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Organizational mindfulness to innovation at an organization in the cork sector

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Abstract

Purpose – The purpose of the research described in this paper is to provide empirical evidence pointing to IT artifacts' contribution to organizational mindfulness.

Design/methodology/approach – To accomplish the specified aim, the authors studied how a leading company in the cork industry uses a platform to support the innovation process's ideation phase. This case study took two and a half years, and the research information was collected in documents, meetings, observations and interviews.

Findings – The study provides empirical evidence pointing to the funneling of collective attention induced by the studied platform. The use of an innovation platform was engaging the collective attention to the incremental innovation of processes to the detriment of products' disruptive innovation.

Originality/value – The authors' findings contribute to developing an IS mindfulness theory and designing sociotechnical arrangements that expand organizational mindfulness. The analysis of the gathered research information resulted in a first explanation for the impact of using IT artifacts on organizational mindfulness. The resulting framework emerged as a first step in the effort to develop an IS mindfulness theory, paving the way for developing a methodological approach to support CIOs in addressing the challenges of the digital age.

Keywords Attentional engagement, Information systems, IT use, Organizational mindfulness

Paper type Research paper

Introduction

In the digital economy, organizations collect, produce and process a vast amount of information to make sense of internal and external changes. The information systems deliver various visualizations, alerts, recommendations and reports to support the decision. The organization's intricate technological infrastructure exposes decision-makers to many informational stimuli to which they must pay attention. Herbert Simon, Nobel Laureate economist, noted in the 1970s that when information becomes abundant, it creates a poverty of attention. By placing a massive strain on the limited attention capacity of organizations, the ability to develop shared perceptions that strongly bind collective cognition and action – collective attentional engagement (Barrick *et al.*, 2015) – may be impaired (Green *et al.*, 2017; Hoefer and Green, 2016), therefore creating difficulties in interpreting situations and leaving organizations vulnerable to manipulation and threats (Alexander and Lyytinen, 2017; Sun *et al.*, 2017). Through attentional engagement, organizational members, intentionally and in a sustained way, allocate cognitive resources to problem-solving, planning, sensemaking and decision making (Ocasio, 2011). Attentional engagement is required to obtain a deep understanding of situations, quickly identify unexpected events, and implement a prompt and effective response.

Attentional engagement with issues and action alternatives produces a certain level of collective mindfulness. The resulting level of mindfulness is dependent on the collective ability to sustain attention (stability of attention), allocate adequate cognitive resources to understand

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situations and act effectively (vividness of attention), and interconnect insights (coherence of attention). The study of the impact of IT artifacts on collective mindfulness has been the subject of some studies focusing on how using IT artifacts shapes organizational mindfulness. In Dernbecher and Beck (2017), the authors offer a general perspective on information systems (IS) research addressing the concept of mindfulness. According to these authors, and with relevance to our study, the concept of mindfulness has been used as (1) a prerequisite for effective IT use; (2) an accelerator of IT use; and (3) an implication of IT use. Dernbecher and Beck (2017) refer to several knowledge gaps in the IS research that need to be addressed to better understand how mindfulness, at the various levels of analysis, impacts and is impacted by the use of IT artifacts. Of particular interest for the discussions in this paper is the need for research addressing how the use of IT artifacts impact mindfulness at the organizational level of analysis. Organizational mindfulness can be seen as the collective ability to spot unexpected changes, counteract unrealistic expectations, remain focused on the events as they unfold and perform core business tasks even in the face of breakdowns or changes (Gärtner, 2013).

To address this knowledge gap, this paper describes a case study carried out to answer the research question:

RQ1. How does the collective attentional engagement enacted by the use of IT artifacts impact organizational mindfulness?

The study is grounded on the attention-based view of the firm (Ocasio, 1997) and Rerup's concept of attention triangulation (Rerup, 2009), jointly explaining the dynamic structure of the collective attentional engagement. Our study focused on the use of a platform to manage innovative ideas and projects. We studied how the platform engages users in exchanges about innovation goals and practices, idea generation and assessment and innovation success or failure. We sought to clarify the contextual constraints shaping those exchanges, thus establishing the boundary between what was considered relevant and what could be ignored.

In our study, we aimed at understanding how the attentional engagement enacted by the studied platform contributed to the collective mindfulness to innovation challenges/opportunities, resulting in a certain degree of reliability in meeting the strategic innovation goals. To achieve this goal, we analyzed documents communicating the organization's innovation strategy and describing the support provided by the platform to its users. For 2.5 years, we took observation notes about the platform's use and the various interactions outside the platform. During this time, we also interviewed 13 users considered central to the success of the platform and innovation strategy.

Complementing the research in the information systems field with theoretical insights from the management field, we intend to contribute to the development of an IS mindfulness theory. We expect that this knowledge helps managers assess the quality of IT-mediated organizational attention and define sociotechnical arrangements that expand organizational mindfulness. Furthermore, a better understanding of the impact of information systems on collective attention will support the design of effective strategies to bind human and artificial cognition to achieve organizational goals.

The paper is organized as follows: in the next section, the theoretical insights about organizational attention and mindfulness are presented; then, we provide an overview of the use of the concept of organizational mindfulness in IS research as a way to frame the case study described in the paper; the research methodology and the case study are then described. Finally, an account of the framework emerging from our research is offered.

Organizational attention as a collective and distributed capability

Attention is a scarce and critical capability distributed in the organization. Attention is crucial to interpreting the diversity of issues and action alternatives collectively perceived as relevant to achieve strategic goals (Sutcliffe *et al.*, 2016).

The organizational structure and communication channels allow distributing the effort of attention by the various members of the organization (Ocasio *et al.*, 2018; Kleinknecht *et al.*, 2020). The quality of organizational attention is related to the collective ability to (1) identify the information that is relevant to implement the organization's mission, (2) sustain the attention for the time needed to interpret all relevant information, (3) stay alert to unexpected events and (4) integrate the various insights produced at the different levels of the organizational structure.

According to Ocasio (2011), organizational attention emerges from the interplay of three attentional processes: attentional perspective, attentional engagement and attentional selection.

The *attentional perspective* may be rooted in the past organizational experience (backward-looking) or the environment's knowledge that supports anticipation of events (forward-looking). It provides the direction for collective attention and defines how organizations allocate resources in understanding situations and acting upon that understanding. The dominant strategy of the organization corresponds to the dominant attentional perspective.

Through *attentional engagement*, organizational actors, intentionally and in a sustained way, allocate cognitive resources to problem-solving, planning, sensemaking and decision-making (Ocasio, 1997; Mantere and Vaara, 2008). The communication dynamics produced by attentional engagement, continuously creating and modifying attentional perspectives, would quickly result in attention overload. Bansal *et al.* (2018) mention that the detailed monitoring of all potentially relevant problems and opportunities overloads the organizational resources and can bring out contradictory information, increasing the likelihood of failures.

The *attentional selection* process is central to avoid the overload of attention because it limits the number of issues and action alternatives to which the organization pays attention at each moment. It integrates mechanisms to select what the organization, or its groups, should focus on and ignore, therefore dealing with the complexity and variety of available information and leveraging effective decision and action. Attentional selection ensures the efficiency of attentional engagement over time.

Organizational mindfulness emerges from the interplay between the three attentional processes. In other words, organizational mindfulness reflects the performance level of organizational attention viewed as a collective capability distributed in the organization. This performance may be mindful or mindless, and we propose that it fluctuates between these two extremes over time. Organizations may engage in dealing with events and information they deem relevant while being unable (1) to identify non-salient cues and signals pointing to threats or opportunities; (2) to remain focused on events for enough time to understand their consequences; and/or (3) to perform core business processes in the face of breakdowns or changes. These would be clear signs of lower levels of organizational mindfulness.

Organizational mindfulness: the quality of organizational attention

Rerup (2009) posits that attention is a dynamic capability; its quality varies over time and among the various focuses of attention in organizations. According to this author, the organizational attention quality integrates three dimensions: stability, vividness and coherence. *Stability of attention* refers to sustained attention required to develop a deep understanding of situations (Maslach *et al.*, 2018; Salvato and Rerup, 2018). *Vividness of attention* implies a rich and relatively broad understanding of a set of inter-related aspects; the focus of attention is directed to the analysis of various elements at the same time to generate complex interpretations of situations, even when contradictions are found in the available information (Vendelø and Rerup, 2020). *Coherence of attention* implies that attention at the various organizational units, functions and responsibility levels is similar, complementary, and compatible (Strike and Rerup, 2016; Rerup and Feldman, 2011). As a result, the organization pays proper attention to organizational and

environmental stimuli deemed relevant by the dominant attentional perspective – the strategy (see Table 1).

Each dimension of attention produces incomplete understandings of problems and opportunities; the three dimensions' triangulation is necessary to create a mindful attentional engagement at all organizational structure levels (Rerup, 2009; Vendelø and Rerup, 2009). The dimensions of attention are deeply intertwined, and it is not possible to optimize one of them separately without negative consequences arising in the others (Rerup and Levinthal, 2014). From a certain level of attention stability, for example, via an enhanced adherence to routines, the organization begins to exhibit an extreme and rigid performance, becoming more vulnerable to market changes. On the other hand, monitoring all warning cues makes the organization more susceptible to distraction. Moreover, the massive amount of information available to the organization can make it challenging to prioritize the emerging action alternatives, making the organization vulnerable to the manipulation of internal or external decision-makers. Finally, the collective effort to achieve high levels of coherence in the organizational response can result in greater difficulty integrating different perspectives on events (reduced vividness) and increased business processes' rigidity (increased stability), making the organization less prepared for innovation and learning.

Organizational mindfulness in the information systems literature

Once the theoretical foundations of organizational attention (capability) and organizational mindfulness (quality) have been presented, it is now important to provide an overview of the research in Information Systems using these concepts.

In Dernbecher and Beck (2017), the authors offer a general perspective on Information Systems (IS) research addressing the concept of mindfulness. According to these authors, the concept of mindfulness has been used as (1) a prerequisite to effective IT use; (2) an

Table 1. The extreme points of the dimensions of organizational attention

The extreme points of the dimensions of organizational attention	High	Low
Stability	Deep and undistracted attention to issues and responses	Superficial attention
	Attentional discipline over time	Poor time management. Difficulty prioritizing tasks
	Accurate analysis of situations. Enhanced ability to remember	Difficulty in understanding situations
Vividness	Enhanced ability to detect problems and opportunities in the periphery of the main focus of attention	Inability to detect unexpected information
	Freedom from existing schemes and conceptual labels	Tendency to develop naïve understandings
	High capacity to create complex understandings and clear insights into situations	Difficulty in generating new answers
Coherence	Right balance between top-down attention (strategy/planning) and bottom-up attention (distributed experience)	Inability to define a common pattern of attention (strategy)
	Right balance between external and internal focuses at all levels of the organization	Duplication of time and effort in analyzing aspects (potentially not relevant)
	High levels of motivation and cooperation	Conflicting/uncoordinated perspectives, leading to widespread demotivation

accelerator of IT use; and (3) an implication of IT use. Most of the papers reviewed fall under categories (1) and (2). A smaller percentage addresses mindfulness as an implication of IT use.

The authors also found that research has focused on the organizational, group and individual levels of analysis, with mindfulness seen as an organizational characteristic, heedful interrelation of individual activities or a cognitive propensity. Our paper's perspective focuses on mindfulness as an organizational characteristic.

Given these insights, we decided to review literature after 2017 and focusing on mindfulness as an organizational characteristic; we also sought literature addressing the role of using IT in shaping organizational mindfulness. This literature review clarifies the relevance of our research's contribution.

The reviewed literature describes the role that the use of IT can play in shaping attention stability, vividness and coherence at the organizational level. By shaping and interrelating these attentional dimensions, IT artifacts enact attentional triangulation and contribute to organizational mindfulness. The literature addressing this impact of IT artifacts is scarce. The review of the literature published between 2017 and 2020 found only ten papers directly addressing it. The other papers found (44) present organizational mindfulness as a prerequisite or moderating factor in the adoption and use of IT; several papers study how individual mindfulness shapes or is shaped by the use of IT artifacts.

Impact of IT artifacts on attention stability. Some scholars emphasize the importance of leadership and the precise definition of organizational roles (Vendelø and Rerup, 2020) to ensure that organizational routines are respected and prompt action to address organizational challenges is enacted (Gracia *et al.*, 2020). Routines stabilize organizational attention and ensure the *codification of knowledge* on aspects considered relevant to the business's success (Kleinknecht *et al.*, 2020). In the same vein, scholars in the IS field emphasize IT's role in stabilizing organizational attention (Salovaara *et al.*, 2019). Say that automating operations increases *adherence to routines*, expanding the organizational capacity to *investigate issues and alternative actions* previously defined as relevant. However, these authors note that by automating their operations, organizations often become less able to cope with changes and complex problems, usually associated with high-risk situations. These authors analyze the role of digital operations, stressing that while algorithms typically display a high accuracy of analysis of information within their processing scope, they also reduce the organization's ability to anticipate events and prepare for opportunities/problems outside its primary focus. This translates into lower mindfulness about the organization's environment. The authors recommend a greater balance between digital and human operations when automating organizational routines.

Stable organizational attention promotes the adequate interpretation of the complex situations that organizations increasingly face and the proper processing of the huge volumes of information accessible to them. Maintaining the stability of collective attention requires adequate coordination of activities, smooth communication of information to decision-makers, the training of workers in the practices and technologies that ensure the proper performance of their functions, the timely distribution of resources and constant attention to key performance indicators (Callari *et al.*, 2019; Enya *et al.*, 2020; Wu *et al.*, 2020). Kleinknecht *et al.* (2020) stress that the experience gained by the continuous focus on information considered essential for the organization's success can result in the rejection of clues that contradict that experience, making the organization vulnerable to threats from the environment.

Impact of IT artifacts on attention vividness. Vendelø and Rerup (2020) suggest that organizations have to continually challenge how work is organized to sustain and rebuild the focus of collective attention. Salovaara *et al.* (2019) mention that organizations must ensure multiple ways of reporting problems, analyzing information and discussing scenarios to quickly adapt and respond to divergent and unknown situations. The effort to maintain the vividness of attention is essential to counter the rigidity of operations that may arise from

efforts to stabilize organizational attention (Gracia *et al.*, 2020). For Le-Coze (2019), the ability to *identify non-salient issues and actions* and *improvise* must be stimulated in the organizations. These abilities allow organizations to perceive, for example, near-accidents and foresee the decisions required to minimize the near-misses (Enya *et al.*, 2020). Therefore, the used IT artifacts should redirect *information search* according to emerging knowledge needs, increase decision-makers' ability to identify disparate information, and support innovative solutions to unexpected problems. Li *et al.* (2019) suggest that digital transformation-mindful organizations are better prepared to identify technological developments that can promptly support the implementation of their business strategy; thus, these organizations show an enhanced ability to respond to environmental turbulence.

Keller *et al.* (2019) report a trend in organizations to decoupling, the use of decomposed and unresponsive systems that enable organizations (1) to strengthen routines, rules and procedures needed to consistently sense and respond to external events, and (2) to sense unexpected opportunities and threats and quickly respond. However, while decoupling seems to work in the short-term, it produces a fragmented IT landscape that is often costly to maintain and hinders the integration of the various focuses of attention in the organization (negative impact on the coherence of collective attention).

Impact of IT artifacts on attention coherence. Coherent organizational attention promotes flexible responses in daily operations and critical situations. Vendelø and Rerup (2020), Salovaara *et al.* (2019) and Kleinknecht *et al.* (2020) mention the importance of the *ability to reconfigure competencies* to address changes in dynamic and competitive environments. For Le-Coze (2019), this capacity is visible when the organization is capable of self-design. The organization implements self-organization initiatives to make operations more flexible and responsive. Lichtner and Westbrook (2019) mention the role sensemaking activities may play in organizations' ability to reconfigure competencies, including facilitating the adoption of IT applications that reinforce new competencies.

Nevertheless, IT applications that strengthen rules, routines and procedures, such as ERP systems, may also hinder the ability to reconfigure organizational competencies, therefore, slowing down the reaction to market opportunities (Keller *et al.*, 2019). Moreover, Le-Coze (2019) warns that self-organizing may have unwanted consequences. It may generate unexpected patterns leading to undesirable events and deviations from the strategy, compromising communication and collaborative decision-making effectiveness.

Collaborative decision-making encourages team learning, may prevent rigid interpretations of situations and fosters proper resource management. Social media tools and collaborative systems have been studied in the context of decision making for their ability to provide information, support knowledge transfer and assist in reaching consensus or negotiated decisions. These same systems can also make collaboration and decision more difficult given the high volume of information they collect and communicate, which can cause attention overload (Barros and Ramos, 2019; Ramos and Barros, 2019). Therefore, these systems must deliver information to people or groups recognized as reliable information processors, distributing interpretation's effort in the organization. Li *et al.* (2019) state that the relationship between technology specialists and users is a major factor in deploying technological structures that minimize the effort to interpret the high volumes of information that organizations currently have access to.

The proper integration of the various focuses of attention in the organization requires *effective communication channels* (Salovaara *et al.*, 2019). Moquim (2019) stresses that IT artifacts institute communications channels. Meaningful communication supports the accommodation of diverse viewpoints, facilitates knowledge sharing and strengthens the collective focus on the multilevel implications of decisions (Poston and Kettinger, 2014). Therefore, the challenge is to design IT-based communication channels that reduce the impact of uncertainty and equivocality in business processes (Chang *et al.*, 2016; Li *et al.*, 2019).

Attentional triangulation promoted by the use of IT artifacts. The reviewed literature (ten papers) focuses on how technology promotes attentional engagement around aspects relevant to decision and operations, mobilizing cognition and collective action to solve problems and take advantage of opportunities. The use of IT tools, such as data analytics, big data, social media, artificial intelligence and, innovation platforms, affect collective mindfulness in teams (Curtis *et al.*, 2017), the execution of operational/supporting activities (Nwamkpa and Roumani, 2018; Ramos and Barros, 2019) and the organization as a whole (Oliver *et al.*, 2017; Holm *et al.*, 2020). As a consequence, IT ends up shaping the quality of decisions, sometimes in unexpected ways. While technology can play a central role in extending the organization's ability to process high volumes of information (Nwamkpa and Roumani, 2018; Holm *et al.*, 2020), it can also promote the communication of information in a continuous and not integrated manner, leading to attention overload (Oliver *et al.*, 2017; Ramos and Barros, 2019). As a result, there is a decrease in collective mindfulness and a consequent reduction in the decision's quality when the collective attention cannot process the incoming information.

The role played by IT artifacts in the distribution of cognition to enhance organizational attention has also been studied, particularly in the context of automation of operations. Organizations are seen as sociotechnical systems that integrate mindful attention (human) and mindless attention (algorithmic). The correct integration of these two elements of attention in the operational activities is considered fundamental to ensure organizational reliability (Salovaara *et al.*, 2019; Asatiani *et al.*, 2019). Yet, many organizing challenges remain underexplored, including "human–automation task allocation, mitigation of the risk of deskilling, and management of collective knowledge across human and automation" (Asatiani *et al.*, 2019). Collective mindfulness is seen as emerging from these sociotechnical arrangements, ultimately determining the organizations' reliability (Callari *et al.*, 2019; Lichtner *et al.*, 2019; Salovaara *et al.*, 2019) and market agility (Keller *et al.*, 2019).

We do not intend to present an exhaustive list of studies using the concepts of organizational attention and mindfulness in the IS field. The research presented in this section is helpful to position our study by raising the main insights about how the use of technology shapes the dimensions of organizational attention and how it impacts organizational mindfulness.

Considering the increasing digitalization of organizational processes and business models, it is increasingly necessary to understand better the influence of IT use on the organizational mindfulness of events and circumstances. Our study aims to develop an IS theory of organizational mindfulness. For this, our work integrates previously developed insights into a new framework that emerged from our case study. Our study is a first contribution to clarify how organizational attention, as a collective and distributed capability, can be improved by IT artifacts, resulting in enhanced organizational mindfulness towards events and circumstances, thus influencing organizations' quality of decision.

Studying the impact of IT use on the organizational mindfulness: the research framework

Given previous research work described in the last section, it is clear that IT artifacts play a central role in enacting attentional engagement and shaping organizational mindfulness. Consequently, we formulated the following broad research question:

RQ1. How does the collective attentional engagement enacted by the use of IT artifacts impact organizational mindfulness?

Our research question assumes a sociotechnical perspective of the information systems field (Sarker *et al.*, 2019), studying IT artifacts in the context of their use by collectives (the organization), which induces a particular impact on organizational mindfulness.

Our in-depth study was conducted in the world's largest cork organization – Cork S.A. (fictitious name) – which has remained the industry leader for more than 145 years. The organization currently has about 4,000 employees, more than 25,000 customers, and it is present in 70 countries. Its turnover reaches 702 M €/year, of which 7.5 M € are invested annually in R&D. The US National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) are among its best-known clients.

Cork S.A. was selected because of its representativeness in the national and international markets and its heavy investment in innovation, communicated in reports and public contents. Innovation is considered a structuring part of its organizational strategy.

We applied the case study method (Yin, 2017) since our goal was to gain an in-depth understanding of the phenomenon unfolding within the context being studied (Darke *et al.*, 1998; Tsang, 2013), namely the impact of the idea management tool – CORK.IN – on the organizational mindfulness about innovation demands and opportunities. Moreover, the studied platform's enacted collective attention is an intersubjective construction, rendering the case study a particularly adequate research method (Pan and Tan, 2011; Walsham, 1995).

Our intention is not to identify new conceptual variables that define the phenomenon but rather to explain it in detail, raising the subjective and intersubjective aspects that support it. The purpose is to develop a holistic explanation of how the attentional engagement enacted by an artifact (an idea management tool) shapes the collective mindfulness (innovation demands and opportunities). Again, we consider that the case study is an adequate method to achieve this purpose.

The case study lasted for 2.5 years (December 2013 to May 2016) and included research activities in all business units, the Holding and the R&D unit. The study was performed according to the principles of qualitative research (Cavaye, 1996). Its design was guided by Klein and Myers's principles of interpretative rigor (Klein and Myers, 1999).

Theory-driven decisions

In line with the theories that guide our study, we decided to focus on four structural dimensions of innovation in the organization: (1) innovation strategy defined by the holding company (dominant pattern of attention), (2) the communication within and between the business units, (3) the innovation process implemented and (4) the collective attentional engagement enacted by the idea management tool (CORK.IN).

We started by understanding the discourse elements inserted in the Holding and R&D Unit's innovation strategy. The information used to disseminate the innovation strategy was analyzed and employees contributing to its internal and external promotion were identified and invited to the interviews phase. The analysis of gathered documents included identifying their intended audience, structure (style of the language, chain of ideas, incentives and authority implicit in the text) and the rhetoric used (vision, objectives, values, statement of urgency). The communication practices defined in the strategy were also identified and analyzed (sanctioned interactions and resources – with particular emphasis on the communicative role of the CORK.IN Platform). Other aspects that were studied included the approaches defined for decision and negotiation and the incentives and rewards available (including those aimed at promoting the use of CORK.IN).

The communication and collaboration practices established within and between the business units defined the context for implementing and using the CORK.IN Platform. Therefore, they were the object of a thorough investigation by analyzing documents (addressing strategy and procedures) and observing employee participation in innovation activities. We studied the innovation process implemented transversally to all business units, from the ideation phase to the final stage of commercialization of innovative products or internal adoption of the developed innovations. We gathered information about local innovation strategies and their alignment (or lack of it) with the dominant innovation strategy.

Regarding the CORK.IN Platform, we studied the supported language, the enacted communication (vertical and horizontal), its users' roles in the innovation process, how information produced (reports, visualizations and alerts) was used, and the legitimation of decisions endorsed by the platform. In this way, we aimed to understand the engagement enacted by the platform with issues and action alternatives (stability, vividness and coherence).

To analyze the data gathered in documents, observations and interviews, we used three main concepts derived from the theories that support our study: (1) the three dimensions of collective attention to innovation (stability, vividness and coherence), (2) IT use and (3) organizational mindfulness. The categories that emerged from the content analysis were grouped in these concepts. The grouped categories were linked to allow for the contextualized description of the concepts and their interrelations.

From the performed analysis emerged a contextual explanation for the impact of the CORK.IN on the collective mindfulness about the innovation demands and opportunities. To generalize this explanation, we looked for constructs used in the literature that could be considered similar to the identified categories. It was decided to use the literature listed in Ocasio *et al.* (2018), Ocasio and Joseph (2018) and Dernbecher and Beck (2017) papers because they are two very recent, comprehensive and systematic literature reviews. We included all papers by Claus Rerup, the scholar who proposed the three dimensions of attention. Together with the papers already mentioned in the sections devoted to the literature review, we analyzed a pool of 87 papers published in management and information systems' top journals. This focused literature review led to slight adjustments to the categories that emerged from research information.

Ensuring rigor

The research design was guided by Klein and Myers's principles of interpretative rigor (Klein and Myers, 1999). All research information gathered during the first stage of the study (meetings, observations, documents) was interpreted according to the hermeneutic circle principle that posits that a text's meaning must be found within its cultural, historical, and literary context. Therefore, transcriptions, notes and documents were analyzed by (1) relating individual parts within the same text and across texts, whenever they referred to the same events, constraints, insights; (2) linking individual textual elements with the insights from the whole text or related texts; (3) verifying emerging interpretations in documents against the procedural, legal and historical contexts of innovation in the company.

The analyzed documents helped to elicit the communicative and discursive practices used to convey the organization's innovation strategy. We sought information about sensemaking processes and the negotiation of different perspectives on the innovation and collaboration objectives. The insights thus obtained were subsequently compared with the observation notes and interview transcripts, offering the context for further analysis.

The research team was careful to involve participants with different sensitivities and experiences, including managers, technical and administrative staff of the Holding, R&D unit and the five business units. In addition, the research participants were users or promoters of CORK.IN.

All moments of interaction with the participants were carefully planned and recorded to gather information rich in detail and diversity of local meanings. After each meeting or a small set of consecutive meetings, the research team met to discuss the interactions, identify moments in which communication was not the most effective, and define ways to improve communication with the participants.

The ABV theory and Rerup's theoretical perspective on the triangulation of attention provided the interpretive framework to analyze transcriptions and documents, which allowed for the emergence of abstractions and generalizations as proposed by Klein and Myers (1999).

The research themes were then discussed with the participants to elicit feedback that could inform the researchers about theoretical bias constraining the interpretation of gathered information.

Gathering and analysis of research information

Research information was gathered in documents, meetings, observations of participants performing their tasks, and semi-structured interviews.

The documents analyzed included various technical reports, internal documents and informative materials, and public content about the organization and its innovation strategy. A total of 59 documents and more than 3,220 pages were analyzed, including each business unit's consolidated organizational reports and internal annual reports (2005–2017).

These documents analyzed and codified helped understand the organization's strategic interests, structure and political arrangements and gain insight into the organizational culture and image it intended to project externally (Chowdhury, 2010; Gray, 2004; Denscombe, 1998). Moreover, these texts provided useful information to guide and contextualize observations and interviews. Besides, the documents provided a window on how the technologies evolved over the years until the need for CORK.IN emerged.

The research team held four meetings with the organization's top management to validate the insights from the documents' analysis. The first meeting included a visit to two business units' facilities and a general presentation of the entire organization. During the second meeting, the team presented the study to the manager directly responsible for implementing the CORK.IN Platform, who granted access to key people. The research participants were selected to allow observations and interviews in all business units and the group's Holding. Each interview was followed by visits to the plants to observe the activities and use of CORK.IN mentioned by the interviewee.

The two other meetings allowed gathering the views of the managers responsible for the decision to adopt the CORK.IN Platform. In these meetings, the developers of the platform were also present. These participants provided important information about, on the one hand, the CORK.IN's functionalities and, on the other hand, the rationale behind the platform's design and the way it was used in the various business units.

When visiting the various facilities, the research team took notes at the place of observation or within the two hours immediately after leaving the visited facility. A total of 22 pages of observation notes were produced and later subjected to content analysis, further contributing to the identification/consolidation of theoretical categories; they also helped make small adjustments to the interview guide to make the best possible use of each interviewee's profile.

A total of 16 semi-structured interviews were conducted, involving at least one director/manager of each of the 05 business units (10 interviews, in total), and 6 interviews with C-level management of the Holding. The interviewees were selected due to their management positions, power in shaping decision-making, and/or their role in championing CORK.IN's use in the business unit.

The interviews had an average duration of one hour. Emphasis was placed on the experience with innovation, the ideas the interviewee helped implement, and the use of CORK.IN. When the interviewee was a director of a department, the interview would also focus on the strategies adopted to stimulate the platform's use, the mechanisms adopted to foster engagement and motivation, his/her perspective about the usefulness of collaborative tools for the organization, and her direct and indirect involvement as a CORK.IN manager/user.

Each interviewee described their role in the organization, professional career, and professional development over the years. After this introductory part, the interviewee was encouraged to reflect on how CORK.IN interfered with the performed tasks, interactions, and

communication. The interview guide included a question about employees' motivation to use the tool; the perspective of participants responsible for championing the use of CORK.IN was particularly useful. The interviews provided interviewees with an opportunity to reflect on their experience of using CORK.IN to support the organization's innovation and its impact on communication and innovation practices over time and up to the present. The information gathered in interviews helped collect empirical evidence to understand the communication implemented to share and discuss innovative ideas, framing innovation concerns in the organizational culture and industry. All interviews were transcribed (143 pages) and later coded.

The observations were planned to understand (1) how tools were used in the day-to-day work and how employees felt towards using CORK.IN in comparison with other collaborative tools existing in the organization; (2) how CORK.IN supported the innovation process across the business units; (3) how this platform influenced communication and decision in the organization; and (4) how innovation strategies and routines directed decision-makers' attention.

The observation notes and interview transcripts transmitted resistance to CORK.IN and attention overload in the various business units. The insights gained with the analysis of interviews and observations guided the next stages of documents' access, interviews and observations. The results were then integrated into subsequent reports made available to participants for validation and feedback.

The supporting theories – attention-based view of the firm and attentional dimensions – guided the research's design and content analysis; they facilitated assessing the relevance of emerging codes, categories and explanatory themes (Gioia *et al.*, 2013). Research themes were connected to produce the larger narrative providing a situated account of how the attentional engagement was enacted by CORK.IN and how the tool impacted organizational mindfulness of innovation demands and opportunities.

Attentional engagement in collaborative ideation: a case study

Synopsis of the study

Cork S.A. consists of a Holding company, five business units, and a strategic unit exclusively dedicated to supporting the group's R&D and Innovation efforts. These five business units are consolidated in their sector of activity, namely:

(1) Raw materials ensure the optimization of the flow of raw materials. This business unit holds the responsibility to prepare, study and decide the company's multi-annual supply policy. Its innovation focuses on the promotion of the quality of cork and the best practices of cork oak forest management.

(2) Cork Stoppers supplies wine producers and distributors worldwide. This unit's innovation focuses on the stopper's quality, which must both be safe (non-detectable TCA) and benefit the wine. The unit produces natural and technical stoppers. The latter category includes a stopper that combines cork with glass for easier handling and reuse.

(3) Coatings produces and distributes cork floor and wall coverings. It is internationally renowned for the quality and innovation of its products. Innovation in this unit focuses on the aesthetics and durability of the coatings.

(4) Composite Cork is the most technologically advanced business unit. It reuses the surplus cork from the rest of the cork industry and develops high-performance materials for multiple industries – such as aerospace, panels and composites, automobile, gaskets and seals, electricity industry, construction, sports surfaces,

flooring, consumer goods, furniture and footwear. For NASA and the European Space Agency (ESA), the unit produces spacecraft shielding materials.

(5) The Insulation business unit produces acoustic and thermal insulation agglomerates that are 100% natural. This business unit's innovation focuses on developing new products and applications; environmental protection and natural resources conservation are ongoing concerns.

The five business units have independent operational management. Yet, these units are linked by a common organizational strategy, including the innovation strategy. The organization considers its main strategic challenges to bring added value to cork, developing innovative solutions for the market through a strong investment in Research, Development, and Innovation (R&D + I). To address this challenge, Cork S.A. incorporated an autonomous unit entirely focused on R&D + I activities; this unit was consensually considered one of the organization's main strategic pillars.

The strategic decision to incorporate this R&D + I unit produced some changes, both in processes and communication. These changes were viewed positively by all the directors in the various business units. Everyone understood innovation as the key to business success. In the interviews with top managers, the concern with *product innovation* and the organization's *ability to lead the market* stood out:

> Today, we have a team that enables us to be constantly in innovation and presenting new solutions to our customers. (E1)

At the top management level in each business unit, the concern for innovation was fuelled by the cross-cutting strategy in this area and the need to see innovation aligned with the organization's business strategy. There was a concern for product innovation while, at the same time, there was a tendency to focus on the innovation of production processes.

Since the implementation of the CORK.IN was transversal to the entire organization, it led to structural and procedural changes; its acceptance depended on the success of a transversal innovation culture. CORK.IN was considered instrumental in nurturing this success. The practices that the platform institutionalized in the organization were considered the most appropriate for high-value innovation.

Research results

The strategy provides the ground for integrating activities and achieving consistency between functions and units (Porter, 1986). The innovation strategy defines the issues and action alternatives with which organizational members should engage to perform their tasks. It connects the various foci of attention in the different phases of the process.

Collective attentional engagement with innovation. The pattern of attention defined by the organization-wide innovation strategy promoted engagement with product innovation to increase the organization's market value. Since 2011, Cork S.A. has implemented initiatives to foster collaborative innovation and make communication easier between business units.

The organization maintained continuous and intense internal communication about the importance of innovation and the central role of employees' creativity at all organizational levels. The innovation manual used to communicate the innovation process had been developed collaboratively by representatives of the various business units. The innovation process's formalization was fundamental to consistent collective engagement with innovative ideas, projects, and results.

The communication of the strategy and process of innovation was not limited to the internal context. This communication was also happening with its environment by disseminating the investments in innovation on the organization's website and social networks. The most innovative projects were annually presented to stakeholders and the market in general.

The discourse to external stakeholders communicated the organization's pride in the number of patents it has developed over the past six years (40 patents) and its constant presence in international innovation and technology events. Integrating one of the most traditional industry sectors, this information showed an innovative and non-conforming corporate culture at the forefront of the industry in which it had few competitors to match.

The value of innovation was promoted internally to encourage the adoption of concepts and practices, engaging all employees in discussions about common innovation challenges. This engagement was seen as fundamental to capitalize on internal knowledge and experience and, from there, to obtain results that promoted the organization's external image: patents, innovative projects, investments. Innovation governance channels were already well-established and able to consistently integrate the efforts of key players in the various business units. Our interviews showed a good understanding of the innovation routines being implemented to engage the attention of organizational members at the various units with the well-defined issues (routinized engagement with innovation) and alertness to the emerging issues, methods and responses (vivid engagement with innovation).

Using CORK.IN to leverage ideation in the business units. Over the years, innovation has emerged as an effort specific to each business unit, focusing on the particular needs of the niche markets they addressed. CORK.IN was viewed as a collaborative tool with the potential to advance the sharing of innovative ideas and to facilitate communication. It was expected to help institutionalize concepts and practices, share knowledge and discuss the perspectives of the various internal experts; it supported the evaluation and selection of ideas and projects.

> Within the scope of an Idea Management Program for which I am responsible, we identified the need to have a platform that responds in areas such as: (1) workflow for approving ideas which includes different levels of access; (2) a scoring/reward system of these ideas; and (3) a channel of knowledge sharing among users. (E1)

Ideas shared on the platform would go through commenting and improvement before being submitted to a formal evaluation performed by a technical team integrating managers from the various business units. If selected for further development, the authors of the ideas were awarded points. The sum of the points received over time was a source of internal reputation, indicating the various participants' degree of creativity and expertise in the organization's ideation process.

Stabilizing attention with CORK.IN. The organization's R&D + I Unit prepared an extensive training plan to ensure that all employees would become proficient in using the various features of CORK.IN. By learning the embedded best practices, the employees would be trained in the relevant concepts, values and beliefs about innovation, promoting an intersubjective space of communication and action that was considered key to changing from a culture of silos of collective experience to one of open collaboration.

> CORK.IN itself was an excellent idea and many of the tasks that we have down there [in the offices] today were CORK.IN's ideas, which arose from improvements in jobs, improvements in terms of communication between people, panels, many different things, we have several ideas. (E7)

The long history of the various business units' innovation was based on an in-depth knowledge of the business and market expectations. CORK.IN was expected to enable the sharing of this experience, allowing cross-pollination of ideas. On the platform's Wiki, users were able to post on a particular subject and, in a collaborative way, see their contributions complemented by other employees. The Wiki provided knowledge representations often used to support the description of innovative ideas or support the selection of ideas. These knowledge representations were shared in articles focusing on a particular subject and/or in reports and practical reflections. They were giving voice to the decision-makers in the different organic units.

The Wiki use allowed for the detailed description of innovation challenges and the aggregation of multiple contributions focusing on a new process, the logic underlying past decisions, or other issues considered relevant to innovation. Nevertheless, the sharing of information via Wiki was felt by some interviewees as an effort that took time away from them to perform their usual tasks.

CORK.IN integrated an internal social network – referred informally as *Facebook* – to promote collaboration and the exchange of experience. This functionality facilitated interaction among the employees registered on the platform. It also supported sharing information, questions, and suggestions, categorized into central interest themes to the organization. The CORK.IN's social network did not differ much from social networks such as Facebook and LinkedIn; this similarity capitalized on the experience of using those other networks.

> I try to maintain, as much as possible, my Facebook wall active, sharing information because inside the [company] . . . We are a very large Group, many times others do not know what we do here. (E13)

> The communication part, which is what I. . . I maintain . . . me and XXX keep it a little . . . and XXX enough, that he is also responsible for it but, we try to keep this forum very active, even for people to receive alerts that there is a message, and end up going there right? and then they see other things. (E2)

Our study of the use of the CORK.IN platform allowed to identify some key categories describing the interconnection between the stability of attention and the use of CORK.IN. Table 2 presents these categories.

Attention to non-salient cues enabled by CORK.IN. The transversal communication facilitated by CORK.IN was seen as fundamental for greater collective attention to the impacts of decisions and a faster reaction to new problems/opportunities resulting from these

Impact of CORK.IN on the stability of collective attention

Codes	Category	Description	Attention stability and CORK.IN
Investment on innovation	Resources allocated to innovation	Time, incentives, budget, human resources dedicated to innovation	Time and effort put in using CORK.IN to innovate were rewarded
Time to use the platform			CORK.IN implemented the defined innovation incentives and best practices
HR allocated to innovation			Significant budget allocated to the innovation supported by CORK.IN
Innovation practice	Adherence to established practices	Institutional effort to stabilize the innovation practices across the various business units and ensure compliance with those practices	Training was provided to learn innovation practices and use CORK.IN
Innovation policy			CORK.IN contributed to the institutionalizing innovation routines
Knowledge sharing (wiki, forum, social network -SN)	Experience's repository	Use of tools to preserve and share knowledge	The Wiki and the social network features of CORK.IN allowed for the codification of knowledge relevant to innovation. This knowledge base guided the assessment of shared ideas, stabilizing the attention to issues and action alternatives that experience proved relevant

Table 2.
Attention stability and the use of CORK.IN

decisions. CORK.IN' social network supported the fluid and transversal communication between business units. This meant that production and administrative challenges, very similar across the organization's business units, were quickly propagated internally, prompting strong engagement with sensemaking, problem-solving and opportunities' seizing.

> CORK.IN ... is a communication tool [...] to get ideas for improvement or other innovative initiatives. [...] has room for suggestions [...] we make use of the platform of CORK.IN, which is a platform that we use for the communication of suggestions. (E11)

Some published information, often about technology and science advances relevant to the cork industry, immediately received extensive comments, suggestions, and testimonies, whether positive or negative. This online dialogue fostered a collective understanding of the operational challenges faced by the various business units. It encouraged the development of innovative solutions that would meet the multiple dimensions of problems.

CORK.IN integrated a discussion forum seen as another feature to support the open discussion of issues relevant to innovation. The Forum was a communication channel dedicated to the discussion of specific content. Decision-makers in specific technical areas were able to transmit their messages to a broader audience. Thus, on the one hand, the organization was able to identify specialists from a particular area. On the other hand, the relevant experience was being recorded to be used when needed, feeding the collective memory. This structure organized by discussion categories widened the attention of the forum's users.

The forum was feeding creativity and insight by keeping participants informed about issues that might not be in their immediate range of interests. Some interviewees mentioned the need to complement the forum discussions with face-to-face interactions to help structure the reflections around an idea and develop actionable concepts (see Table 3).

Tying the various focuses of attention with CORK.IN. Cork S.A.'s business units stood out in the national and international markets for their products' quality and ability to integrate relevant scientific and technological developments. Over time these units had developed their innovation strategies and practices. Our study found the organization was making an effort to integrate these different foci of innovation.

> An employee, when s/he has a good idea for innovation, that has positive effects on production, quality, new markets, new products, safety, anything in these areas and that brings actual benefits to the company is considered a CORK.IN idea. And then there is retribution; there is the recognition of a prize to the employee for having shared these ideas. (E3)

The ambassador's role was created to facilitate the emergence of bottom-up leadership that could encourage participation and self-organization around cross-cutting innovation challenges. These ambassadors were responsible for engaging employees in daily participation and supporting an ever-evolving body of knowledge to guide innovation in the organization's business's best interests. The diversity of information generated by ambassadors' constant intervention ensured greater fluidity of communication and the consistency of practices throughout the organization.

> It happened that I became responsible for encouraging the use of CORK.IN here in this unit, for managing CORK.IN for people who do not have access to the computer. Each person who has a computer makes their entering of ideas and manages their Facebook wall. People in the factory that do not have a computer, I'm the link to make this ... to make this contact. (E2)

CORK.IN was a core tool to connect the foci of attention within and between the business units. Ambassadors in charge of disseminating the platform gradually made innovation a collaborative process, independent of the business unit in which the participants were located (see Table 4).

Impact of CORK.IN on the vividness of collective attention			
Codes	Category	Description	Attention vividness and CORK.IN
Use of searching functionalities SN comments Participation in events Training	Resources to search for information	Tools, incentives, budget, facilitating processes that supported the sharing of experience and the gathering of external information	CORK.IN social network and forum, together with international conferences and exhibitions, were used to capture and share internal and external changes with relevance for innovation
Sharing of cues	Alertness to changes	Efforts to analyze available data to spot cues about innovation demands, innovative approaches and environment changes	CORK.IN social network and forum allowed for the sharing of news and insights gained externally. They enacted attentional engagement with potential innovation issues and solutions
Information flow	Flexibility in solving problems	Shown ability to get better or faster results. Swift change of production processes to integrate an incremental innovation	By supporting the communication between the business units, CORK.IN was highlighting common innovation challenges in production and administrative processes
Communication of innovation issues			Challenges were spotted faster and in a more sophisticated way than previously

Table 3.
Attention vividness and the use of CORK.IN

> CORK.IN force the units are to sit together. (E1)

> [. . .] like the CORK.IN innovation platform that belongs to the holding company, but they decline there for the business units; that's why we work on a transversal way. (E16)

Collective mindfulness to innovation. The previous sections described an organization attentive to the challenges of innovation and implementing a well-defined innovation process; various monitoring mechanisms were used to detect internal and external changes, which allowed its employees to identify problems and opportunities on the periphery of their main innovation concerns. The organization's employees demonstrated a strong commitment to solving innovation challenges even though the barriers linked to a tradition of independent innovation in the five business units did not allow a coherent interconnection of the various focal points of attention.

> It is not enough to have the idea here [. . .] this matters; it is strategic for the company; goes in the direction of what the company wants; there is market volume. Evaluating the idea takes a lot of work. Now, if we have hundreds of ideas, I mean, are we going to do that in all of them? Or has this already been worked on by those who came up with the idea? (E6)

CORK.IN was a central instrument for the engagement of collective attention. Its daily and generalized use produced a certain level of collective mindfulness to innovation. CORK.IN was channeling collective attention, integrating and expanding it; it was also reframing expectations and behaviors. In this sense, CORK.IN was a significant contributor to the organizational mindfulness towards innovation, sometimes seen as a disturbing factor.

On the factory floor, employees were encouraged to share innovation challenges. However, because of the intensive nature of the work performed there, these employees could not directly use the platform. Instead, the innovation ambassadors would enter, on the

Impact of CORK.IN on the coherence of collective attention			
Codes	Category	Description	Attention coherence and CORK.IN
Institutionalization of innovation Knowledge sharing	Enacting a transversal innovation culture	Ability to transfer knowledge about innovation and to implement the structural changes needed to create an innovation process across business units	The history of innovation, the platform's communication channels, and the innovation ambassadors were transforming the organization's innovation culture
Bottom-up collaboration Top-down collaboration HR allocated to innovation	Collaboration in decision making	Ability to collaboratively analyze and select innovative ideas for development	Decision-making linked to innovation was becoming a collaborative effort between managers, and those in the day-to-day execution of their activities felt the problems and opportunities
Knowledge sharing Idea sharing Incentives	Communication for innovation	Effectiveness of governance and operation channels in promoting the sharing and improving innovative ideas	CORK.IN had considerably improved the collective ability to share innovative ideas, select the best ones, and sophisticate them through the cross-pollination supported by experts in various fields

Table 4.
Attention coherence and the use of CORK.IN

platform, the challenges and ideas identified by factory workers. Since the ambassadors' availability to this task was limited, this intermediation led to some ideas being lost or not always being recorded according to the original understanding.

> CORK.IN appears a lot for people to open up a little bit in a way. And many times people are afraid, I feel it when I'm down there with them, they are afraid to try . . . to give an idea of improvement. [. . .] they have some sheets and fill them out . . . and give their idea and deliver. And if it passes through, great; if not, for them, it is fine as well. (E8)

Despite the effort to institutionalize innovation routines, some interviewees mentioned that to accelerate the selection of ideas to solve problems, they circumvented CORK.IN. Similarly, Cork S.A.'s top managers would sometimes define innovation projects based on external information instead of consulting experienced employees. Consequently, these ideas and solutions were not widely shared and did not immediately benefit other business units. Moreover, internal experts felt disempowered by this disregard for established routines and communication channels.

> [. . .] I have some facility to get my ideas [to the management] outside CORK.IN [. . .] if I think there is something that can work or that may work better and that it can solve a certain problem, I mean, I propose immediately it not using CORK.IN. (E6)

While CORK.IN's Social Network, Wiki and Forum generated significant interest and participation; these platform's features were also a source of attention overload. Most respondents reported great difficulty participating actively in discussions and information sharing due to their daily work intensity. While ideas related to the tasks they performed were easy to comment on and complement, disruptive ideas or shared by other business units could require a lot of effort to analyze and comment on. In these cases, CORK.IN was seen as a distraction factor, incompatible with the employee's other responsibilities. The result was a

tendency for the incremental innovation of processes instead of product innovation. The product innovation continued to be carried out mainly outside the ideation supported by CORK.IN and, often, would stay only within the business unit responsible for commercializing the product.

> Many of the tasks we have here today were ideas from CORK.IN. Improvements in jobs, improvements in terms of communication between people, panels, many different things, we have several ideas implemented. (E2)

Table 5 describes the most salient dimensions of the innovation mindfulness displayed by Cork SA, as impacted by CORK.IN.

Our study showed that CORK.IN was triangulating attention toward the incremental innovation of production and administrative processes and, therefore, deviating the attention from what was defined as a strategic goal of innovation – product innovation (incremental and disruptive).

Discussion of the research results: the emergence of a theory

To understand the organization's attention to innovation and, particularly to the ideation process, we identified the consensual categories from interviews and observations; then, we grouped them by the attention dimension to which they refer. The result of this process of characterization of collective attention is described on the left side of Table 6 (Case Study). Table 6 also identifies equivalent constructs in the literature (Literature column).

Emerging organizational mindfulness to innovation

Organizational mindfulness	CORK.IN impact
Preoccupation with failure	The platform was aligned with the organization's innovation strategy and implemented the best practices considered fundamental to maximize innovation success Over time, certain occurrences started to harm collective alertness to innovation challenges, and solutions, including (1) difficulties in reconciling day-to-day tasks with the effort required to describe an innovative idea and share knowledge, and (2) some ideas were passed on to R&D without being entered on CORK.IN. These occurrences were challenging the success of innovation supported by CORK.IN but were not addressed
Reluctance to simplify	Ideas were often improved with other participants' contributions independently of their location in the organization or areas of expertise. This allowed for cross-pollination of ideas and multidisciplinary inputs, therefore supporting sophisticated solutions to innovation challenges
Sensitivity to operations	The difficulty in reconciling participation with daily activities and the impossibility of workers on the shop floor to participate directly in ideation supported by the platform limited the knowledge about the five business units' operational challenges
Commitment to resilience	The knowledge codification encouraged by the CORK.IN's Wiki, forum and social network allowed to create a knowledge base used to inspire future innovation and ensure the platform's continuous flow of ideas
Deference to expertise	The platform's various features supported horizontal communication, knowledge sharing, and identification of specialists in the different areas of knowledge relevant to the innovation efforts Ideas and solutions from external sources and not entered on CORK.IN discouraged internal experts from participating in discussions on the platform

Table 5.
Impact of CORK.IN on organizational mindfulness to innovation

Table 6.
Abstracting the study's categories

Abstracting the study's categories Case study Category		Literature Constructs	References
Stability	Resources allocated to innovation	Effort investigating issues and action alternatives	Durand (2003), Rerup (2005)
	Adherence to established practices	Adherence to routines	Levinthal and Rerup (2006)
	Experience repository	Knowledge codification	Rerup (2015), Roberts *et al.* (2012)
Vividness	Resources to search for information	Searching intensity	Lansing (2007), Li *et al.* (2013)
	Alertness to changes	Ability to identify non-salient cues	Maslach *et al.* (2018), Nigam and Ocasio (2010), Rerup (2009), Thatcher *et al.* (2018)
	Flexibility in solving problems	Ability to improvise	Fritz *et al.* (2009), Rerup (2001, 2009), Salvato (2009)
Coherence	Enacting a transversal innovation culture	Ability to reconfigure competences	Barreto (2010), Nadkarni and Barr (2008)
	Collaboration in decision making	Adherence to collaborative decision-making	Joseph and Ocasio (2012), Joseph and Wilson (2018), Sutcliffe *et al.* (2016)
	Communication for innovation	Effectiveness of communication channels	Cornelissen *et al.* (2015), Curtis *et al.* (2017), Joseph and Ocasio (2012), Schoeneborn (2011)

In Figure 1, we propose that organizational attention moderates the impact of IT use on the organizational mindfulness about innovation (context of our study). In our framework, the IT Use construct was adopted from DeLone and McLean (2016). The Organizational Mindfulness construct was adopted from Weick *et al.* (1999).

Our framework suggests that attention can be understood as an organizational capability with three interrelated dimensions: stability, vividness, and coherence. Our framework proposes that IT artifacts are triangulation mechanisms contributing to the organization's mindfulness level (*triangulated attention*). The perceived quality of decisions and actions in

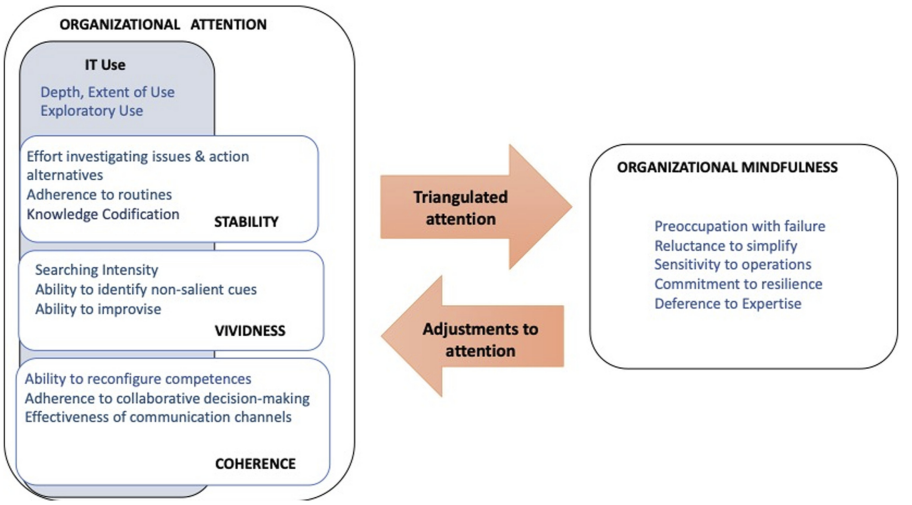


Figure 1.
Impact of IT use on organizational mindfulness: a first explanation

specific domains can raise awareness about the need to intervene in the focus or structural distribution of attention. This intervention can integrate different management approaches to address the problems. Our framework advocates changes in the use of IT artifacts to support collective attention dimensions. The changes can include the IT artifacts used and how they are used (*depth, extent, and exploratory use*), increasing or reducing organizational attention's stability, vividness, and coherence.

The following sections detail the framework's constructs, linking the use of IT artifacts with the dimensions of organizational attention and clarifying their contribution to organizational mindfulness. While IT artifacts are not the only triangulation mechanism, the increasing digitalization of processes and services makes this use a major contributor to the overall organizational mindfulness level.

The role of IT artifacts in distributing organizational attention

IT artifacts are an integral part of the structure of attention as they support/enable the flow and processing of information and the production of informational stimuli. The daily use of IT artifacts can potentially prevent the overload of collective attention. IT artifacts help clarify what should be monitored (ex: automatic information capture features) and how to perform tasks (ex: available features to support work). In this way, they reduce the effort *investigating issues and action alternatives* and promote *adherence to routines*. The *knowledge codification* they promote offers an additional contribution to the stabilization of attention by facilitating the understanding of meaning structures underlying organizational actors' actions and interactions.

Our framework proposes that organizations characterized by strong attention stability make *frequent and in-depth use* of IT artifacts. Users perceive artifacts as a means to improve their efficiency and inform their decision.

However, the cognitive comfort provided by IT artifacts can also narrow collective attention, preventing the detection of essential clues to timely adjust to changing conditions. To avoid this narrowing of attention, organizations adopt artifacts that expand the search for new information (*searching intensity*) and events' anticipation (*ability to identify non-salient cues*). Our framework proposes that in organizations with good attentional vividness, people tend to *explore* IT artifacts' functionalities to understand how to increase their actions' effectiveness. In these organizations, the IT infrastructure displays some inefficiencies to favor the level of uncertainty necessary to *improvise* responses to unexpected events.

Organizational attention results from the interconnection of the various foci of attention in the organization. Especially in medium and large organizations, horizontal and vertical communication depends heavily on IT artifacts. The *effectiveness of IT-based communication channels* significantly contributes to the coherence of attention to internal and external informational stimuli. In organizations where communication is fluid and IT artifacts are used to facilitate collaborative decision-making (*adherence to collaborative decision-making*), there is a greater *ability to reconfigure competencies* (skills, knowledge and attitudes) in response to opportunities and threats. This ability requires a flexible, interoperable, and somewhat redundant IT infrastructure.

How IT artifacts are used and interconnected will significantly influence how users develop shared interpretations that strongly bind collective cognition and action (collective attentional engagement). The quality of shared understandings depends on the effort spent (1) searching and collecting information, (2) understanding the results of processing and communicating insights and (3) carrying out tasks supported or enabled by those artifacts. Our framework proposes that the smaller this effort, the better the triangulation of attention made possible by IT artifacts and, therefore, the greater the positive impact on organizational mindfulness.

Organizational mindfulness emerging from the use of IT artifacts

The attentional triangulation leveraged by IT artifacts produce in the collective of their users a certain degree of collective mindfulness, which is characterized by enhanced or impaired:

(1) *Preoccupation with failure*: verifiable by the artifacts' impact on the collective ability to detect and manage risks, monitor competition and organizational performance, and develop organizational competencies.

(2) *Reluctance to simplify*: verifiable by the artifacts' impact on the collective ability to manage diversity and inclusion and nurture sensemaking and conflict management.

(3) *Sensitivity to operations*: verifiable by the artifacts' impact on the collective ability to manage processes and continuous quality improvement, implement operational changes successfully, and ensure organizational agility.

(4) *Commitment to resilience*: verifiable by the artifacts' impact on the collective ability to handle crises, develop resilience and nurture organizational learning.

(5) *Deference to expertise*: verifiable by the artifacts' impact on the collective ability to effectively manage human resources, promote leadership, and manage knowledge and innovation.

Our framework proposes that increasing organizational mindfulness implies intervening in how IT artifacts support collective attention as a distributed capability. Thus, changes may include adopting new artifacts or encouraging improvements in how the artifacts are used (depth, extent, exploratory use). These interventions may increase or decrease:

(1) *Stability*: quality/relevance of captured information and clarity/readability of the results of information processing, including visualizations, reports and others (*effort investigating issues and action alternatives*); quality of the institutionalization of shared practices, norms, and meanings (*adherence to routines*); quality of access and storage of information and knowledge (*knowledge codification*).

(2) *Vividness*: acuteness of capture of new information/knowledge, variety of sources of information and persistence in monitoring information (*searching intensity*); acuteness of the information analysis (*ability to identify non-salient cues*); creativity and timeliness of action (*ability to improvise*).

(3) *Coherence*: flexibility of operations and knowledge integration (*ability to reconfigure competencies*); trust and shared mental models (*adherence to collaborative decision-making*); alignment between organizational communication channels and business objectives and engagement with issues and alternatives of action (*effectiveness of communication channels*).

Impact of IT use on organizational mindfulness: the contribution to the IS literature

Some authors have warned about the growing difficulty in maintaining the quality of collective attention (Schoemaker, 2019; Worley and Jules, 2020; Hanin, 2021). Ensuring the quality of collective attention against a torrent of stimuli from multiple IT artifacts is today a central challenge to the digital transformation of organizations. Maintaining acute collective attention (in this paper conceptualized as mindfulness) is as relevant as "tackling issues related to data privacy, algorithmic discrimination, regulation of smart devices, and other issues posed by new digital technologies." (Hanin, 2021, p. 396). Furthermore, Dernbecher and Beck (2017) emphasize the need for contributions at the organizational level of analysis, clarifying the impacts of IT artifacts on the quality of collective attention. Our study contributed in this regard by analyzing how an innovation platform interconnected attention foci dispersed across several organic units,

highlighting common challenges and funneling collective attention towards incremental innovation.

Our study showed that even IT artifacts aligned with best practices in a given area – in this case, innovation – can cause attention bias and overload. The framework developed in this study offers tangible guidance for changing the parameters of stability, vividness, and coherence through adjustments to how the organization's IT artifacts are used. The impact of these adjustments can be measured by the level of organizational mindfulness enacted. The developed framework (Figure 1) suggests a continuous cycle of adjustments and measurements to improve the quality of collective attention. Thus, our study contributes to the literature on IS use by conceptualizing it as a triangulation mechanism that enacts a certain level of organizational mindfulness. It also ties the IT artifacts' success with the quality of collective attention they stimulate. Furthermore, our framework paves the way for developing a methodological approach that CIOs can use to address the challenges of the digital age.

Conclusion

Our study helped to clarify why CORK.IN, a platform developed to provide comprehensive support to innovation and promote the emergence of ground-breaking ideas instead engaged its users in the incremental innovation of production and administrative processes. The study provided a first explanation for the impact of using IT artifacts on organizational mindfulness. It has an essentially exploratory nature and the resulting framework requires further research to stabilize the constructs.

Our study presents some limitations, namely in the number of people interviewed. This limitation was due to some users' unavailability to participate in the interviews. The problem was circumvented by dedicating more time to observing meetings and the platform's use and including users who played a crucial role in disseminating the platform and the innovation strategy.

Complementing the research efforts in the Information Systems field with theoretical insights from the Management field, we intend to contribute to the development of an IS mindfulness theory. We also expect that our research allows managers to assess the IT-mediated organizational attention quality and define sociotechnical arrangements that expand organizational mindfulness. Furthermore, with a better understanding of the impact of information systems on collective attention, it will be possible to define effective strategies to bind human and artificial attention to achieve organizational goals better.

Our framework provides the structure for an IS theory that explains how IT's use contributes to the emergence of mindful attention to circumstances and events. It offers guidance on aspects to consider to improve organizational attention as a collective and distributed capability in the organization, linking this capability with the quality of interpretations of circumstances and events. In this way, our framework helps to clarify the impact the use of IT has on organizational mindfulness.

Scholars have shown an increasing interest in IT and its role in developing the economy, industry and technology (Goyal *et al.*, 2018; Jeyaraj and Zadeh, 2020). Petter *et al.* (2018) warn about the need to refocus information in the Information Systems field to find deeper insights for knowledge gaps related to the interplay of information, technology and people. Our framework shows that attention provides a vital link between information, technology and people, ensuring that information regains its centrality in Information Systems research. The patterns of collective attention determine what information is generated and consumed. In the end, it is attention that gives relevance and meaning to information. Therefore, our framework is part of this effort to refocus information in the Information Systems field.

Furthermore, Baird and Maruping (2021) argue that the study of IT artifacts' use is about to undergo a paradigm shift due to the increasing adoption of agentic artifacts. These authors

argue that new models and theories are needed to conceptualize IT use as a relationship between human and technological (artificial) agents in organizations. Both kinds of agents should be conceptualized as being able to initiate interaction and take responsibility for the execution of tasks. Their paper focuses on a type of interaction – delegation. However, the interaction between autonomous agents can take other forms, such as collaboration (performing the task together) and engagement (joint effort to set, maintain and end the connection between agents to performing a task). The engagement has a behavioral and cognitive dimension. Our framework focuses on the cognitive dimension: attentional engagement. Thus, our framework also contributes to this emerging perspective with detailed knowledge about how IT artifacts leverage human agents' attentional engagement. It can be extended to explain how human and artificial attention can be linked to produce organizational mindfulness.

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