, to new social demands and how to use digital technology to rethink operations and business models. Thus, market competitive pressure asks for Knowledge Management (KM) strategies, which in turn requires organizational flexible structures, adaptable processes and an IT infrastructure aligned with the business strategy [7–10].

Knowledge and the capacity to manage it is considered the most distinctive and strategic asset a business can have. Not only it helps firms to act intelligently, but it is also a driver to organizational learning [11]. In SMEs promoting KM diffusion is vital to innovativeness and to maintain their competitive position [12, 13]. KM is an opportunity to foster organizational knowledge through the coordination of people, processes, and technologies with sights to knowledge creation, sharing, and application aiming at achieving businesses’ goals and sustaining competitive advantage [6, 14–16]. Thus, the success of any firm depends on this intangible resource [17].

Despite KM numerous benefits for small firms [18], such as improved decision-making and increased productivity, it is a little understood subject for the general public and the field favours large businesses and neglect SMEs [2, 9]. There is a general idea that they are not ready for KM [10]. This explains why large firms, which have more financial resources invest more in KM.

Consequently, there are some obstacles to KM implementation in SMEs, namely critical success factors, such as the absence of a clear strategy for KM, the lack of a sharing culture, leadership support and managers’ commitment, as well as the absence of an information technology infrastructure that supports information sharing [19–21].

As a way of stimulating KM implementation in those companies, Participatory Design can be deemed as a promising opportunity to KM diffusion. Regarding KM in SMEs, these companies emphasize the importance of employees’ knowledge as a key to the development of activities, processes, and projects of the company while this knowledge is concentrated in certain people [22].

Participatory Design is increasingly applied in design projects and one of its characteristics is to provide users’ participation, through empathy and communication, understand their behaviours and what they want during their experience with the product, enabling the creation of new attractive modes for user experience [23, 24].

Considering the disruption caused by pandemic provided the acceleration of creative ways of digital technologies adoption, we present in this paper the opportunities of Participatory Design to engage companies’ members in implementing KM within SMEs with the help of information technologies. The use of Participatory Design can help firms to promote a common understanding while defining a strategy to design KM practices and tools to create, share, store and use their knowledge by exploring already available technologies.

We know of no prior empirical study explored Participatory Design potential to help KM implementation in SMEs. Motivated by the issues mentioned, this study aims to examine opportunities presented by Participatory Design to implement KM in SMEs from the viewpoint of technology supported by leadership and organizational culture aspects.

Different from our previous study [25] that focused only on the opportunities presented by Participatory Design in the technological field, in this study, we aim to present and discuss new aspects of Participatory Design potential contributions by tackling organizational culture characteristics and leadership aspects that should also be explored by Participatory Design in KM implementation.

To achieve this goal, “Literature Review” discusses the role of technology, organizational culture and leadership as KM critical success factors. “Research Method” develops the idea of Participatory Design. “Opportunities of Participatory Design for KM Implementation Emphasizing Critical Success Factors” puts forward a systematic literature review approaching Participatory Design in KM and our research method, mentioning recent papers on the topic. Finally, “Discussion” and “Conclusions” presents our findings and discussions, while conclusions close our paper.

Our contribution aims to demonstrate that a knowledge sharing culture can be enhanced within SMEs organizations by motivating and engaging people to participate in KM design initiatives. Hence, Participatory Design fosters not only employees belonging sense that leads to KM effectiveness, but also accelerates companies’ digital transformation, reducing technological knowledge gap.

The findings of this study are designed to enable owners-managers and practitioners to think about Participatory Design opportunities to implement KM in SMEs.

**Literature Review**

**Knowledge Management**

KM can be defined as a systematized and targeted management of processes, methods and tools, making full use of
the organization’s knowledge potential for strategic objectives, making effective decisions, implementing and creating value to customers [6]. In summary, knowledge is the input for value creation and KM can combine several sources of knowledge in favor of transforming tangible resources into intangible values in the form of product and process innovation [14].

KM is characterized by a systematic process of identifying, creating, capturing, acquiring, storing, sharing, organizing, transferring, sustaining, retrieving, renewing, evaluating, and using explicit and implicit forms of knowledge at the individual, group, organizational and community levels by bringing people, processes and technology together to improve organizational performance and create value [13].

It is a process that does not happen in isolation in the organization. It is considered systemic, being strongly influenced by the organizational structure. It relies on people, processes and technology to sustain itself. Dalkir [14] highlights that coordination between these three factors is needed, achieved through promoting the creation, sharing and application of knowledge, as well as through providing valuable lessons learned and best practices to organizational memory in order to promote continuous organizational learning.

Organizational Culture, Technology and Leadership as Critical Successful Factors to SMEs’ KM Implementation

KM has been recognized for improving organizational performance through the implementation of tools, processes, systems, structures, and cultures aiming at creation, sharing, and use of knowledge, which are crucial for innovation, companies’ decision-making, competitiveness, adjustment to market conditions and business value creation [26, 27]. It brings numerous benefits to organizations, such as sales growth, employee development (skills and learning), consumer satisfaction (loyalty), creativity, better relationship with other firms and enhanced human resources management [2].

SMEs are innovative by nature, since they produce customized products and services that are easily adaptable to changes in the business environment [2]. Thus, knowledge is one of the main organizations’ assets in those firms. Nonetheless, managing it is a challenge for SMEs, as they concentrate most of their organizational knowledge—predominantly tacit—in their partners and managers, have little recorded knowledge and do not store it properly for later recovery and use [24].

A knowledge-oriented culture can be considered one of the most important conditions to KM and maybe the most difficult to be established [28]. It can be defined as a glue that unites organizational members and gives them an identity on behalf of a commitment [29]. An organizational culture is expressed through values, meanings, principles, suppositions, and norms shared by members through management structure, practices, and behaviors [30].

Regarding SMEs there are some cultural aspects that can be useful to KM initiatives. Some KM processes are facilitated by SMEs’ characteristics, which favor their implementation. On one hand, knowledge sharing is favored by the familiar climate between employees, which promotes trust and strong social interaction, proximity between employees with higher frequency in verbal communications due to open workspaces, easy of information flow, and overlapping activities among colleagues.

On the other hand, knowledge storage and retention process face constraints, since solutions are customized and differentiated, while storage processes demand financial resources, time, and people to formalize and structure artifacts, patterns, systems, and procedures. Consequently, knowledge rests concentrated in the mind of only a few people, namely owners and managers, which hinders the realization of knowledge management processes which through learn by doing and not through research [31–33]. In addition, technology is not used with the goal of managing tacit knowledge, but mainly to knowledge storage. Hence, people are not dedicated in developing knowledge databases in those firms.

The biggest challenge for most KM efforts in SMEs regards facilitating knowledge sharing activities. This KM diffusion process involves complex aspects related to culture, people, behavior, and business process [34]. Constraints to KM implementation are called critical success factors, i.e., activities and practices that must be directed to ensure KM implementation [35]. Support from top management and leadership are the most important ones, followed by a culture that encourages sharing; a clear strategy and purpose for KM; resources, processes, and activities; training and education; human resource management; information technology; motivational assistance; organizational infrastructure and evaluation [19].

Aspects related to people as we can see from the main critical success factors are more crucial than technology itself in supporting KM in a 80/20 ratio, exemplified by the existence of a culture favorable to knowledge and the creation of an environment conducive to sharing [28, 36]. Thus, KM is recognized as a cultural phenomenon [27], whose main foundation is people, so the formation of a knowledge-sharing culture based on employee involvement and trust favors people’s willingness to collaborate and form a network of interactions aiming at achieving organizational goals [37–39].

In this context, in addition to the technology infrastructure relevance to support core KM activities, such as large-scale information sharing, it is necessary to think of social,
cultural, motivational, and interactive mechanisms to engage workers in tacit knowledge transfer [40, 41]. Lin [9] considers a sharing culture one of the three critical organizational factors to KM adoption in SMEs, together with top management support and reward system. In a SME with a sharing culture, employees share ideas and naturally exchange knowledge with colleagues rather than telling forced to engage in these activities.

In the current pandemic context, in which companies are operating remotely while increasing the speed of use and creation of means of communication, it is imperative to analyze cultural aspects mixed with technology as a critical success factor, which is indispensable for communication, social interaction and collaboration. Considering these two facets, Participatory Design can be an opportunity to tackle both issues, whose importance is stressed by Lin [9], who emphasizes the influence of IT support in the KM adoption stage and a sharing culture in the implementation stage, respectively, and Chu [42], who states that both the technology and the knowledge culture are necessary to sustain knowledge management systems.

Information Technology is considered one of the main critical success factors for KM implementation [27, 35]. It plays a vital role enabling and supporting tacit knowledge creation, sharing, transfer and use, including geographically dispersed teams [41]. They are catalysts for knowledge development, as they help it to be managed systematically, helping to convert tacit to explicit knowledge by supporting communication, collaboration, and KM processes of accessing, capturing, storing, and sharing knowledge. Moreover, it is considered one of the KM pillars that impact on organizational performance together with people and processes [14].

Thus, IT helps SMEs to increase KM efficiency (providing relevant and reliable knowledge) and facilitate KM diffusion. Not only it is a mechanism for storing and managing information through a knowledge base, but it also promotes problem solving and decision-making through collaboration, communication, and sharing among peers, in the form of social networks, video-conferencing tools, blogs, wikis, discussion groups, e-mail or web portals [9, 41].

The effectiveness of KM tools (including technological ones) in the process of generating, coding, and transferring knowledge inside and outside organizations [43] depends on the existence of a collaborative and knowledge-sharing culture [44]. For instance, based on a two-stage model for organizational innovation diffusion, namely adoption and diffusion, Lin [9] concluded that for KM diffusion, IT support have a strongest effect on the KM adoption, while a sharing culture on KM implementation stage.

Despite this, SMEs are often weak in terms of IT competence, as they lack the necessary expertise and financial resources to plan, organize and direct these applications. IT competence refers to the ability to use applications such as online databases or intranet to support business functions. The greater the IT competence, the better they will achieve growth and pursue best practices, as IT enables, and support core KM activities and these resources must be ready as SMEs start to deploy KM initiatives. Hence, managers should pay attention to invest time and effort matching IT decisions to desired KM goals. Moreover, this IT strategy must be reliable, practical, and user-friendly to provide an easy means to access important and up-to-date content [9].

Successful KM implementation in SMEs also depend on top management support [19, 45], especially on the adoption stage, as only leaders can define KM purposes and strategies, drive these initiatives, and incorporate KM into business processes and organizational culture. This is because leaders act as change agents, facilitating innovations, encouraging, and influencing voluntary employee participation in donating and collecting important knowledge and skills within the organization to foster organizational competence [9]. Leaders can be considered catalysts of KM as they establish the conditions necessary to KM, support and are committed to it [19]. This leadership support to KM can be done through messaging, infrastructure, and resources provision and by stressing which type of knowledge is strategic for the firm [28].

Bearing this in mind, Participatory Design can be considered as an opportunity to stimulate the good use of technology and its effectiveness through a sharing culture and participatory leadership [16]. Technology itself does not foster knowledge sharing, as this depends rather on a separate extrinsic motivation that can come from organizational culture and top management encouragement [9]. Considering this structure needs to be designed in a personalized way for each company, it can be helpful to integrate the company’s workers in the design process, taking advantage of existing technologies combinations, instead of buying a new system. Indeed, there is no single, ready-made solution in KM systems: what works for one company may not work for another [27]. Thus, this scenario reinforces the usefulness of Participatory Design in KM implementation.

The use of Participatory Design might stimulate, as a spill over effect, a culture of collaboration favourable to knowledge among employees, customers, and suppliers in the process of knowledge exchange, favouring trust and a common ground that enables knowledge expansion within and outside organizational boundaries employing technological support. Moreover, SMEs have a fluid communication, more generalist professionals, flexible organizational structures, and short-term strategies which can support changes and innovative strategies and that can help them to catch opportunities coming from their customers’ needs and preferences [7, 46].

The next subsection presents some basic concepts and the context of Participatory Design to clarify this work main proposal.
Participatory Design

The reality understanding is based on tacit knowledge, that is, practical knowledge, intrinsic to people and difficult to express in words, whose dissemination takes place through a social process, in which people need to contribute to becoming part of the network of knowledge [47]. In this context, it is necessary to promote an organizational structure and culture that encourages the expression and retention of tacit knowledge within the organization, the improvement and expansion of knowledge bases, as well as the integration between individuals and knowledge through collaboration and sharing in a process of systematic transfer of knowledge and best practices [47–51].

Before introducing the concept of Participatory Design, it is worth understanding ’participation’. It is the action of being part of something or sharing something, referring to decision-making processes involving lay people in situations in which they strengthen their autonomy by expressing opinions and making decisions in the development of a project [52]. Participation involves people in the significant adaptation of their contexts to change their lives, valuing the capacity of local actors through methods that facilitate social learning and problem solving through the integration of different types of knowledge [53, 54].

Participatory Design came up with the idea of participatory democracy in Scandinavian Europe 40 years ago, allowing citizens to participate in decisions that impact their lives; over time, the practice was also introduced in the industrial sector and in systems development, in the design of products, processes and interfaces [55, 56].

Participatory Design involves actors with different roles, life contexts, experiences, and interests within the activities of the co-creation process and product or system design, such as designers, development teams and external partners—suppliers and their own consumers [57]. It supports the creation of the best user experiences with the product [39], which makes them more accepted, source and usable, as it values a way of thinking and acting of the participants during the development process, prioritizing empathy, dialogue and communication to reach a solution during the collective learning process [55, 57].

There is an approximation between co-creation and design, which together give rise to the terminology ‘Co-design’. Co-creation refers to any act of collective creativity shared by two or more people, whereas Codesign indicates collective creativity applied throughout the entire range of a design process, in the development of a collaborative project with a common goal involving creation of a shared understanding of the content of design, with the participation and integration of actors from different disciplines, trained or not in design [58].

Codesign (also called collaborative design) refers to the interdisciplinary process of developing products and services in partnership with various stakeholders (designers, users, promoters, decision makers). In this process, there are some levels of participation: i) informative (solitary); ii) consultative (weak participation); iii) collaborative (with people exerting more influence in decision-making) and iv) empowerment (which is when there is a transfer of control over decisions to people, with strong participation). Thus, it is denoted that participation and collaboration have points in common, although they do not mean the same thing [56].

The practice of Collaborative Design or Co-Design is not recent, but it has existed for over 40 years under the name of Participatory Design, and both have in common the fact that they bring the user and other actors to participate in the design process, regardless of their skills and abilities, with a single common goal [56]. While collaboration encourages the contribution of various actors in the creative process, participation promotes the active intervention of users in the development of the project, giving them power over project decisions, and design beneficiaries are not just a source of information for designers [59].

As Participatory Design deals with an important KM process, which is the creation of knowledge, this could also eventually favor it in terms of encouraging, establishing, or reinforcing a culture favorable to knowledge and its sharing. Thus, this work seeks to understand how the literature has been dealing with Participatory Design in the field of KM, identifying the relationship between them, as influences and applications. From the results of this review, several perspectives of empirical studies can be glimpsed, such as evaluating situations in which Participatory Design could be a strategy that supports the implementation of KM, favors some of its processes or minimizes the effects of some factors successful critics.

Due to the similarities between Participatory Design and other nomenclatures, such as Collaborative Design and Codesign, it was decided, in the review protocol, to adopt all of them to expand the range of studies related to the theme. In the next session, we present the steps followed to answer the research question.

The Relationship Between Knowledge Management and Participatory Design

KM is fully present in Participatory Design [25]. KM plays a key role in design processes, since management is crucial to coordinate design teams, as it represents knowledge schemes that aid in decision-making. Participatory methods contribute to creating favorable contexts and environments for people’s interactivity [57]. Hence, KM processes can be fostered due to interactivity, coordination, and participation.
facilitated by collaborative methods, which help in the design of innovative products and systems.

When individuals use the technological tools available to support PD methodologies, they enable interaction and provide the exchange of experiences. By focusing on understanding user needs, Participatory Design promotes knowledge sharing. In this sense, by fostering communication between multidisciplinary teams to find solutions to users’ problems in the most diverse contexts, Participatory Design methodologies act as a KM tool, fostering knowledge sharing, collaboration between individuals involved in the project and innovation [25]. Valtolina et al. [63] emphasize that Participatory Design is an important tool to support the projection and development of systems that support KM in organizations. When designing a KM system, it is important that the users of this system make their needs explicit so that the necessary requirements for the proper functioning of the system are mapped. In this case, the interaction between those responsible for the development of the system and the users becomes fundamental to determine the appropriate notations and structures to support the activities developed to promote the sharing of knowledge among the members of the organization. Another example of this is the research carried out by Camacho et al. [15]. They show how a knowledge management system (KMS) was designed in a rural low-knowledge school in Costa Rica with the aid of participatory methods promoted a learning culture that would encourage the use of the KMS, which involves the integration of people, process, and technology. When studying the use of Participatory Design in the supply chain, London and Singh [64] point out that participation appears to create effective high-performance collaborations in multidisciplinary supply chain groups on individual projects, given that the integration of consultants and contractors brings together the interaction of different worldviews, with the search for interaction, collaboration and communication for the implementation of an integrated design and delivery solution across the entire supply chain, considering that the actors in the chain operate most of the time in a virtual team.

Treasure-Jones et al. [69] highlight that Participatory Design methods are necessary for the creation of technological tools that promote informal learning, supporting both learning practices and the creation of knowledge in the organizational context. This provides changes in the way of promoting knowledge in the organization, facilitating the explanation of the knowledge of individuals.

For Hajrizi et al. [67], Participatory Design methods connect people, information and technology in a multidisciplinary way. When studying the environment of universities, the authors employ a vision of inclusive design that determines the vision, purpose and methods for building collaborative environments that facilitate the sharing of knowledge and the learning of individuals.

It is observed that technology is crucial to support participative or collaborative processes delivering a KM solution. In this context, the technology underpins the collaboration and implementation of KM in organizations. In this sense, the use of technology engages individuals with common interests to collaborate, co-create or develop a project related to KM, namely the design of interactive systems [63, 68] or the creation of a solution to improve design processes [64], a technological tool to facilitate learning during work [69] and an environment of virtual collaboration [67]. Thus, this review shows that technology is crucial to support participative or collaborative processes delivering a KM solution.

Nonetheless, various papers express the importance of participatory design for decision-making, creativity in working teams, knowledge sharing [71], innovation processes [72], risk management [73], to implement cropping systems for which little knowledge is available [74].

**Research Method**

To investigate the opportunities presented by Participatory Design in KM implementation in SMEs, we accomplished a qualitative and exploratory study based on a protocol adapted from Denyer and Tranfield [60] and Pinto et al. [61]. We sought to understand the opportunities presented by Participatory Design in KM implementation by tackling ‘information technology’, ‘organizational culture’ and ‘top management support’ as three main critical successful factors. Therefore, we accomplished an ethnographic study to analyze a KM implementation initiative in a Brazilian SME firm. Finally, we identified potential opportunities Participatory Design might present to similar contexts, by emphasizing each of the chosen critical success factors.

We chose to conduct ethnographic research once it analyzes the behavior of a group, social or cultural system, and is based on a deep description and interpretation of personal experiences within the studied contexts, combining observation, attentive listening, and participation in community events [75, 76], facilitating data interpretation [77]. We collected primary and secondary kinds of data. Primary data were collected from observation during a period of 5 months—from July to December 2020—of a working group’s meetings, called ‘Knowledge Management Squad’, a kind of committee responsible for KM implementation in a SME consulting firm focused on Information Technology solutions to big financial companies. As it is a characteristic of a SME, the company, not willing to invest a huge amount of financial resources on a consultancy to KM implementation, preferred to organize a working group to study and implement KM practices, although none of them had considerable experience in the field.
The group was made up of eight members: six from the company, representing each of the business units, one KM’s master student, and a consultant specializing in job training. In total, 22 online meetings through the MS-Teams’ platform were observed, with an average of 2 h each. The company was chosen using the criteria of convenience and accessibility, with the consent of the company’s partners. A field diary of each meeting was written by using a structure of folders in Microsoft OneNote containing the following aspects: i) date; ii) time; iii) purpose of the meeting; iv) participants; v) converging opinions; vi) divergent opinions; vii) decisions made; viii) researcher’s perceptions and; ix) remarks from members’ main ideas about each meeting topic.

In addition, secondary data, such as group documents (minutes of meetings, planners, mind maps, power point presentations from company meetings), were used as a complement to analyze the field diary to build the final report. To build the ethnography final report, we used a script as a support to characterize the organizational culture, understanding participants’ roles, behavior, attitudes, beliefs, routines, rules, activities, deliveries, aiming at finding evidence of multidisciplinary participation, members engagement during the process of designing knowledge management initiatives for the company, collaboration while using technological tools, level of interaction between members and the impact of all these in structuring KM initiatives.

For data processing, a thematic codification of the final report was done, based on topics related to technology, allowing to find opportunities presented by Participatory Design for KM implementation in SMEs focusing on this critical success factor. Thus, IT does not contribute to a successful KM initiative without considering organizational culture mechanisms that promote knowledge transfer [78].

**Opportunities of Participatory Design for KM Implementation Emphasizing Critical Success Factors**

As we could see in the ethnographic study, organizational culture and top management support influences the degree of use of the available tech tools. For instance, Squad made a good use of participatory techniques and technological applications to design KM in the firm studied. The research was conducted during the COVID-19 pandemic when enterprises were forced to completely adapt to a remote context, so conditions forced technology-driven collaborative work to continue the KM implementation project initiated before pandemic.

For this reason, as we could see from the example presented by Squad, the use of Participatory Design can be recommendable to establish an environment that encourages people to interact with one another before KM implementation and thus paving the way to enable sustainable knowledge sharing as part of the organizational culture [16].

In our previous work [25], we stressed how Participatory Design was useful to foster collaborative work taking advantage of already existing technological platforms to structure KM implementation. In the present work, though, we focus on how a better use of these techniques mentioned in the literature aligned with organizational culture and leadership aspects can help to present better results in KM implementation for SMEs, such as giving more attention to factors that support tacit knowledge sharing rather than explicit knowledge.

**Opportunities Presented by Participatory Design to SMEs**

As we could see from the literature and from the case studied, Participatory Design can be deemed as a KM practice, as it necessarily fosters tacit knowledge sharing by making people interacting with a clear goal. Squad was a good example in which collaborative work was used to establish KM practices in a consultancy firm. Moreover, the level of involvement and participation of Squad members in meetings was relevant to decision-making during each stage of implemented practices and to analyze as many variables as possible concerning solutions for problems they found along the project. Hence, Participatory Design methodologies are recommended to stimulate KM initiatives, as it needs diverse points of view from different participants of a company to be effective and to have members’ commitment.

**Technology**

One of the main opportunities for Participatory Design concerning technology as a critical success factor is the use of available communication platforms and collaborative tools. The company studied is technology-driven and had access to many platforms, low cost and free for use. In the beginning of the KM implementation process, the Squad started to explore these tools not only to communicate and enable collaborative work in the working group, which was remote, but also to design the two practices selected to be implemented in the pilot plant.

Squad’s work was eminently collaborative, so they used collaborative tools to the KM implementation process. Mind maps were used to organize topics and plan meetings as well as agendas. Moreover, online sticky notes were used for voting and structuring critical enterprise processes and the corresponding knowledge linked to them in design thinking sessions which involve companies’ members aiming at choosing the best KM practices for each type of knowledge. Figure 1 shows a sample of the use of an online tool used
by Squad to knowledge mapping. Information was collected
during online meetings in which participants could contrib-
ute for structuring each process on the board.

The green part consists of ‘activities’ contained in the
processes of one business unit; the yellow, the knowledge
involved in these processes, while the purple, the artifacts
generated and finally potential KM practices that could be
implemented or that are already being used.

After choosing KM practices that would help to manage
this mapped knowledge, it was necessary to establish all
necessary procedures and tasks to implement both practices.
To achieve this goal, the group collaborative used MS Teams
to plan agendas, host meetings, folders with materials, and
schedule activities to monitor group members’ task division
in a planner. Hence, this empirical case showed how tech-
nological tools can be collaboratively used and can help to
promote a positive impact on KM implementation.

One of the KM practices consisted in technical articles
and another one was lectures about a technical issue fol-
lowed by a happy hour to discuss the topic presented. Both
practices would be conducted by the own employees as a
strategy to knowledge sharing. Although both practices
already existed in the company, they operation were not
structured, so materials were not well stored and shared with
the rest of the company while only the same few people
participated organizing the topics and the events.

After several discussions, the working group decided to
create a knowledge base (called library) using the SharePoint
Platform to store documents and spread each KM practice.
The platform existed in the firm but was not being used,
so it helped to host the practice of technical articles pro-
duced by employees with tips and new technical knowledge.
This practice previously occurred spontaneously, dispersed
through e-mails, and without a stimulus from the company
to foster its constant production in a structured manner. In
this context, Marques Junior et al. [11], while examining
the degree of diffusion and intensity of use of KM tools
and practices in Brazilian SMEs points out that e-mail still
stands out as the most used tool to support KM, so there is
a need for greater dissemination of practices and tools to
support KM.

The practice Tech Hour, which consisted of giving lec-
tures about a technical issue related to solve problems in
consultancy projects, already existed before pandemic, but
Squad restructured the practice in MS-Stream to be linked
to MS-Teams and MS-SharePoint, helping to store and dis-
seminate content firstly exposed on a live. One important
group finding during these two practices’ implementation
was that MS-SharePoint might stimulate synergy, interactiv-
ity, and connection between the two implemented practices
and ease knowledge access. Nonetheless, it would be not
easy in the beginning to make it usual for employees.

The next section shows some opportunities presented by
participatory design to SMEs, based on literature and eth-
nographic research.

Organizational Cultural

Squad could better explore peoples’ engagement towards
knowledge sharing through the implemented practices if it
used the same methodology of participation internally on
the group by inviting other team members from the com-
pany—including more leaders—and more inside and outside
consultants to help to design the practices for the pilot plan.
This could have fostered a participatory leadership [16] as
well as a culture of local participation to implement KM
which could have helped to give effectiveness to the practices once they were implemented. The fact that only one partner participated in strategic KM design and in Squad meetings hampered the diffusion of a behavior prone to KM in the organization.

Moreover, we observed some aspects of organizational culture and leadership hindered this more inclusive process, such as a demand for productivity and respect to strict deadlines, circumstances which conditioned Squad’s work and results. Hence, Participatory Design can be an opportunity for SMEs since it overcome some critical success factors.

Employees’ involvement is considered a critical success factor to KM implementation [38]. In SMEs, it is especially necessary as knowledge is concentrated in owners and managers. Thus, Participatory Design can engender a cultural environment favorable to sharing and strengthen the formation of a shared vision [65] to KM that will later support KM strategies and make the attitude towards the processes of knowledge creation, storage, sharing and using more natural and part of the organizational culture.

Another important benefit of Participatory Design to SMEs is that it enhances trust among employees. SMEs environment is favorable to Participatory Design as they have some characteristics such as a verbal culture, proximity between employees, frequency in communication and a familiar environment.

Considering KM practices can have some knowledge topics in common, the platform can render KM effective if practices are concentrated in a unique hub and knowledge can be found by unified search engines. Nonetheless, in the company studied, the platform structuring counted with only two out of eight people from Squad working on it, which can prevent people to engage in it in the future if there is not a good communication plan to foster use. Thus, Participatory Design could play an important role in stimulating future KM users to express their needs and opinions, while participating in the implementation of interactive platforms and consequently making the organizational culture more prone to knowledge creation and sharing through the adopted practices.

In conclusion, participatory design can be an opportunity to firms that want to undergo digital transformation, which necessarily requires firms to close knowledge and technological gaps. Hence, through employee involvement and participation it is possible to explore some idle capacity while promoting creativity and innovation.

Leadership Support

Cormican et al. [16] stress that empowering leadership and participatory leadership are two main drivers in promoting knowledge sharing. Indeed, ethnography analysed that one of the company’s partners was responsible to kick-start Squad to implement KM. Moreover, leaders’ motivation was very important during Design Thinking sessions to knowledge mapping, as people was shy during sessions. Thus, not only leaders should participate in KM design, but they must also guarantee employees involvement and contribution to the process.

Another gap presented by Squad KM design was that strategy was mostly designed by Squad without participation of other leaders, partners, and employees. As a result, it was difficult for the group to make decisions and drive solutions as they were not convinced about priorities, even though the group had the obligation to monthly report their results to a strategic committee formed by all the firms’ partners. Hence, partners’ role as pioneers of a knowledge-oriented culture was reinforced. Nonetheless, a positive outcome of Squad was that recognizing leader’s importance to suggest strategic topics to be shared was that they created a mechanism of capturing interesting knowledge to be shared through implemented practices in committee formed by leaders that discuss project quality and work methodologies.

Hence, top management support is strategical to define a KM strategy; b) stimulate members to contribute to KM initiatives; c) create a knowledge sharing culture through stimulus to contribute to KM practices and by giving example; d) stimulate exchange between senior and junior colleagues in order to foster tacit knowledge sharing.

Discussion

Ethnography identified some gaps concerning participation that hindered workers and leadership involvement in decision-making relating to KM choices. Some organizational culture aspects such as productivity, deadlines and deliveries hindered Squad to benefit from involvement with other employees and companies’ Squads to foster synergies during the process of selection and structuring of KM practices, which prevented more innovative discoveries and the spread of the importance of KM across the company.

Nonetheless, the use of Design Thinking to knowledge mapping in the early stages of the KM project was a positive incursion made by Squad that could have been used in other circumstances during KM implementation, as it promoted the vision of leaders and led avoiding knowledge concentration and allowing the formation of a shared understanding about relevant knowledge in each business unit, stimulating people to think and explore current KM practices and develop new ones [25]. As acknowledged by Bertella et al. [71], this iterative design process uses an extensive range of tools, such as sticky notes, empathy, stakeholders with different perspectives, and a collaborative attitude helping to find creative ways of making a disruption in the business-as-usual way of thinking. Another positive effect of adopting
participatory methods is that leaders can interact with employees to develop innovative solutions to business making workers more productive and leaders less overloaded.

As a result of Squad not using too much participatory strategies to communicate with other groups and colleagues was that KM Squad members were much more committed and motivated to the applicability of knowledge to generate value for the company than others that were not involved. This is not a result of a lack of interest, as companies’ members were interested in managing accumulated knowledge, as it could be seen from other KM initiatives around the company to store content before Squad’s advent. In this sense, the creation of Squad culminated in a community very committed to KM due to its members active roles, a behaviour desired for all members around the company.

The lack of knowledge about KM made other companies’ members more distant and with a lot of doubts and difficulties understanding Squad’s goals and implementation process. Thus, workers’ involvement can also be considered a critical success factor for KM implementation [38] and stresses how workers can contribute to reaching organizational goals through communication, knowledge sharing and collaboration to problem solving [16]. Figure 2 exposes contrasting aspects related to each critical success factor observed in Squad and participatory design opportunities based on the literature review.

Participatory Design is important to promote a multidisciplinary and empathic perspective, a joint solution about KM and to establish a shared vision and purpose to create collaborative tools and environments that can facilitate the development of KM process, such as knowledge creation and knowledge sharing. In this sense, if Squad have promoted the involvement and participation of other partners and specialists during their meeting sessions, it might have promoted more engagement and motivation for people to participate in the implemented practices as an environment of mutual learning in the design of KM should be created [15] later supporting an effective knowledge-oriented culture, as users could effectively contribute to design KM practices implemented according to their needs.

Participation should be an element to be considered while designing KM implementation strategies for SMEs. First, it is necessary to involve leaders in KM design and implementation. In Squad, although the project initiated due to an initiative of one of the partners, much of the strategies rested concentrated on Squad and not effectively designed with partners’ participation. As a result, decision-making was slow and Squad members did not have a complete understanding about what were the priorities. Moreover, leadership support in very important to release budget to technological investments and to engage companies’ members in KM initiatives by their example. Figure 3 shows an overview of our discussed results in a summarised way.

Participatory Design can be considered a useful strategy to tackle SMEs KM critical success factors that later help to implement KM. Hence, the lack of considerable funds to pay consultancy firms to implement KM should not hinder these companies to innovate by using already available tech and human resources to KM design as illustrated by our studied case. Some SMEs’ characteristics, such as members’ proximity and a familiar environment favour the creation of working groups to KM design, as members tend to be more collaborative if they trust their peers. Participation can also be used to make people discuss already implemented KM initiatives making additional improvements. Contexts in which people participate in KM developments could be confirmed in...
Hajrizi et al. [67], Zaman and Falak [68], Treasure-Jones et al. [69] and more recently on Camacho et al. [15].

**Conclusions**

Theories currently fail to explicate how to tackle KM’s critical success factors to KM implementation in SMEs. Nonetheless, Participatory Design presents some opportunities to narrow this gap. This work investigated the opportunities presented by literature on Participatory Design to implement KM in SMEs from “technological” [25] organizational culture and leadership support perspectives. We based our analysis comparing a concrete KM implementation case that profited from available technological devices to KM design with the literature about participatory design to find opportunities to tackle critical success factors and help to KM implementation in these types of firms.

Our previous study showed Participatory Design has potential to engage teams and people participation to implement KM in SMEs by taking advantage of existing technological platforms on the firm [25]. In this sense, we suggested SMEs consider exploring available tech tools to engage employees to design KM. In the current study, we acknowledge that technology itself is not sufficient to effectively implement KM, so we suggest that those firms profit from environmental conditions such as a familiar context and greater proximity between people to stimulate interaction and collaborative work, which pave the way to use participatory design techniques such as design thinking. As we could see in ethnography the more people participate in knowledge sharing the better they will trust each other, foster knowledge creation, and give rise to a knowledge-oriented culture.

Another important aspect refers to leadership. Before any KM initiative, there must be a leader to organize and establish a goal to KM and a strategy. We indicated that leaders have an important role to share knowledge with less experienced members and to indicate relevant knowledge to be disseminated through the company. Participatory Design in turn can foster participative leadership discussions and stimulate leaders to contribute to KM initiatives, giving space to a knowledge sharing culture.

There are some study limitations. First, it is based on only one case study. Further studies can overcome these limitations by replicating this research in different organizational settings. Moreover, they can explore the impact and relationship of Participatory Design in each critical success factor. The more participation is stimulating the better leadership involvement, knowledge sharing among employees and the use of available human and technical resources aiming at KM purposes.

Further research will envision to analyse other types of SMEs to verify if Participatory Design could also help in designing KM initiatives from the perspective of critical success factors and chose which of them could be most benefited by Participatory Design. Hence, SMEs’ lack of financial resources should not be a barrier to KM implementation, as the methodology presented encourages firms to take advantage of its own available technological, cultural, and human resources by making people to interact and share their accumulated knowledge.
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Declarations

Conflict of Interest No.

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