Participatory Design in Knowledge Management: An Opportunity to Small and Medium Business

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Abstract: Knowledge Management (KM) has become an essential driver to develop dynamic capabilities for businesses, organizational learning, and boost knowledge assets 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 KM implementation within Small and Medium Enterprises (SMEs). Our study explores if Participatory Design might be considered an opportunity for KM implementation in SMEs, by focusing on information technology as a critical success factor. To achieve this goal, we conducted an ethnographic study in the real environment of a consulting firm that is starting its own KM. Our results show that Participatory Design might be recommended to SMEs to implement KM, by taking advantage of already available, but underused technological tools.

1 INTRODUCTION

SMEs are the main sources of job creation and local economic development. Despite representing 90% of businesses in the world (Durst and Bruns, 2018), SMEs have limited resources in which require developing dynamic capabilities to remain competitive in a constantly changing market (North and Babakhanlou, 2016).

SMEs are important drivers of economic growth in Brazil. Data from SEBRAE (2020) show that there are more than 19 million companies spread across the Brazilian territory. Of these, around 89.93% correspond to SMEs and comprise the most diversified segments. They are responsible for employing around 20 million people and have a 30% share of the Gross Domestic Product (GDP).

Knowledge and the capacity to manage it are considered the most distinctive and strategic assets a business can have, as it helps firms to act intelligently, and it is also a driver to organizational learning. The success of any firm depends on this intangible resource (Nieves and Osorio, 2015). In this context, KM intends to manage organizational knowledge through the coordination of people, processes, and technologies through the creation, sharing, and application of knowledge aiming at promoting organizational goals (Dalkir, 2017; Davenport and Prusak, 2005).

Despite this, there is a tendency in KM to focus on large businesses and neglect SMEs (Durst and Edvardsson, 2012). Moreover, 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 sharing culture, leadership support and managers' commitment, as well as the absence of an information technology infrastructure that supports information sharing

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(Wong and Aspinwall, 2005; Anand, Kant, Patel and Singh, 2012; Miklosik and Zak, 2015).

As a way of stimulating KM implementation in those companies, by tackling the critical success factors, Participatory Design can be deemed as a promising opportunity. Increasingly applied in design projects, one of its characteristics is to provide users' participation, through empathy and communication, understand their behaviors and what they want during their experience with the product, enabling the creation of new attractive modes for user experience (Mahlamäki, 2013; Wang, Yu and Xu, 2017).

Since information technology is one of the most critical success factors in KM implementation, in this paper, we present the opportunities of Participatory Design to engage companies' members in implementing KM within SMEs. Hence, our contribution aims to strengthen the knowledge-sharing culture within SMEs organizations motivating and engaging people to participate in KM design initiatives. In this sense, employees can have the opportunity to discuss and present their own users' needs getting their belonging-sense that drives their engagement to KM effectiveness. To achieve this, the literature, discussing technology as a critical success factor, as described in Section II. Section III presents Participatory Design, while Section IV a systematic literature review approaching Participatory Design in KM and our research method. Finally, sections V and VI focus on our findings and discussions, while conclusions close our paper.

2 TECHNOLOGY AS ONE OF THE MAIN CRITICAL SUCCESSFUL FACTORS DURING KM IMPLEMENTATION

KM is recognized for assisting organizational performance through the implementation of tools, processes, systems, structures, and cultures to improve the processes of creation, sharing, and use of knowledge, which are crucial for innovation, competitiveness, companies' decision making, adjustment to market conditions and to create value for the business (Despres and Chauvel, 2001; Choy, 2005).

Despite the fact knowledge is one of the main assets of organizations, managing it is a challenge for SMEs. Although they are innovative by nature, since they produce customized products and services and are easily adaptable to changes in the business environment (Durst and Bruns, 2018), 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 (Durst and Edvardsson, 2012).

KM implementation could bring numerous benefits to organizations, such as sales growth, employee development (skills and learning), consumer satisfaction (loyalty), innovation, creativity, better relationship with other firms, improvements in human resources management, and organizational performance (Durst and Bruns, 2018).

Some KM processes are facilitated by SMEs' characteristics, which favor their implementation. On the one hand, knowledge sharing is favored by the familiar climate between employees, which promotes trust and strong social interaction, with higher frequency in communications, ease of information flow, and overlapping activities among colleagues. Knowledge storage and retention process, on the other hand, face constraints, since solutions are customized and differentiated, while the storage process demands 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 (Wang, Yu and Xu, 2017).

Before any KM initiative, however, it is necessary to pay attention to some critical success factors, which are activities and practices that must be directed to ensure KM implementation (Choy, 2005). Wong and Aspinwall (2005) list 11 critical success factors for KM implementation in SMEs, in this order of importance: support from top management and leadership; 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. From all these aspects, the ones related to people are more crucial than the technology itself in supporting KM Davenport and Prusak, 1998; Delong and Fahey, 2000), since the formation of a knowledge-sharing culture based on trust favors people's willingness to collaborate (O´Dell and Grayson, 1998; Govella, 2019). Hence, KM is recognized as a cultural phenomenon (Choy, 2005), whose main foundation is people.

Davenport and Prusak (1998), when approaching the eight success factors of KM, affirm that one of the most important conditions is the existence of a culture favorable to knowledge, not to mention the importance of motivated workers who develop, use

and share knowledge, in addition to the support and commitment of senior management and leadership.

An environment conducive to sharing presupposes the creation of a culture of knowledge sharing supported by leadership, in which employees understand the importance of knowledge sharing, highlighting trust as a key element for the formation of this culture and technological infrastructure that gives support to communication (Dorow, 2017).

Nonaka and Takeuchi (2004) call "ba" these favorable environments for the creation of a shared culture of trust and empathy, in which participants share their context and create knowledge from a network of interactions. These informal environments allow people to develop mutual respect and friendship in their relations over time, even more than in clearly established channels (Dorow, 2017).

Despite these considerations, 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 and focus on one critical success factor that is currently decisive for others to flourish: technology, which is indispensable for communication, social interaction and collaboration. Thus, this study opted to analyze the opportunities presented by Participatory Design while tackling this factor.

Information Technology is one of the main critical success factors for KM implementation (Choy, 2005; Wong, 2005) as it plays a vital role in enabling and supporting tacit knowledge creation, sharing, transfer, and use, including geographically dispersed teams (Chugh, 2019). 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 organizational performance together with people and processes (Dalkir, 2017).

Despite the relevance of technology infrastructure for large-scale information sharing, it is necessary to think of mechanisms to engage workers in tacit knowledge transfer as it is often low and there is often a lack of confidence (Chugh, 2019), and to consider social, motivational, interactive, and organizational cultural aspects in the processes of knowledge creation and sharing (Hasanali, 2002). Thus, technology should be considered not only a mechanism for storing and managing information, but also a promoter of collaboration, communication, and sharing among peers, in the form of social networks,

video-conferencing tools, blogs, wikis, discussion groups, e-mail, or web portals (Chugh, 2019)

This interactive process can be facilitated by platforms, such as social networks, as they can function as a KM system to provide access to sources of knowledge that can be combined in different ways, stimulating knowledge creation through exchange between people with differing backgrounds. One advantage of these networks is the formation of a group identity, trust, and a common understanding that contributes to the transfer and creation of knowledge among the participants (Nieves and Osorio, 2015).

The effectiveness of KM tools (including technological ones) in the process of generating, coding, and transferring knowledge inside and outside organizations (Ruggles, 1998) depends on the existence of a collaborative and knowledge-sharing culture (Servin, 2005). Bearing this in mind, Participatory Design can be considered as an opportunity to stimulate the good use of technology and its effectiveness. Technology itself does not foster knowledge sharing, as this depends rather on a separate extrinsic motivation that can come from organizational culture or leadership encouragement. 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 (Choy, 2005). Thus, this scenario reinforces the usefulness of Participatory Design in KM implementation.

The use of Participatory Design might stimulate, as a spillover effect, a culture of collaboration favorable to knowledge among employees, customers, and suppliers in the process of knowledge exchange, favoring trust and common ground that enables knowledge expansion within and outside organizational boundaries employing technological support.

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

3 PARTICIPATORY DESIGN

The real 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 (Lee and Yang, 2000). 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 a systematic transfer of knowledge and best practices (Bhatt, 2002; Huysman and Wulf, 2006; Martins and Meyer, 2012; Gonzalez and Martins, 2017; Lee and Yang, 2000).

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 (Bratteteig and Wagner, 2014). 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 (Sanoff, 2007; Berthet, 2016).

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 systems development, in the design of products, processes, and interfaces (Camargo and Fazani, 2014; Straioto and Figueiredo, 2015).

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 consumers (Chen et al., 2018). It supports the creation of the best user experiences with the product (Govella, 2019), 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 solve the collective learning process (Camargo and Fazani, 2014; Berthet, 2016; Chen et al., 2018).

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 the 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 (Sanders and Stappers, 2008).

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 (Straioto and Figueiredo, 2015).

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 (Sanders and Stappers, 2008). 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 (Scariot et al., 2012).

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.

4 RESEARCH METHOD

To investigate Participatory Design in KM implementation in SMEs, we accomplished a qualitative and exploratory study based on a protocol adapted from Denyer and Tranfield (2009) and Pinto et al. (2017). We sought to understand the opportunities presented by Participatory Design in KM implementation by tackling information technology as one of the main critical success factors. So, we firstly reviewed KM literature in the last fifteen years. Secondly, 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 the critical success factor of information technology.

4.1 Participatory Design and Knowledge Management: Literature Review

In this literature review, we present a general evaluation about a topic, allowing us to find out literature gaps about an issue, fostering future investigations (Rivero-Baiocchi, 2019).

We accomplished the literature review through five steps as follow: i) research question; ii) definition of keywords, databases, and research strategies; iii) selection of articles based on abstract, title, and keywords; iv) full reading of selected articles and new filtration; v) presentation of results and discussion. In the first step, we considered the following research question: "Is there scientific literature addressing Participatory Design in Knowledge Management in the last fifteen years?" In the second step, we looked for publications related to the topic on online scientific databases: the Brazilian *Portal de Periódicos da Capes,* Science Direct, and Dimension, based on the keywords: "Knowledge Management" and "Participatory Design"; "Knowledge Management and Collaborative Design"; "Knowledge Management and Co-Design" from 2005 to 2020.

In total, we reached 108 papers regarding our target topic. So, in the third step, we have read the title, keywords, and abstract of all selected papers, which resulted in the second filter criteria. Moreover, we just considered complete articles published in national or international journals while we excluded duplicated papers. We selected papers that were related to the topic of Participatory Design and its synonyms to Knowledge Management and vice-versa as the main topic. At this step, 18 were chosen for full reading, and 90 were excluded of which 22 were

duplicated. In the fourth step, we re-evaluated those papers, including only those articles that presented a connection between Participatory Design, Collaborative Design, or Co-Design with KM, but not the contrary. In the fifth and last step, we analyzed the 13 papers. The criteria of analysis were focused on the content of the selected papers summarizing critically each one.

Our results show that KM is fully present in Participatory Design. 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. Interestingly, in the 13 paper remnants, we also found that participatory methods contribute to creating favorable contexts and environments for people's interactivity. 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.

The relationship between participative contexts and participatory design methodologies for the creation of KM systems, generate and share new knowledge, understand user requirements in product development, foster innovation, collaboration, and communication of multidisciplinary teams and communities of practice, create solutions in the most diverse contexts. In this context, two dimensions in the selected articles make a strong link between Participatory Design to KM: participation and technology, as presented in Table 1.

Table 1: Dimensions covered in selected articles.

Authors	Dimensions	
	Tecnology	Participation
Berthet et al. (2016)		X
Wang et al. (2009)	X	
Valtolina et al. (2012)	X	X
Wang et al. (2017)	X	
London and Singh (2013)	X	X
Van Der Bijl-Brouwer and van Der Voort (2014)		X
Rızvanoğlu (2018)	X	
Treasure-Jones et al. (2019)	X	X
Sakellariou et al. (2017)		X
Kyakulumbye et al. (2019)	X	X
Hajrizi et al. (2017)	X	X
Rivero-Baiocchi (2019)	X	
Zaman and Falak (2018)	X	X

Source: The authors (2021).

Of the 13 articles finally selected, ten concern 'technology', nine discuss 'participation, while only six both issues together. Nonetheless, only five

articles were selected to be discussed, as all of them have in common the fact that they address contexts in which participation is used to KM design, supported by technology, as shown in Table 2.

Table 2: Contexts in which participation is used to design KM solutions.

Author	Context
Valtolina et al. (2012)	A new perspective for designing and developing interactive systems to support collaborative knowledge management, involving the interaction of domain experts through participation to map and translate their professional models into the appropriate vocabularies, notations, and visual structures suitable for navigating between the elements of the interface, facilitating knowledge sharing among heterogeneous communities of practice.
London and Singh (2013)	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 are most of the time in a virtual team.
Treasure-Jones et al. (2019)	Participation occurs through collaboration to build a technological tool for informal learning, supporting learning practices and knowledge construction in real work contexts in healthcare SMEs, resulting in changes in practice, such as making individual knowledge explicit.
Hajrizi et al. (2017)	A collaborative design approach induces multidisciplinary participation towards the development of new and more complex ways to connect people, information, and technology in the university and with society. Employs an inclusive design approach to establish a shared vision, purpose, and methods to build collaborative environments to enable discovery and access, interpretation and analysis, creation and sharing of knowledge, valuing the social context of learning – where knowledge is acquired and understood through action, interaction and sharing with others, often made possible by technology.
Zaman and Falak (2018)	Participation takes place through the engagement of the local community in the process of designing systems for knowledge management in a rural indigenous area.

Source: The authors (2021).

Analyzing these five articles, it should be noted that all of them necessarily involve 'technology' to include and engage people from different backgrounds and disciplines from the same context of work or community to collaborate, co-create or develop a project related to KM, namely the design of interactive systems (Valtolina et al., 2012; Zaman and Falak, 2018) or the creation of a solution to improve design processes (London and Singh, 2013), a technological tool to facilitate learning during work (Treasure-Jones et al., 2019) and an environment of virtual collaboration (Hajrizi et al., 2017). Thus, this review shows that technology is crucial to support participative or collaborative processes delivering a KM solution.

4.2 Ethnographic Research

We conducted this research through ethnographic research once it analyses 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 (Silverman, 2005; Schuler and Namioka, 2015), facilitating data interpretation (Kozinets, 2010). We collected primary and secondary kinds of data. Primary data were collected from observation during a period of five 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 an SME consulting firm focused on Information Technology solutions to big financial companies. As it is a characteristic of an SME, the company, not willing to invest a huge number 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 two hours each. The company was chosen by 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; ix) remarks from members' main ideas about each meeting topic, as illustrated in Figure 1.
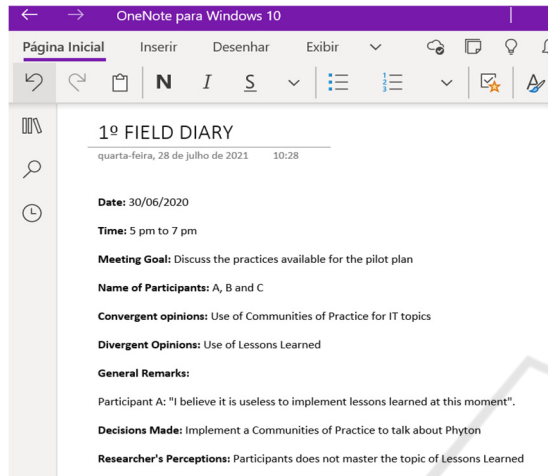

Figure 1: Example to illustrate how field diary was elaborated.

In addition, secondary data, such as group documents (*e.g.*, minutes of meetings, planners, mind maps, MS-PowerPoint presentations from company meetings), were used as a complement for our analysis of the field diary to write the final report. Moreover, to the ethnography final report, we used a script 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 (Karlsen and Gottschalk, 2004).

5 RESULTS: PARTICIPATORY DESIGN FOR KM IMPLEMENTATION

Analyzing the company in which ethnography was carried out, organizational culture influences the degree of use of the available tools. For this reason, Participatory Design tends to have greater chances of success within technological platforms in conditions that favor collaborative work among employees. The research was conducted during the Covid-19 pandemic when enterprises were forced to adapt completely data collection to a remote context. Thus, Participatory Design could be recommendable for the good use of existing technology platforms and tools that can support the KM implementation process. The technological dimensions identified were the use of already existing communication platforms and the use of online collaborative tools.

5.1 Using Already Existing Communication Platforms

The company had some underused platforms in many of its functionalities. With the beginning of the KM implementation process, the Squad started to explore these tools not only to communicate and enable collaborative work but also to complete a complete KM cycle in each practice implemented, namely knowledge creation, sharing, storage, and use. Two practices were chosen to be implemented in the pilot plant. First, a practice related to writing technical articles and another one related to giving lectures, both conducted by the company's employees. Although both practices already existed, they were not structured, and materials were not well stored and shared with the rest of the company.

First, the working group after several discussions decided to create a knowledge base (called a library) using the SharePoint Platform to foment these KM processes in each KM practice. The platform existed in the firm but was not being used, so it helped to host the first practice to be implemented, i.e., technical articles produced by employees with tips and new technical knowledge. This practice previously and occurred spontaneously, dispersed through e-mails, and without a stimulus from the company to foster its constant production in a structured manner.

Second, the 'Stream' Platform started to be linked to MS-Teams and MS-Sharepoint to store and disseminate live lectures given by employees themselves on topics of the company's interest (a practice called Tech Hour, that after pandemic started

to be completely remote). One important group finding during these two practices' implementation was that MS-Sharepoint might stimulate synergy, interactivity, and connection between the two implemented practices and ease knowledge access.

KM practices could be completely structured by the Squad based on a KM cycle. For this, the group used a platform called MS-Teams to plan agendas, host meetings, folders with materials, and schedule activities to monitor group members' task division in a planner. Hence, the existing two practices were collaboratively organized by Squad. Considering decision-making, the level of involvement and participation of Squad members in meetings was relevant to implement the chosen practices and analyze as many variables as possible concerning solutions for problems they found along the implementation process. Hence, Participatory Design methodologies are recommended to stimulate a starting KM project, as it needs diverse points of view from different participants of a company to be effective and to have members' commitment.

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 founded 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 design the platform.

5.2 Using Online Collaborative Tools

Another aspect analyzed was the use of online collaborative tools in the KM implementation process. As Squad's work was eminently collaborative, it was necessary to create mind maps to organize new content about KM, organize the topics to be discussed in each meeting, and the agendas of the meetings. Moreover, online sticky notes were used for voting and structuring critical enterprise processes and the corresponding knowledge linked to them in Design Thinking sessions, to elucidate the best KM practices for each type of knowledge, online spreadsheets, online voting forms, etc.

One of these tools used by Squad to map critical knowledge was 'Ideaboardz', as can be seen in Figure 2. All this information was collected during online meetings in which participants could contribute to structuring the board.

The green part consists of the '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.
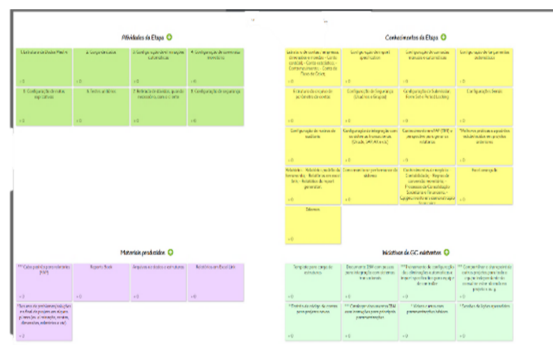

Figure 2: Mapping strategic knowledge through an online toll called Ideaboardz.

6 DISCUSSION

Although communication platforms and other technological tools were used for KM implementation in the company studied, ethnography identified some gaps concerning participation that hindered workers and leadership involvement in decision-making relating to KM choices. Squad barely benefited from other company Squads' involvement to make some synergies during the process of investigation and structure of the practices, which prevented a lot of discoveries and the spread of the importance of KM and its meaning across the company since the beginning of KM Squad.

Participatory Design can be useful to boost the possibilities of taking advantage of available technological resources and can promote some spillover effects: a) a culture of collaboration among employees; b) prevent people inhibition; c) promote collaboration among leaders and led, avoiding knowledge concentration within seniors; d) fosters the emergence of other methodologies, such as hackathons, which involve people from different areas to solve complex problems; e) helps to better explore current KM practices and to develop new ones, following KM cycle of capture, creation, sharing, storage, and use; f) encourages people from different areas to share knowledge not only during collective events but also during individual work. Also, it was verified that workers involved in KM design (the group Squad) 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 are interested in managing accumulated knowledge. 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 and stresses how workers can contribute to reaching organizational goals through knowledge sharing and collaboration to problem-solving.

Participation should be an element to be considered while designing KM implementation strategies for SMEs. The lack of considerable funds to pay consultancy firms should not hinder these companies to innovate by using already available tech and human resources to KM design as illustrated by our case. Some SMEs' characteristics, such as members' proximity and a familiar environment favor the creation of working groups to KM design, as members tend to be more collaborative if they trust their peers. Thus, contexts in which people participate in KM developments could be confirmed in Hajrizi et al. (2017), Zaman and Falak (2018), Treasure-Jones et al. (2019).

7 CONCLUSIONS

The theory currently fails to explicate how to tackle KM's critical success factors to KM implementation in SMEs. Thus, integrating theory on Participatory Design and KM presents itself as an opportunity to solve this fail and extend theory in both areas. In this paper, we investigated the opportunities presented by Participatory Design to implement KM in SMEs using technology, a critical success factor in KM implementation, through a literature review and accomplishing ethnography research. In this sense, the paper analyses the opportunities of participatory design in the KM implementation process based on lessons learned from a concrete KM implementation case that uses the support of technological devices, which is also a KM critical success factor. Our results show Participatory Design has the potential to engage teams and people participation to implement KM in SMEs by taking advantage of technological platforms. In this sense, we suggest SMEs consider exploring available tech tools to engage employees to design KM since if it is combined with a familiar context and greater proximity between people, they

support interaction and collaborative practices, which enables trust for knowledge sharing.

It should be noted some study limitations. First, the explorative nature of only one case study. Hence, generalisability should be avoided. Further studies can overcome these limitations, replicate this study in a dissimilar organizational setting. Moreover, they can explore other critical success factors that could be strengthened by Participatory Design or the relationship between them. For instance, leadership could be strategic to encourage people participation in structuring the best usage of technological platforms' potential for the sake of KM.

Finally, in further research, we will explore the impact of Participatory Design in other critical success factors and the opportunities behind it in the same case study. Also, we suggest future research to analyze other types of SMEs to verify if Participatory Design could also help in designing KM initiatives from the perspective of critical success factors such as leadership, strategy, organizational culture, and which of them could be most benefited by Participatory Design. Hence, despite SMEs' lack of financial resources to invest in innovation, Participatory Design should be seen as an opportunity for firms willing to implement KM, by taking advantage of its own technological and human resources.

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