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Abstract:
This conceptual paper revisits and updates the concept of top management support (TMS), which has been the long-established rationale for explaining the role of top managers in digitalization activities. In our view, the concept of TMS is grounded in technological determinism, accounts for attitudinal and behavioral aspects that appear to be little more than exhortation and accepts the occasional responsibility of top managers in technology management. We consider both the crucial role that top managers may play in the digitalization process and the fact that digital technologies have become pervasive in today's organizations. Then, we develop a model by which top managers and digital technologies are cooperatively involved for digitalization. For that, we have looked through the theoretical lens of imbrication and attention perspectives to reconstruct the role of top managers in the digital transformation process. In our view, each imbrication layer can be viewed as a process where top managers form beliefs to act on digital opportunities for strategic action. Specifically, our model provides insights into how executives' characteristics and social processes impact the likelihood of forming either beliefs about radical or incremental opportunities requiring strategic action. Additionally, we offer several hypotheses that enrich our knowledge of the relationship between top managers and the digitalization process.

Keywords:
top management support; digitalization; imbrication; affordances; attention; digital transformation.

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1. Introduction

For contemporary organizations, undergoing a "digital transformation" process becomes mandatory to pursue innovation and remain competitive [1, 2]. This process entails both digitization and digitalization. While digitization refers to the encoding of actions or representations of actions into a digital format (zeros and ones) suitable for computational technologies, digitalization refers to the ways in which organizational life is organized through and around digital technologies. Nowadays, digital technologies directly affect the mechanisms through which businesses create and capture value [3, 4], and these technologies are inextricably intertwined with social relations to weave the fabric of organizations [5]. In this context, researchers emphasized that top management support (TMS) is the most important organizational factor for fully taking advantage of digital technologies [6-8]. In fact, the concept of TMS currently embodies the main basis for analyzing the role of top managers in digitalization activities. Despite this valuable work, research on TMS considers digital transformations as special-case activities in organizations, mainly examined from a project management perspective [e.g., 7, 9, 10, 11]. TMS research findings have been mixed, confusing, and lack cumulative insights. Prescriptions for TMS are vague [11], embodying good practices far removed from the root cause of top managers' influence on project performance [12]. Moreover, the underlying psychological and social processes, by which executives' participation in digitalization activities are converted into strategic choices remain unknown [12]. Scholars suggested opening such black box of TMS [13, 14].

The relationship between participation and digitalization success was traditionally assumed to be necessary and sufficient though moderated by such contingencies as task interdependence or system complexity [see e.g., 15, 16, 17]. By contrast, Markus and Mao [18] argued that such a relationship is neither necessary nor sufficient but merely influential and that the nature of this participation process is emergent. With this view, we reconstruct the role of top managers in the digitalization process by adopting an emergent perspective. We then conceive top managers' participation as a dynamic process, in which any outcome emerges unpredictably from complex and reciprocal interactions between the top management team (TMT) and digital technologies within an organizational setting. We undertake such a reconstruction by drawing on the imbrication perspective [19] and then considering each imbrication layer as a process, in which top managers form beliefs to act on digital opportunities for strategic action [20].

The term "imbrication" literally refers to overlapping but mutually enabling layers to describe the way social and digital practices can become interconnected [21]. Specifically, the imbrication of executives and digital technologies means that they function interdependently and acknowledges that both are necessary for digital transformation to occur. As we will explain, opportunity belief arises from a two-stage process [20]. First, the identification stage elucidates how executives identify digital novelties or changes as potential opportunities. Second, the evaluation stage explains how executives form the belief that these identified technological changes represent an opportunity worthy of exploitation. Furthermore, we hypothesize that TMT characteristics and social processes influence potential opportunities' recognition. Opportunities are classified in terms of being incremental and radical. While incremental opportunities often arise from small changes, radical or discontinuous opportunities often do from big changes in the technological trajectory. Specifically, we suggest that TMT's demographic heterogeneity, behavioral integration, and attentional bottom-up processing are positively related to the likelihood of noticing discontinuous opportunities, although TMT tenure can hold back that possibility. On the other hand, we propose that a low level of social conflict along with a high degree of cognitive conflict within the TMT can facilitate consensus reaching for radical opportunity beliefs. Moreover, we suggest that TMT shared leadership can improve the likelihood of positive evaluation of radical opportunities' implementation.

Next, we provide an in-depth account of previous research in TMS. Subsequently, we suggest adopting an emergent perspective on top managers' participation in digitalization activities. Afterwards, we argue that the imbrication perspective perfectly captures the notion that the TMT and digital technologies are widely viewed as cooperatively involved, thus illuminating an emergent participation view. Finally, we propose that each imbrication layer provides insights into how the TMT attention is allocated to identify potential opportunities and intervening processes which might impact the likelihood of forming beliefs about radical and incremental opportunities requiring strategic action.

2. Top management support: making the case for new theory

Of the many definitions of TMS [see 7], the following two may be representative. First, TMS to digital transformations consist of understanding the importance of digital technologies, sponsoring initiatives of technology personnel, and participating in digital transformation project activities [22]. Second, TMS includes shaping the organizational context to make it more adaptive or facilitating the adapting of the digital technology to organizational characteristics [15]. Past research has shown that TMS is a critical organizational factor for successful information systems (IS) planning [23, 24], successful IS implementation [25, 26], and generally to take full advantage of digital technologies [6, 7, 27, 28]. In particular, with respect to project success, TMS was shown to be the most critical success factor [10, 11]. Although lack of TMS may not necessarily doom a project to failure [29] or may not even be favorable [30].

TMS has been largely decomposed using two constructs: involvement [or beliefs; 13] and participation [31]. Executive participation refers to the top manager's activities or personal interventions in technology-related matters: digital transformation planning, development, and implementation. Executive involvement is concerned with the psychological state of the top manager, reflecting the top manager's perceptions and attitudes concerning digital technologies—that is, the degree to which a top manager views digital technologies as critical to an organization's success [31]. As noted by Dong et al. [7], the attitudinal interpretation of TMS promotes a back-seat driver view in which top managers are seen to take a hands-off approach, just focusing on creating a generally supportive climate. On the other hand, the behavioral interpretation advocates an active participant view [18, 31] in which top managers are encouraged to directly influence the mutual adaptation between the technology and the organization, assuming responsibility for both technical and organizational changes [32]. Dong et al. [7] by looking at TMS through the theoretical lens of metastructuration [33], offer a behavior-based definition of TMS, which includes three types of actions: first, resource provision, e.g., providing funds, technologies, staff, and user training programs; second, change management, e.g., promoting organizational receptivity of the new technology; and third, vision sharing, e.g., communication, actions related to ensuring that lower-level managers develop a mutual understanding of the core objectives and ideals for the new technology.

Recent lines of inquiry on TMS have gone further. For example, the content of top management's supportive behavior has been broken down in a multidimensional construct consisting of a set of inter-related behavioral categories such as resource provision, structural arrangements, communication, expertise, and power, exhibited during a project [7, 9]. Other scholars have proposed a dynamic and situated view, i.e., top managers must be flexible, adjusting their supportive behaviors and intensity to the specific context and particular technologies at different times. TMS fluctuates during the project course ranging from moments of direct involvement to periods of low attention and enthusiasm. TMS is not always passively readily available but could be gained and regained through a project's active mobilization and constant alignment efforts [9, 12, 34]. Moreover, the need for social alignment is argued, i.e., the shared understanding between the chief information officer (CIO) and the TMT about the role of digital technologies in the organization, driven by a broad variety of technology governance mechanisms [35-37]. Furthermore, a shared agreement on the actual value of digital technologies among executives may be decisive for clarifying future goals for these technologies. Consensus is harder to reach when TMT members are heterogeneous. The absence of consensus – discord – suggests technology disengagement [38, 39].

Although this large body of research has yielded some recurrent patterns, findings have been mixed and confusing, and for the most part it has not provided cumulative insights. For example, although TMS represents the context for project success [40] related to single projects or in multiple-project environments [34], prescriptions for TMS have not clearly been developed [11], and particularly, prescriptions for involvement and participation appear to be little more than exhortation, i.e., good practices far removed from the root cause of top managers' influence on project performance [12]. Top managers generally consider projects to be an operational issue, and rarely of their direct interest [41]. Moreover, the psychological and social processes, by which executive participation in digitalization activities are converted into strategic choices, remain largely a mystery. Empirical investigations have so far failed to open the black box of TMS [12, 42]. Calls made in the literature suggest opening such black box of TMS [13, 14]. There is only limited reliable knowledge about the types of behavior that underlie TMS, and little insight has been gained into the

reasons why executives' support is sometimes low [9]. Thus, how, and why TMS contributes right across the digitalization process are not well understood [9, 22].

Although TMS has long been theorized to play a critical role in the implementation of digital transformations, empirical studies have not always supported this hypothesis [43]. Prior studies found that TMS is necessary and sometimes a sufficient condition to ensure project performance [10, 11], although not necessarily doom a project to failure [29]. Therefore, the absolute criticality of TMS has been questioned [34]. It seems successful outcomes cannot be achieved without high levels of TMS, whereas weak or poor TMS can be mitigated, for example, in the presence of high level planning and user involvement [11]. Studies found TMS not critical and showed contradictory results while the empirical evidence is either weak or inconclusive –i.e., positive, negative, inverted u-shaped– [7, 11, 17, 29, 34, 43-45]. Therefore, a clear and compelling understanding of the behavioral spectrum that makes up TMS is not yet fully understood. Furthermore, differing perspectives have resulted in inconsistent measures [7, 9, 11, 15, 31, 46, 47]. Then, further research is required to explore how TMS contributes to success.

Such observations and doubts invite a fresh examination of TMS for the digitalization process.

3. Adopting an emergent perspective on executives' participation in digital transformation

As noted by Markus and Mao [18], the nature of the participation process itself is emergent because it can be characterized in terms of actors' attempts at communication, influence, negotiation, creativity, and conflict resolution, all of which have highly uncertain outcomes. In this view, the relationships between participation activities and outcomes are neither necessary nor sufficient, but merely influential [18]. This conceptual paper then adopts an emergent perspective to conceptualize executives' participation as a dynamic process, in which any outcome emerges unpredictably from complex and reciprocal interactions between the TMT and digital technologies within an organizational context [48]. How people design, interpret, and use technology is a function of the material components comprising the artefact, the institutional context in which a technology is developed and used, and the power, knowledge, and interests of human actors [49]. Making reliable predictions in the emergent perspective requires detailed understanding of dynamic organizational processes in addition to knowledge about the intentions of actors and the features of digital technology [50]. Consequently, our theoretical posture represents a departure from both, variance, and process approaches. Instead, we believe that our assumption of neither necessary nor sufficient relationships is best captured by the imbrication perspective, where the TMT and digital technologies can be widely viewed as cooperatively involved.

3.1 Further elaboration of TMS with the imbrication perspective

The term "imbrication" specifically refers to overlapping but mutually enabling layers, as used in tiling [51]. The notion of imbrication was proposed to describe how social and digital practices can become interconnected [21, 52]. The term 'affordance' refers to the potential for action that new technologies provide to users, and is useful in explaining why human and material agencies become imbricated, or function interdependently [19]. Through the notion of imbrication we suggest that it might be possible that top managers and digital technologies can become interconnected in such a way that they become interdependent [53]. For example, when new digital technologies emerge with the promise of novel affordances, there might be a corresponding shift in the characteristics of the TMT. Deliberate efforts to realign managerial profiles with the new digital technologies' requirements might result in recruiting executives whose expertise and skills fill the existing gaps among the incumbent executives. Therefore, by adopting the metaphor of imbrication [19] we recognize that: first, the TMT and digital technologies are distinct but fundamentally interdependent; second, past imbrications accumulate to help explain, although certainly not predict future imbrications; and third, top managers must proceed within the framework established by previous imbrications to reconcile their goals with the things that a technology can or cannot do. Thus, in the presence of flexible routines and flexible technologies, when top managers are unable to achieve their goals in that setting, they should either change the pattern of their routines or the technologies they use. Perceptions of constraint lead top managers to change their technologies while perceptions of affordance lead them to modify their routines. We suggest that digital affordances and constraints,

the catalysts for imbrication, are perceived by top managers in developing their executive functions. In doing so, top managers consider the potential benefits of digital technologies and how to obtain them. For example, the deputy CEO of a manufacturing company adopting the SAP/R3 enterprise system saw an opportunity for improving the account managers' planning and reporting activity. In response, changes in the customer relationships management module of the enterprise system were introduced and mobile functionality for their users was developed. Now, account managers can request a full report to set up a meeting with customers and then provide immediate feedback. Therefore, the deputy CEO paid close attention to the possibilities for action due to the new SAP/R3 functionality. As a result, SAP/R3 was adjusted to fit the top manager's goals and intentions [48]. These successive changes create the technological infrastructure that people use to get their jobs done.

The imbrication metaphor suggests how a human agency approach to technology can usefully incorporate notions of material agency into its explanations of organizational change [19]. This perspective allows a return to a middle ground between the poles of voluntarism and technological determinism, by recognizing that technologies have certain material and institutional orders that transcend the particularities of the contexts in which they are used [54]. Accordingly, materiality has been defined as the arrangement of an artifact's physical and/or digital materials into particular forms that endure across differences in place and time and are important to users [55]. Hence, technology has a materiality that makes some actions possible and others difficult or impossible [56]. Human agency is usually defined as the ability to form and realize one's goals [57], and this perspective suggests that people's work is not determined by the technologies they employ. Even using the most seemingly constraining technologies, human agents can exercise a great deal of discretion in shaping the effect of technology on their work [58]. Otherwise, material agency is defined as the capacity for nonhuman entities to act without human intervention. Digital artifacts exercise agency through their performativity, i.e., through the things they do that users cannot completely or directly control [59]. Coordinated human (social) and material agencies both represent capacities for action, but they differ with respect to intentionality. As noted by Leonardi [55], people often enact their human agency in response to technology's material agency. Given this important difference with respect to intentionality, social and material agencies might be equally important in shaping practice but in different qualitative ways. Thus, people have intentionality, and technological artifacts have materiality. Figure 1 exhibits the mutual shaping over time of social –TMT– and material agencies –digital technologies–. This view, where the TMT and digital technologies become constitutively entangled, is useful for moving from static to dynamic patterns of analysis such that each layer of sociomaterial imbrication becomes more substantial in that it shapes action in a path-dependent manner because of its history of accumulation.

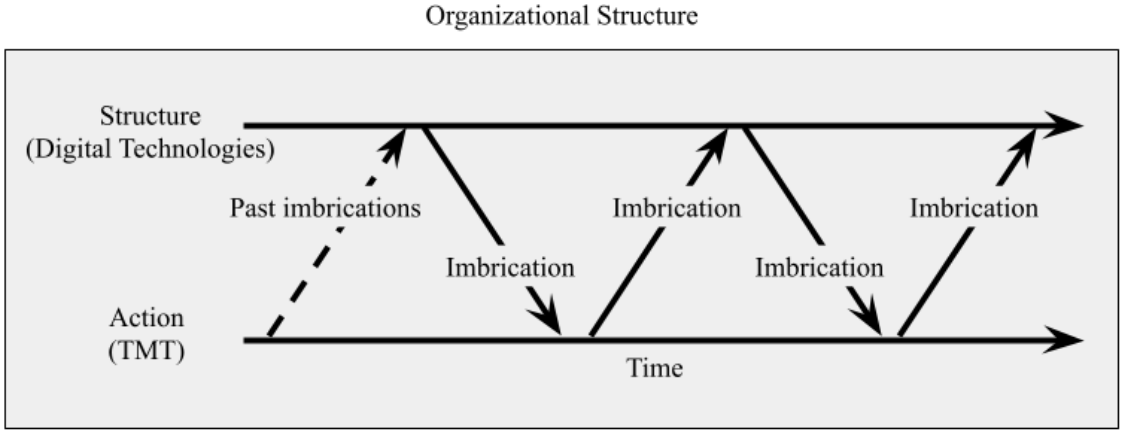

Figure 1. TMT-digital technologies imbrication framework. Adapted from Leonardi [60]

As noted by Leonardi [60], in Figure 1, the activity occurring within the grey square represents actions constitutive of broader organizational structure or technological infrastructure, horizontal arrows symbolize time, diagonal arrows signify the imbrication of material and social agencies, and the dashed line represents imbrications that occurred before the current TMT began using digital technologies in this organizational setting. When adopting this framework, we are directed to explain three issues. First, how, and why imbrication occurs, the mechanisms by which imbrication occurs. Second, the role the TMT play in the creation of the sociomaterial over time, how the TMT come to understand, interpret, and deal with the materiality that pre-exists their interaction with digital technologies, i.e., the digitalization status of the organization as a whole [61, 62]. And third, how current digital technologies becomes imbricated with the social contexts into which they are introduced [60]. To that end, we rely on an attention model of top managers' opportunity beliefs for strategic action [see 20]. Specifically, the model presented in Figure 2 provides insights into how TMT's attention is allocated to identify potential opportunities. Moreover, this model also explores the intervening processes that might impact the likelihood of forming beliefs about radical and incremental opportunities requiring strategic action. Opportunity belief arises from a two-stage process. The identification stage elucidates how the TMT identifies technology novelty or change as potential opportunities. The evaluation stage explains how the TMT forms a belief that these identified technological changes may represent an opportunity worthy of exploitation. We added a new stage, called action, where the TMT decides how to imbricate agencies, either by changing routines or by changing technologies.

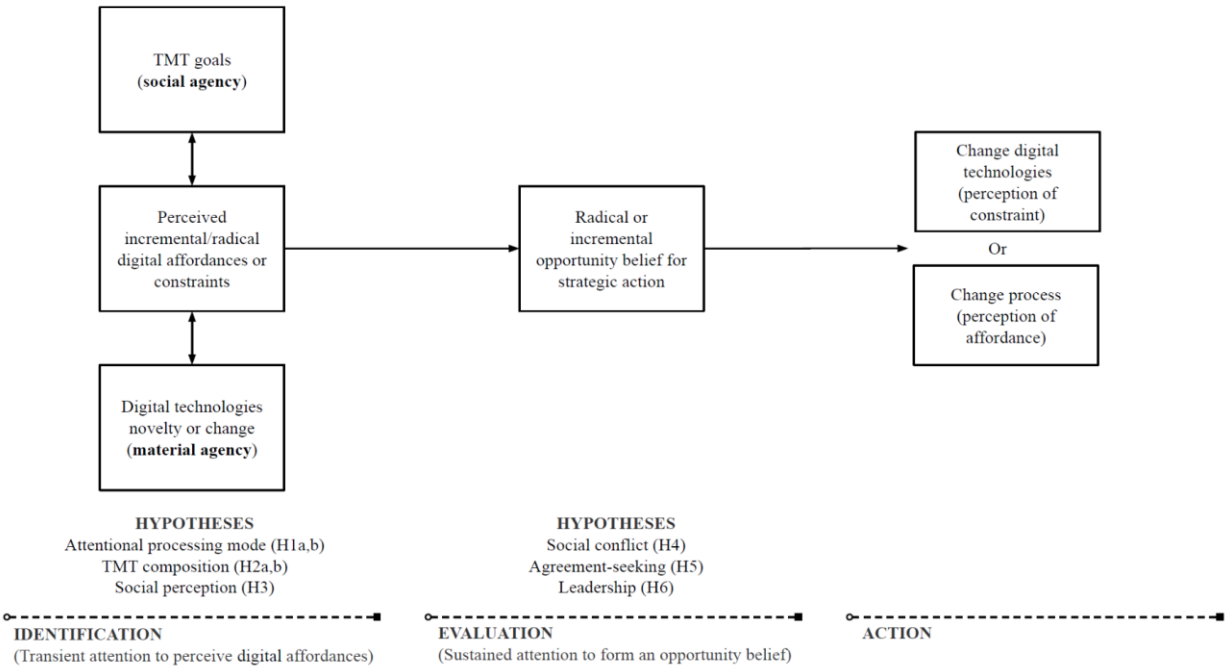

Figure 2. An attention model of top managers' opportunity beliefs for an imbrication layer

3.2 Transient attention to perceive digital technologies' affordances

In the identification phase, by allocating transient attention, top managers may perceive affordances or potentialities for either incremental or discontinuous changes in their organizations. We suggest that this noticing varies according to the allocation of TMT's attention, TMT composition, and social perception.

As shown in Figure 2, digital technologies have material properties that afford different possibilities for action based on the contexts in which they are used. Therefore, affordances are unique to the particular ways in which a TMT perceives what digital technologies do. The relational character of affordances emphasizes that digital technologies exist independently of the TMT, but affordances and constraints do not [63]. Because the TMT using digital technologies has diverse goals, they perceive a specific technology as affording distinct possibilities for action [5, 64]. On the other hand, the TMT may perceive that technology constrains their ability to carry out their goals. According to this relational view, affordances and constraints are constructed in the space between human and material agencies [19]. TMT's goals when using digital technologies are formulated, basically, by their perceptions of what digital technologies can or cannot do, just as those perceptions are shaped by TMT's goals. For this reason, as the TMT attempts to reconcile their own goals with the digital technologies, they actively construct perceptual affordances and constraints. Next, we delve into how the TMT's attentional processing mode, TMT composition and social perception influence the identification and evaluation of potential opportunities.

3.2.1 Top-down and bottom-up allocation of managerial attention

Attention is shaped by both top-down –i.e., goal or schema-driven– and bottom-up –i.e., data or stimulus-driven– processes [65]. Top-down processes of attention allocation are directed toward aspects of the environment that are expected to be important and away from aspects that are not. Bottom-up processes instead are stimulus-driven allocations of attention from striking aspects of the environment [65]. Because incremental changes to the environment typically occur when and where they are expected to occur, they are likely to be noticed by transient attention being allocated to them through high top-down processing; however, bottom-up processing may better enable top managers to be drawn to unexpected signals of environmental change [20], e.g., disruptive digital technologies.

In the transient attention phase, whether top managers notice incremental or discontinuous digital technologies' affordances vary according to the degree to which they rely more heavily on top-down or bottom-up attention allocation. As an example, Venkatraman's [66] frequently cited framework breaks digital technologies' potentialities for business transformation into five levels: localized exploitation, internal integration (considered as two evolutionary or incremental levels), business process redesign, business network redesign, and business scope redefinition (as three revolutionary or discontinuous levels). Top-down attention allocation, i.e., the allocation of attention to core concepts, directs TMT's attention to noticing incremental potential opportunities more concerned with efficiency impacts. However, by engaging in more bottom-up processing, the TMT allows the emerging digital technologies to capture their attention even when they are not actively searching for them, then is more likely that they perceive discontinuous affordances [cf. 20], more related to competitive effects.

Hypothesis 1(a): The greater the increase in TMT's attentional top-down processing –i.e., goal-driven–, the greater the likelihood of noticing incremental digital technologies' affordances (relative to discontinuous digital technologies' affordances).

Hypothesis 1(b): The greater the increase in TMT's attentional bottom-up processing –i.e., technology-driven–, the greater the likelihood of noticing discontinuous digital technologies' affordances (relative to incremental digital technologies' affordances).

3.2.2 TMT composition

The composition of the TMT refers to the collective characteristics of its members such as demographic attributes (e.g., tenure, age, functional specialties, and educational background) and/or psychological profiles (values, cognitive styles and personalities). Such composition affects the TMT's internal processes, which in turn affect its decisions and other

outcomes. Executives of diverse experiences and tenures bring varied frames of reference to a TMT's deliberations, which are especially valuable for ongoing innovation and change [67]. For example, incumbent and new owner-managers focused on incremental or efficiency-related digitalization activities during family succession processes [68]. An heterogeneous TMT, though probably triggering social friction, facilitates to open up debate and expand problem solving, then more likely attending to a broader range of new stimuli [69]. Thus,

Hypothesis 2 (a): The greater the increase in TMT's demographic heterogeneity –i.e., the degree of diversity among executives' experience manifested in tenure, functional background, and so forth–, the greater the likelihood of noticing discontinuous digital technologies' affordances (relative to incremental digital technologies' affordances).

On the other hand, the time of entry into a group is an important determinant of a person's communication patterns within the group [70]. A long average group tenure results in decreasing levels of overall communication because group members feel that they can anticipate other members' perspectives. Therefore, a long TMT tenure may lead to increased isolation with respect to external sources of information, which may lead members to become less receptive to disruptive digital changes and innovation. However, tenured TMTs have experienced past imbrications and will likely have a distinctive understanding of incremental potential opportunities compared to someone who recently joined the TMT [71]. In fact, a group's tenure is positively related to the degree to which their members have shared outlook and perceptions [72]. Thus,

Hypothesis 2 (b): The greater the increase in TMT tenure, the greater the likelihood of noticing incremental digital technologies' affordances (relative to discontinuous digital technologies' affordances).

3.2.3 Social perception

Variability frequently appears among group members in terms of their a priori preferences and/or attitudes regarding a technology [73]. However, widely held perceptions are gained through information exchanges by way of sharing attitudes and beliefs about digital technologies. Indeed, exposure to others' attitudes through membership in a group shapes peoples' perceptions of a new technology [74]. Then, assuming that perceptions are a social phenomenon [75], why do TMT members come to share similar perceptions of a technology's affordances? Social constructivists of technology have shown that contagion and other social influence processes are seen as the primary cause of convergence of attitudes, values, and beliefs among the potential users of a technology. In this view, adoption is a collective rather than an individual process that stands apart and may sometimes be divorced from the technology's physical capabilities [76]. Thus, groups have their own personalities, distinct from a summation of individual personalities [77]. However, interdependence of members is a key criterion for an entity to be considered as a group [78] where the relational and interactional patterns among its members play a key role [79]. In fact, TMTs vary widely in how they are fundamentally structured. Some are structured such that members operate largely independently of each other, while others are set up such that executives' roles and responsibilities are highly interdependent [67]. When interdependence is high, then teams might meet often, share a great deal of information, and engage in collective decision-making —referred to as "behavioral integration" [80], the degree to which the group engages in mutual and collective interaction—. The more a TMT is behaviorally integrated, the more it shares information and resources that are critical for making quality strategic decisions. The more dynamic the organization's task environment, and the need to foster innovation and discontinuous changes in their organizations, the greater the behavioral integration of the TMT [80]. The less the behavioral integration of the TMT, the slower the group will be to arrive at a shared awareness and interpretation of new environmental changes [80]. Thus,

Hypothesis 3: The likelihood of noticing *discontinuous digital technologies' affordances* is higher when the TMT interdependence (or behavioral integration) is high than when it is low.

3.3 Sustained attention to form opportunity beliefs

Top managers require sustained attention to evaluate whether what has been noticed represents an opportunity for the focal organization –i.e., an opportunity belief– that is worthy of strategic action [20]. Therefore, once top managers notice digital technologies' affordances and/or constraints, they enter the phase of sustained attention, in which they

form beliefs about whether these potentialities are opportunities for strategic action. However, the outcome of this assessment depends on the mode of attentional engagement and the TMT processes employed in the development. Attentional engagement involves mindful information processing and views attention as a process involving the application of time, energy, and effort on a selected set of environmental stimuli, a repertoire of action responses, and the relationships between them [81]. Attentional engagement is the process of intentional, sustained allocation of cognitive resources to guide problem-solving, planning, sensemaking, and decision-making [65]. Opportunities may be classified in terms of being *incremental* and *radical*. Therefore, noticed discontinuous digital technologies' affordances are more likely to lead to the formation of a belief in radical opportunities, whereas noticed incremental digital technologies' affordances are more likely to lead to the formation of a belief in incremental opportunities. However, how do TMT members reach a consensus regarding an opportunity belief?

Executives with clear visibility of different business processes can sense from experience or from interactions with others where and how much business value is being created by digital technologies [82]. When they evaluate digital technologies impacts similarly, it can be easier to approve future digital technologies' investments or to initiate corrective action for failing digital technologies' investments. However, they may rate digital impacts differently because of either having divergent personal goals or belonging to extremely narrow functional responsibility domains [39]. The degree of consensus among TMT members as to the extent and locus of digital technologies' impacts is crucial to defining and maintaining a strategic direction for digital technologies [83]. Group processes are likely to influence the level of strategic consensus within a TMT [84], i.e., shared cognitions can result because effective group processes have been utilized to resolve differences in a-priori individual preferences. Now we focus on the specific process of consensus formation and how the leadership style influences the evaluation of different opportunity beliefs. Accordingly, we examine two important group processes: interpersonal (or social) conflict and agreement-seeking.

3.3.1 Social conflict

Social conflict, i.e., the perception by the TMT members that they hold either discrepant or imperfect compatibility of their views, necessarily follows from the variety of human beings [85]. Technologies are likely to serve symbolic as well as instrumental purposes. Thus, interpretations of a technology's opportunities are potentially limitless, can only be understood in situ, and may even trigger political conflict [76]. TMT members with strong general negativity are less likely to actively participate in the decision-making process, and thus their nonparticipation can adversely affect both current and future decisions [86]. Interpersonal, social or affective conflict may result in different interpretations about what is an opportunity worthy of exploitation, and this is particularly true when dealing with strategic choices involving a high degree of uncertainty and ambiguity [87]. Then, when interpersonal conflict is high within the TMT, the differences among TMT members' interpretations of what is a radical opportunity will be greater and then strategic consensus will be lower. Thus,

Hypothesis 4: The likelihood of noticing *radical digital technologies' opportunities* is higher when the level of social conflict within the TMT is low rather than high.

3.3.2 Agreement-seeking

Decision quality, consensus, and affective acceptance are all necessary for sustainable high performance in producing and implementing strategic decisions [86]. However, how can a TMT use conflict to enhance their decisions quality without sacrificing consensus and affective acceptance among their members? The implementation of decisions rests on securing the cooperation of other parties to the decision [88]. Therefore, TMT members must both understand and commit to the decision to be successfully implemented [89]. Thus, decision processes promoting consensus among team members are more likely to enhance organizational performance [90].

Groups using agreement-seeking behaviors achieved higher levels of consensus than groups using structured techniques of task-oriented conflict such as dialectical inquiry or devil's advocacy [91]. However, such structured decision making techniques designed to facilitate the adoption of the best solution by optimizing the level of cognitive conflict during group discussion will, paradoxically, strengthen group consensus, increase member satisfaction and decision acceptance

[92]. Cognitive conflict, inevitable in TMTs, is functional, generally task-related, focused on judgmental differences about how best to achieve common objectives, and then enhances decision quality, understanding and commitment [86]. Thus,

Hypothesis 5: The likelihood of achieving consensus about *radical digital technologies' opportunities* is higher when cognitive conflict within the TMT is high rather than low.

3.3.3 Leadership

The nature, scope, and intensity of organizational changes will require very different styles of leadership behavior in initiating, energizing and implementing change [93]. Leadership of strategic reorientations requires not only charisma, but also building executive teams in support of the change [93]. Therefore, during times of significant organizational change, the challenge is to broaden the range of individuals who can perform the critical lea dership functions. As many organizations are too large and complex for any one executive to directly manage big changes, responsibility for large scale change must be institutionalized, then empowering other TMT members. Applied at the TMT level, shared leadership is a practice in which the CEO and other TMT members share the responsibility for and fully participate in the tasks of leadership [94]. TMT shared leadership promotes a cooperative conflict management style within TMT members [95] while experiencing higher commitment to the overall firm's success, thus more likely approaching conflicts as joint problems that need commonly beneficial solutions [96]. Moreover, shared leadership can improve groups' information processing capacity and is associated with increased team problem solving [94]. Therefore, shared leadership provides a wider pool of resources for a major strategic change process as it brings together the skills, perspectives and commitment of a diverse set of TMT members rather than drawing solely on CEO's expertise. Although no single individual imposing their own vision and preferences can bring about substantive organizational changes, a team assembling a variety of skills, expertise, sources of influence and legitimacy might be able to achieve such major changes [97]. Thus,

Hypothesis 6: The likelihood of positive evaluation of radical digital technologies opportunities implementation is higher when the digital technologies leadership is shared than when it is centralized.

3.4 Action

Finally, depending on whether the TMT perceives that digital technologies afford or constrain their goals, they decide how they will imbricate human and material agencies [19]. If the TMT perceives that digital technologies afford possibilities for action, they most likely will change their routines. Conversely, if they perceive that digital technologies constrain their goals, they will change or modify the technologies. For example, the TMT may perceive an opportunity for enhancing decision-making by visualizing entire work processes [5]. Then, technology features provided by e.g., enterprise systems, business intelligence, business process management tools, real-time tracking devices, etc., need to be coupled with important organizational features such as process standardization, identification of key performance indicators, etc., to enact these particular affordances. By iteratively taking decisions of changing either routines or technologies, top managers develop digital infrastructure that creates business value relative to either efficiency or competitive impacts.

4. Implications and concluding remarks

4.1 Theoretical contributions

Previous research on digital transformations highlighted the complementarity argument, i.e., digital and non-digital factors must be integrated to achieve business goals [98, 99]. We addressed this issue by focusing on the role of top managers as the crucial social agency and key complementary resource for digital transformation. The imbrication view recognizes that both TMT and digital technologies are necessary for digital transformation to occur; their imbrication is what produces complementary changes in digital technologies and in internal processes, and this chain of imbrications occurs in a path-dependent manner to create technological infrastructure.

This conceptual article offered three primary contributions to the TMS literature. First, this paper covers philosophical discussions and provides a critical review of other authors' work and thinking on TMS. This manuscript summarizes recent developments and highlights various limitations that offer opportunities for this examination. Second, in the view that every organizational practice is always bound with digital technologies, we reconstructed the role of top managers in digitalization by adopting an emergent perspective. Therefore, in this paper, top managers' participation is conceptualized as a dynamic process, in which any outcome emerges unpredictably from complex and reciprocal interactions between the TMT and digital technologies within an organizational context. Scholars defined TMS as a set of desirable attitudes and behaviors–[e.g., 100, 101]–, but also as a scarce and valuable resource whose availability depends on diverse aspects [9]. However, the nature and form of TMS is built over time and depends on several contextual factors [102]. The metaphor of imbrication sensitizes us to the production of durable patterns in a path dependent manner [19]. The metaphor of imbrication expresses the idea of a tighter and more continuous relationship between the TMT and digital technologies, a relationship that goes beyond mere support. The concept of imbrication suggests how a human agency approach to technology can usefully incorporate notions of material agency into its explanations of digital transformations. Third, we argue that each imbrication layer can be viewed as a process where top managers form beliefs to act on digital opportunities for strategic action. Opportunity belief arises from a two-stage process. The identification stage elucidates how the TMT identifies digital technologies' novelty or change as potential opportunities. The evaluation stage explains how the TMT forms a belief that these identified technological changes represent an opportunity worthy of exploitation. The identification of radical or incremental opportunities depends on several intervening processes.

4.2 Practical contributions

Because we view digital transformation as a process that occurs in a path-dependent manner, top managers' situated experience and organizational tenure are then valuable characteristics. Therefore, recruiting new top managers who show the required digital competence can be a starting point but not a realistic solution to produce good results immediately. Moreover, as we capture the interplay between digital technologies and the TMT using the concept of affordances, then it is reasonable to expect that TMT characteristics and processes influence potential opportunities recognition. Specifically, we suggest that the more heterogeneous, behaviorally integrated, and intensive in technological vigilance the TMT, the more likely they notice discontinuous digital affordances. However, TMT tenure can hinder that possibility because theoretically is expected that tenure will lead top managers to become less receptive to disruptive changes. On the other hand, we propose that consensus for radical opportunity beliefs can be easily achieved with low level of social conflict but in the presence of a high degree of cognitive conflict within the TMT. Furthermore, we suggest that TMT shared leadership can improve the likelihood of positive evaluation of the implementation of radical opportunities because it approaches the inevitable conflicts during implementation as joint problems that need commonly beneficial solutions.

4.3 Suggestions for future research

Future research may wish to examine the relationship between TMT and digital technologies by seeking patterns across certain contexts and certain types of either digital technologies or TMTs. Further research could examine to what extent different digital technologies require different types of imbrications, or how institutional and technological contexts explain, shape, or inhibit various top management behaviors and actions. Top managers' imbrication with digital technologies is a fruitful research area that still presents numerous questions unanswered. Case studies would help to refine the potential antecedents of this imbrication. Moreover, longitudinal studies should test whether the imbrication process maintains the continuous commitment of the entire TMT and how and why digital leadership might change among individual TMT members.

Future researchers should also study differences that exist in the imbrication process between diverse, highly decentralized organizations and single businesses that are highly centralized. As Jarvenpaa and Ives [31] noted, when contact with digital functions is frequent and direct, the TMT's attention to digital technologies could be more directed toward specific business needs than in the case of highly decentralized or multi-business firms. Organizational size may

also influence the role of the TMT in digital transformations. Hands-on management might be much more important for small organizations in which the CEO or TMT usually makes most of the key decisions and is the only actor(s) who can attach digital technologies to corporate objectives and strategy [31]. Most likely, in large companies, digital technologies' attention might be more adequately placed at the line management level. Future research could also extend to boards lacking oversight of digital technologies [103], as well as attention deficits in board scrutiny of digital technologies matters in favor of focusing on only digital technologies' risk [104], and how either of these situations might affect the role of top managers in digital technologies activities in large organizations.

Describing affordances reasonably requires specifying the subject for whom an object is an affordance, and its action-oriented goals and characteristics or abilities [105]. Consequently, future research could most likely identify demographic and competence traits of the TMT and the effects of those traits on their goals and intentions when using digital technologies (social agency). How analyze users' goals and capabilities concerning digital artifacts represents an important direction for further development [64]. Moreover, executive characteristics affect perception and interpretation [69]. Furthermore, TMT's strategic digital knowledge, i.e., TMT's understanding of the merits, opportunities and advantages of digital technologies in supporting the organization's business strategy [106], also encompasses TMT's awareness of the organizational needs of digital technologies and TMT's attentiveness to the organizational impacts of digital technologies [107]. Otherwise, the lack of TMTs' digital knowledge limits their level of involvement in digital projects [108].

Of course, any explanation of digital technologies' effects is incomplete without careful conceptualizations of users and use environments [64]. Hence, future research, while exploring the TMT's characteristics, could study the effects of the environment, which is beyond the scope of this paper.

Future research could also analyze how the TMT and digital technologies imbrication may differ in situations involving different or a more heterogeneous mix of TMT members. Consider a case in which not all an organization's managers imbricate homogeneously. Diversity can be a double-edged sword, increasing both the opportunity for creativity and the likelihood that group members will be dissatisfied and fail to identify with the group [109]. Scholars suggest that measures of dispersion or variation of characteristics among members of a group are crucial to understanding the effects of demographic indicators on organizational outcomes [110, 111]. When people hold different goals, each member of the same social group can enact a different affordance or set of affordances when using the same technology [112]. With multiple members in a group and multiple features available for use, the number of possible affordances that may be enacted when different individuals use the technology is very large [113].

On the other hand, scholars within the sociomateriality stream have recently begun to consider the role of emotions in sociomaterial accounts [114] as generative forces that mobilize reflection and action [115]. Thus, future research may attach affect a central role in the emergence and change of sociomaterial practices, as it conditions human agents' encounters with technological artefacts. Emotions can be seen as relationally produced, emerging not just from interpersonal social relations, but from sociomaterial relations [114].

We also hope that this paper will encourage additional qualitative and quantitative studies on the role of executives in digital transformation.

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