An interpretive study on the role of top managers in enterprise resource planning (ERP) business value creation

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Abstract:
This paper contributes to the growing body of literature on enterprise resource planning (ERP) business value by investigating organizational ERP development in view of the active involvement, vision, and direction of top management teams (TMTs). A top-down approach to ERP adoption and implementation was adopted with socio-material and social construction assumptions about the mechanisms that generate ERP business value. A single ERP case study was analyzed in an industrial setting by interpretive means, thus providing theoretically based, detailed and interesting insights. Our research suggests that ERP benefits emerge during the TMT's encounters with the ERP system through pragmatic action and situated improvisations. Our findings suggest that ERP adoption is strongly influenced by TMT characteristics and social processes, while complementary process-change needs are perceived by the executive participation during implementation. We also suggest that when the ERP system goes live, a synergistic relationship termed TMT-IT imbrication will create the technological infrastructure perceived as ERP value. At this post-implementation stage, various TMT characteristics and processes are proposed that greatly influence top managers' patterns of imbrication behavior. Several propositions are developed and summarized in a framework to enhance the current understanding of managerial agency in achieving business benefits from ERP systems. The paper concludes with implications for top managers and future research directions.

1. Introduction

The topic of enterprise resource planning (ERP) systems is interesting and important in theory and practice because organizations have invested and continue to invest in enterprise systems to gain access to powerful computer-based information systems (IS) in a more cost-effective manner than through in-house software development [1]. As ERP systems affect many aspects of an organization's internal and external operations, their successful deployment and use are critical to organizational performance and survival [2]. However, implementation is not a procedure of unproblematic installation but rather a complex socio-technical process of renegotiation and redevelopment [3]. Indeed, approximately one-half of ERP implementations fail to meet the organization's expectations [4, 5], and most accounts of ERP failures are linked to lack of top management support (TMS) [6-11]. Therefore, for an adopting organization, the key issue concerning enterprise systems such as ERPs is the critical factors explaining the success of the implementation [8, 12, 13]. Initially, the organizational use of information technologies (IT) was the responsibility of IT specialists, departments or functions. Later, IT research suggested that the responsibility for IT management should be shared between IT professionals and line managers [14-17]. Hence, business managers should deploy IT effectively by assuming ownership and leadership of IT projects within their areas of responsibility [18]. Moreover, past research has shown that TMS, i.e., understanding the importance of IT, sponsoring initiatives of IT personnel and participating in IT project activities [19], is an extremely important organizational factor for successful IS planning [20, 21], successful IS implementation [22-24] and its contribution to performance [19, 25, 26]. Particularly, in the case of ERP systems, the active involvement, vision, and direction of top management teams (TMTs) provide the impetus needed to sustain the implementation process [27]. However, studies on ERP's critical success factors [28, 29] and studies on ERP's effects and risks [30, 31] offer few insights beyond conventional wisdom, and many lack theoretical explanations that adequately explain why the outcomes occur as they do and the way in which findings are reported [32, 33]. Thus, although many studies identified TMS as a critical success factor for ERP implementation [e.g., 7, 34], we lack understanding of how and why TMS contributes to ERP success [35]. Details on the requirements of TMS are provided in the project phase [see 9] and are also acknowledged during the post-rollout period [see 34]. However, the research reported in this paper examines managerial agency through the entire ERP life cycle while also directly engaging issues central to organizational theory, materiality and power, which have hitherto been downplayed in an attempt to counteract the field's earlier tendency toward technological determinism [36].

On the other hand, the IS value generation process still needs to be elucidated because this research stream is heavily dominated by the adoption of variance theories in contrast to process theories [37]. Therefore, an emergent perspective between top managers and IS could substantially illuminate the nature of IS business value. In the attempt to theorize an emergent view of top managers' participation in ERP business value in an IT-intensive world, the socio-material approach may be useful. Against this backdrop, we adopt the theoretical lens of affordances [38] and the imbrication perspective [39] to fundamentally challenge and advance scholars' understanding of the role of top managers in ERP business value creation. Technology affordances and constraints theory is appealing to construct post-hoc explanations of behaviors and outcomes in individual case studies [40], but it can also be viewed as a promising means of analyzing and researching the technology appropriation process [41-43]. Accordingly, we capture the interplay between the ERP system and the TMT using the concept of 'affordances', which is a useful approach to explaining the ever-more-symbiotic relationship between IT and organization. Although the affordance theory landed with delay in the IS field, attention to it is rapidly increasing [44-47]. For example, Anaya [48] delivers a discussion about how sociomateriality can enhance the understanding of benefits realization from enterprise systems, suggesting that benefits can be achieved by using organizational capabilities to exploit the technological possibilities of these systems. This paper adds to these incipient studies but addresses the following research question: how and why does managerial agency influence the business benefits achieved from ERP systems during the adoption, project and post-implementation phases?

The case study reported in this paper has been carried out in an industrial setting using interpretive research. Our findings suggest that ERP adoption is strongly influenced by TMT members' background, goals and social processes, while the TMT participating in ERP implementation greatly determines complementary process change needs. We also suggest that when the ERP system goes live, a synergistic relationship termed TMT-IT imbrication will create the

technological infrastructure that will be perceived by the TMT as ERP value at the intermediate process level. Managerial IT competence and the implementation efforts made by top managers, managers' goals and functional position, and the presence of imbrication factions may greatly influence managers' perception of ERP value.

From one point of view, ERP packages have profound effects on the structuring of work and the forms of human action they enable or constrain [49], thus privileging material agency. Conversely, ERP systems can be resisted and reinvented during use [50], thus favoring a human agency view. However, our use of affordance theory was based on our increasing interest in this theory as a specific way of conceptualizing what a TMT with a particular purpose can potentially do with a technology such as an ERP system. As relational concepts, affordances and constraints may facilitate the scholarly understanding that what one TMT with particular capabilities and purposes can or cannot do with an ERP system may be very different from what a different TMT can do with the same technology. Although the claim that the TMT should be more actively involved in obtaining IT value is not new [see, e.g., 51, 52-54], surely the newness of this paper lies in its ontological stance that contributes to the unpacking of how exactly the TMT should be actively involved in obtaining ERP value. Furthermore, although imbrication is not unique to the TMT and is valid to anybody in an organization, –i.e., by paying attention to ERP affordances and constraints, employees can form routines in carrying out their daily work, and those routines may contribute to ERP value creation–, we suggest that obtaining ERP business value, according to business strategy and objectives, entails TMT-IT imbrication.

The structure of the paper is as follows. First, we bring together the insightful theory stimulating this study. Second, we describe the setting up and carrying out of the fieldwork of our interpretive study. Third, we explain the empirical findings corresponding to the stages of the ES journey, while stating the diverse local constructions encountered in the form of theoretical propositions. Finally, we illustrate a collective synthesis of our empirical findings in a framework and discuss theoretical and practical implications, study limitations, and future research directions.

2. Background

The complexity and multidimensionality of the process of IT value creation constitute a great challenge for researchers [55]. Because it is difficult to fully capture, allocate, and isolate the value generated by IT investments, perceptions play a key role in assessing the impact of IT [56, 57]. Previous research on IT value has highlighted the complementarity argument, i.e., IT factors and non-IT factors must be integrated to achieve business goals [58, 59]. IT is not simply a tool for automating existing processes but, more importantly, is also an enabler of organizational change that can lead to additional productivity gains [60]. These arguments are supported by many theoretical lenses, including the sociomaterial perspective [61-63] and the notion of affordances as an influential ecological psychology theory [38, 64]. Technology affordances and constraints theory is increasingly used to understand the uses and consequences of IS [40]. An affordance perspective suggests that although IT and organization features may exist separately, their value in explaining organizational form and function is derived from how they are enacted together [43]. Therefore, technology affordances and constraints are distinct from both technology features–i.e., properties or built-in functionalities–and human purposes. Indeed, they help explain that (i) people do not always realize the apparent potential of a technology when they use it; and (ii) people sometimes or often use technology in ways that designers never intended [40]. In particular, the relational concept illustrates how new uses or new benefits from ERP systems are not inherent in their material properties but rather largely based on the dynamic relationship between people experiencing their agency by adapting these systems to fit their needs and the materiality of the ERP system [48]. Whereas ERP systems favor, shape, or invite, but at the same time constrain, a set of specific uses, these systems can lead to different practices depending on the organizational context [43].

By and large, TMS has been an organizational factor emphasized by researchers as necessary to taking full advantage of IT [65-69], as an informal but effective IT governance mechanism for IT-business alignment and collaboration and, thus, for improving IT business value [70]. Powerful actors shape how people use the technology and how particular uses are diffused across the organization [71]. Likewise, for ERP benefits, TMS is a crucial success factor [7, 67, 72, 73]. Consequently, we address the issue of ERP business value by adopting the imbrication perspective [39] and by

focusing on the role of top managers as the crucial social agency–non-IT factor–and key complementary resource for the IT value-creation process.

Technology affordances and constraints theory considers the dynamic and non-deterministic interactions between people and organizations and the technologies they use. Some scholars assert that technology is inseparable from the ways in which people and organizations use it [e.g., 61]. Then, they refer to 'technology-in-use' and consider their distinction analytical only. Conversely, others accept an ontological distinction between technology and individual or social practices, i.e., that technologies have features and functionalities regardless of whether humans recognize or use them. However, they acknowledge that technology and social practices are tightly intertwined in a way that is sometimes called 'imbrication' [40]. Leonardi [39] elaborated on the theory of affordances to develop his imbrication perspective, suggesting that coordinated human agencies–i.e., social agency–and the actions that the materiality of a technology allow people to engage in–i.e., material agency–become interlocked in sequences that produce the empirical phenomena called 'organizations' and 'technologies', respectively. Both agencies represent capacities for action, but they differ with respect to intentionality. Thus, people have intentionality, and technological artifacts have materiality [74]. ERP packages are especially relevant in influencing human agency at work by proactively stipulating the steps that must be followed for a transaction to be properly executed. That is, ERP packages have profound effects on the structuring of work and the forms of human action they enable or constrain [49]. A relational view of affordance goes beyond talking about generic users or technology as bundles of features. Here, a user's goals and abilities, social context and the specifics of the situation will matter very much [75]. Managerial IT competence allows exhibiting IT leadership [76] and may affect top managers' perceptions and behaviors regarding IT initiatives [77].

As noted by Walsham [78], theory–in our case affordances and imbrication–inspired and enabled us to gain good insights from field data. In this paper, the concepts of 'affordance' and 'constraint' have been concretely examined for ERP systems and the case study setting.

3. Study design and method

The case study described in this paper concerns the introduction of a new SAP/R3 ERP system into a manufacturing company. The planned system was complex and impacted all major areas of the organization. Single-case studies are eminently justifiable when the case may be 'representative' or typical [79]. In that sense, this case represents a typical ERP project but in the presence of the essential IT involvement of most of the TMT members. Three subunits of analysis were considered: the organization, the TMT and each TMT member individually. We thus conducted our research on an embedded, single-case study relying on an interpretive, constructivist view of the research process. Therefore, the organizational processes that concerned how to obtain ERP value, as specified by emergent process theories, were examined by means of interpretive methods and considered in relation to the influences of earlier phases. Keeping in mind the assumptions of interpretive research [80, 81], we focused on the subjective descriptions of top managers' practices and their perceived IT affordances, constraints and value concerning the ERP software package.

Concerning the role of theory in interpretive research [82], we used emergent process theories [12, 83] about how to obtain IT value; we also used affordances [38, 64] and the imbrication perspective [39] as valuable initial guides to design and data collection. However, we preserved a considerable degree of openness to the field data [84] and a willingness to expand initial assumptions and theories by the iterative process of data collection and analysis.

The data collection, involving contact with the organization, occurred over a three-month period between October and December 2013. Multiple methods of data collection were employed, including interviews, company documents, participant observations and surveys to the TMT members. However, the main research method involved semi-structured interviews. One of the authors of this study collected the bulk of our data by conducting interviews with several managers using an evolving protocol [see 85]. In addition to direct observations, we also used company documents, e-mails, and informal interviews to triangulate our findings. Additionally, we surveyed managers to obtain data on perceived IT value and managerial IT competence. Surveys can be a useful complement to other data sources and are thus perfectly valid inputs for an interpretive study [78].

The methodological rigor of the case study may be judged in terms of credibility, transferability, dependability, and confirmability [86]. To first ensure credibility, we applied the following techniques: prolonged engagement, persistent observation, triangulation of sources, methods and theories, peer debriefing, and member checking. The second author impartially examined the first author's transcripts, notes, reports and methodology on a regular basis. After that, feedback about vague descriptions, understated points, data errors, biases or assumptions made by the first researcher was provided to enhance credibility. The results were shared, discussed and validated by the respondents. Data collection methods and sources were triangulated, and rival explanations were considered. Transferability was assured by a thick description [87] of the context so that the reader can determine whether the findings may possibly apply to another setting. Dependability and confirmability were ensured by fully documenting the research process and results. In this regard, an interview guide, a case documentation, and a data analysis protocol were elaborated. Furthermore, the second author was the designated person to check for consistency, thus reviewing the inquiry process, data, interpretations and recommendations [88]. Precautions were taken to corroborate the interpretations made [79, 89]. The design and conduct of this study followed the principles of methodological triangulation [90] and expert guidelines for each method individually [e. g., 78, 82, 85, 91]. Emerging concepts were checked for representativeness by examining them across participants and with multiple methods. Triangulation across data sources–multiple informants at different functional positions–and across data collection methods–interviews, documentation, observation, and surveys–further served to strengthen the emerging concepts. Finally, the interviewees provided commentary, correction, and elaboration on drafts of the findings. Following Walsham's [82] suggestions on what should be reported to ensure rigor and validity in an interpretive case study, a summary of the specifics of site selection and description, data sources and analysis are provided in the following paragraphs.

3.1. Site selection and description

Theories on how to obtain ERP value suggest studying the entire emergent process from adoption to success [12]. Affordance theory suggests the study of TMT's competencies, goals, perceived affordances and constraints using the ERP system. Then, we had to study TMT's characteristics and processes in appropriate settings not only where top managers were supporting IT initiatives but also where the TMT's size was appropriate, including at least five members [92]. Moreover, where a complete working solution was likely to be adopted and used–a situation that relied on ERP's technical adequacy, i.e., its functionality, ease of use and learning, reliability, availability of good technical and support infrastructures, etc.–. We launched two email campaigns targeting companies matching our TMT's size criteria. The tracking issues resulted in more than one hundred conversations. Finally, the firm SHOWERSCREEN (a pseudonym) was chosen because it completely matched all our requirements.

SHOWERSCREEN is a Spanish producer of shower cabins and screens or doors. The company was founded in 1989 as a small family-owned firm. In 2012, with a relatively new senior management team, the firm started the internationalization process with revenue of 21 million euros, 174 employees and 7 TMT members: deputy Chief Executive Officer (deputy CEO), CFO (financial), COO (operations), CMO (marketing), KAM (sales), ORM (organization), and HRM (personnel). At the time of the study, the company had branches in four countries and was preparing for entrance into two new countries. The organization can be described as having a centralized functional structure, power-oriented culture, and congruent goals and values regarding IT. The firm's CEO promoted a data-oriented culture and inspired action based on insights from data. All TMT members were highly committed to IT as an operational and strategic asset. Although we observed the crucial role played by the CIO (not a TMT member), sound IT leadership was attached to the role of the deputy CEO. However, almost all the TMT members had extensive skills for interpreting the meaning of the ERP data elements, their relations and limitations for analysis. Moreover, they showed strong interpersonal skills to champion, train and support end users in their respective areas.

3.2. Data sources

We followed specific guidelines for the conduct of semi-structured interviews [85], including preparing the script, minimizing social dissonance, flexibility, improvisation, and openness. The semi-structured script included questions about IT investments, IT impacts, top managers' characteristics, and organizational and environmental characteristics. All the questions were informed by the theories in what we grounded our research, such as how to create IT and ERP value [12, 83], affordances [38, 64], and imbrication [39]. Top managers were interviewed individually in one session that lasted one and a half to two hours in length.

A major source of data on TMT's perceived IT value and characteristics was obtained by an internet survey built following Dillman's [91] suggestions that was administered to the entire TMT immediately after the interviews. The major variables measured by the questionnaire items were IT perceived value, adapted from Tallon's scale [57], and TMT's IT competence, adapted from Bassellier's et al. validated instrument [93]. Both scales were translated from English to Spanish with minimum adaptation.

Additionally, we also obtained data from interviews with the CEO and CIO. The CEO gave us valuable information about strategic and IT vision, the status of the ERP project and his personal commitment to IT. The CIO informed us of the main details in the development of the ERP project, the reasons for initiating the project and whether top managers were really involved and participating in the project. Additionally, documents pertinent to the project and the organization were sought, reviewed and analyzed for another perspective on the data. These documents included external communication documents, documents on the firm's activities and products, project documentation, and documentation from the ERP supplier and the specific SAP/R3 solution.

3.3. Data analysis

We used simple descriptive statistics–percentages–of quantitative data from surveys only to illustrate the IT competence level of TMT members and their perceived IT value. Instead, we explored all the qualitative data–interviews, documents, etc.–using content analysis [88]. This process entails five steps: unitizing the interview data, coding the units, identifying the categories of similar units, noting the emerging themes, and subdividing themes into subthemes. Following recommendations on the use of computer-assisted qualitative data analysis software [94, 95], we recorded the interviews and selected Dedoose to process and analyze the data from the survey and from the interviews. We chose this tool because it was specifically designed and built for analyzing qualitative and quantitative data. We excerpted and coded each interview file. For the first cycle of coding, we used structural, descriptive, "in vivo", value and magnitude coding. Code weights or ratings represented quality, sentiment, importance or any other dimension on a number ranging from 1 to 5 to help distinguish variation in content where the same code has been applied to many excerpts. Subsequently, we used pattern matching and axial coding [see 96]. Thus, our analysis involved interpreting the meaning of data elements grounded in inductive pattern recognition [89]. What follows is an example that shows how we coded several conversations regarding the analysis of IT investments. Codes and weights appear in this way–code1, weight1; code2, weight2; …–:

> Deputy CEO: "*These investments in the short-term will not have a significant effect in streamlining processes, but rather, quite the contrary–short term ERP intermediate impact, 2–; however, it is a tool with enough potential to allow us to work more efficiently–affordances, 4; efficiency, 4–; but you have to believe in that, you cannot make those decisions based on data ... It is very difficult quantifying it [referring to SAP] in terms of profitability, very difficult–ERP investment analysis, 1–".*

> CIO: "*In this case it is very complicated [referring to SAP]; the main reasons [to make the investment] were the limitations for growing and the lack of information consistency–legacy systems, 1; impeding growing, 4; data inconsistencies, 4–"–ERP investment analysis, 1–.*

ORM: "*We are highly committed–commitment, 5– and capable enough to do it. Then, come on!–TMT involvement, 5–*"–*ERP investment analysis, 1–*.

KAM [regarding the sales app]: "*We did not take into account any budget for the investment, or profitability issues–ERP investment analysis, 1–; just improving the inbound flow of commercial information–affordances, 4; improving frontline sales reps' work, 4–, as well as [the improvement] of tracking and control activities– affordances, 4; improving sales reps control, 4–.*"

Most often, our respondents did not respond to our questions explicitly in terms of affordances, constraints, participation, or use; however, we inferred the responses' implicit meanings from our interpretation surrounding the development and use of the ERP system and from their behavior deduced via observation, documentary and verbal data. For example, we depict TMT-IT imbrication based on our interpretation of the interviews, according to top managers' extreme ratings for each dimension.

4. Findings

Although each ERP system experience runs a different course, the empirical findings serve as a credible representation of the various local constructions encountered, which can adequately enlarge the understandings of respondents while serving the purpose of the inquiry [97]. The different local constructions encountered have been explicitly stated in the form of theoretical propositions and should be considered as explanations for particular phenomena derived from empirical interpretive research in specific settings that may be valuable to other organizations and contexts in the future [82]. Findings are presented corresponding to the phases of the ERP journey and summarized in advanced in Table 1.

Table 1. Phases, main concerns and empirical observations

Phase/Concern	Observation	Method/s	Data sources
Chartering phase			
Whether,	Yes.	Interviews.	CEO, Deputy CEO, COO, ORM, and CIO.
why,	Many constraints related to their legacy system; Many perceived affordances in the new system.	Interviews.	CEO, Deputy CEO, CMO, ORM, and CIO.
and how to undertake the ERP system investment.	"Big-bang" implementation, in-house with external assistance.	Interviews, observation.	Deputy CEO, ORM, CIO and project documents.
TMT's goals.	Automation, integration, analytical decision making, enhancing customer relationship management, etc.	Interviews.	Deputy CEO, CFO, COO, CMO, KAM, ORM, HRM.
Social processes.	Power and contagion may cause the convergence of attitudes, values, and beliefs among the TMT members.	Interviews.	Deputy CEO, CFO, COO, CMO, KAM, ORM, HRM.

Phase/Concern	Observation	Method/s	Data sources
Project phase			
Configuration–parameter settings–.	High.	Interviews, observations.	Deputy CEO, CFO, COO, CIO, and project documents.
Customization–addition of non-standard features–.	High level of IT tailoring to fit crucial processes, especially in operations management.	Interviews, observations.	COO, CIO, and project documents.
Process change.	Low process change. High adaptation to the ERP built-in processes.	Interviews.	Deputy CEO, CFO, HRM.
Success in terms of the implementation project.	Classic performance project metrics were quite successful.	Interviews, observations.	Deputy CEO, CFO, COO and project documents.
Shakedown phase			
New initiatives.	New system's affordances perceived: order tracking, e-commerce and business intelligence.	Interviews, observations.	CEO, Deputy CEO, COO, CFO, CIO and IT function's to-do list.
TMT's IT competence.	Medium.	Interviews and surveys.	CEO, Deputy CEO, CFO, COO, CMO, KAM, ORM, HRM, and CIO.
TMT's perceived ERP value.	High.	Interviews and surveys.	Deputy CEO, CFO, COO, CMO, KAM, ORM, and HRM.

4.1. Chartering the ERP investment

SHOWERSCREEN's top managers decided that it was time to invest in a new ERP solution because they had identified many deficiencies and obsolescences related to the legacy system. The new SAP R/3 system was the most important IT investment ever made and had cost over 1 million euros. Top managers were key players in the decisions leading up to the funding of this crucial IT investment and narrowed the field of ERP vendors to three leading candidates. Because the deputy CEO and the CFO had previous experience with certain SAP partners and with this system, they opted for SAP/R3. Although objectives and metrics were left undefined, we observed a high degree of information exchange, consensus and shared vision about the role that IT should play in the organization. Several managers justified the complexity when trying to analyze the viability of the ERP investment. For example, the deputy CEO stated, "*In the short run, these investments will not have a significant impact on process level agility; indeed, it is most likely the contrary. However, the tool [referring to SAP R/3] has enough potential to make us work efficiently, but you have to believe in that because you cannot make these decisions in a rational manner based on data [...]; it is very difficult evaluating these investments in terms of profitability*". Moreover, the CIO said: "*In this case [referring to SAP R/3], it is very complicated, but the main reasons leading to the investment were the limits for growing and the data inconsistencies [related to the legacy system]*". Notably, the professed objective of the project was not a specific business or process goal but rather to employ the new system to replace legacy systems that were stretched to the limit by 2011 and perceived as a barrier to future expansion. TMT members perceived many affordances in the new system

related to issues such as automation, data rationalization, customer-facing processes, service and customer retention, ease of expansion and growth, and better decision making. Additionally, the deputy CEO said that it "*was an opportunity to invest in something really valuable in the long term*".

In view of affordance theory, the ERP package has material properties that afford different possibilities for action within SHOWERSCREEN's specific context, e.g., automation, reliability, integration, etc. Therefore, affordances are unique to the particular ways in which the TMT perceives what SAP/R3 does. Because TMT members using SAP/R3 have diverse goals–e.g., analytical decision making or enhancing customer relationship management–, they perceive the system as affording distinct possibilities for action. Hence, the TMT members' goals when deciding to adopt the ERP system are formulated, basically, by their perceptions of what SAP/R3 can or cannot do, and those perceptions are shaped by the TMT's goals. Likewise, the TMT members perceive the legacy system's deficiencies–e.g., obsolescence, lack of technical support, and lack of scalability–as constraining their ability to achieve their goals.

Proposition 1: In the chartering phase, TMT members draw on familiar schemas or frames to make sense of the affordances and constraints of the new ERP system, thus transferring interpretations from past practice or experiences to present ones. Moreover,

Proposition 2: In the chartering phase, TMT members actively construct perceptual affordances and constraints when attempting to reconcile their own goals with the ERP materiality.

However, why do TMT members come to share similar perceptions of the previous legacy system's constraints and the new ERP's affordances? Perceptions largely determine whether and why they will adopt and use the new ERP system. From a constructivist point of view, social construction, social influence processes, social perception, and power all play a role in shaping perceptions of the ERP system's utility. In this view, the exposure to others' attitudes through membership in a group shapes peoples' perceptions of a new technology [98]. Thus, adoption is a collective rather than an individual process that stands apart and may sometimes be divorced from the technology's physical capabilities [36]. Social forces would be more important than the technology's physical attributes in determining use [99]. In our study, various social processes came into play and became entwined with the technology's materiality within the context in which it will be used [41].

Proposition 3: In the chartering phase, the perception of affordances and constraints of the new ERP system occurs through the convergence of attitudes, values, and beliefs among the TMT members. Power and contagion are the primary cause of convergence, favoring the adoption of an ERP system.

4.2. The ERP project

The project phase comprises activities that aim to get the system up and running in all the organizational units: finance, operations, manufacturing, marketing, sales, etc. Generally speaking, obtaining IT value requires two necessary outcomes: (i) obtaining IT assets from the correct IT investments via IT management practices and (ii) obtaining IT impacts by using IT assets properly [83]. In the specific case of ERPs, they hold deep knowledge of common best practices for business but are generic, semi-finished products that adopters must tailor to the organization's needs. One of the main problems in implementing ESs is determining which mix of configuration (i.e., parameter settings), customization, (i.e., addition of non-standard features), and process change is the best to meet project or business goals [100, 101] because those systems impose their own logic on the company's strategy, culture and organization, demanding organizational discipline and strict adherence to standardized processes [49, 102]. These systems are often promoted as a means of transferring best practices and might be considered "*a technological architecture that actually dictates how processes should be undertaken*" [103:3]. Consequently, obtaining the IT asset is mainly a process of molding and adapting the so-called best practices to fit the critical processes of the adopting organization [104, 105]. However, the adopters of an ES often adjust the organization's work system to fit the built-in features of the package [12]. Implementing an ERP system establishes a tight link between organizational structures and business processes within the ever-shifting IT framework [106]. Consequently, these organizations must commit to some degree of business process reengineering.

SHOWERSCREEN's top managers made an explicit decision to deemphasize process reengineering in favor of the successful implementation of existing processes. A 'big-bang' risk implementation was chosen to anticipate the end of the system's installation. As the deputy CEO stated, "*process redesign was actually minimized and lesser than I would have desired; people refused to change their routines; however, they finally understood that SAP/R3 embodies certain aspects that require adaptation*". Each phase of the project was carefully planned, and ongoing changes were resisted. New system implementation was completed in no more than twelve months as the firm optimized the entire manufacturing process, including production planning, compliance, and supply chain management and also empowered account managers with enhanced CRM mobile solutions. Therefore, modifications were not minimized because the system was specifically adapted to fit the COO's goals and needs. We observed an important level of adaptation to the ERP built-in processes but also an elevated level of IT tailoring to fit crucial processes of the organization, especially in operations management. Based on our observations, classic performance project metrics were quite successful against the planned schedule, budget, and functional scope.

In view of the imbrication perspective, and thus depending on whether the TMT members perceive that the ERP system affords or constrains their goals, they make choices about how they will imbricate agencies. If the TMT members perceive that SAP/R3 affords possibilities for action, then they most likely will change their patterns of ERP usage, e.g., by adapting to SAP/R3 embedded financial capabilities. Conversely, if they perceive that the ERP constrains their goals, they will change the ERP system, e.g., by tailoring the SAP/R3 operations module to meet their requirements. TMT members who have the authority to acquire the new ERP and who control the implementation terms may frame the ERP's utility and mandate that it should be used in ways that replicate the status quo and that change those other aspects that they believe need to be changed [107]. This perspective connects implementation and use with preceding decisions and events in the chartering phase.

Proposition 4: In the project phase, perceived ERP's affordances and constraints by TMT members may frame current and future process-change needs. That is, potential ERP value at the intermediate process level fundamentally depends on TMT members more closely participating in configuration, customization and process-change activities.

4.3. Shakedown

In the chartering phase, top managers' activity was concentrated on identifying and selecting the appropriate ERP software package, approving and funding an initial ERP journey, and communicating the potential benefits to gain commitment from all stakeholders. Next, in the project stage, top managers were focused on supporting the chosen ERP modules and implementation strategy, assigning project teams and training courses, and identifying current and future needs of process change in accordance with the overall goals and the organizational context. Generally, in the shakedown stage, top managers are expected to engage in tuning system performance, retraining activities and encouraging all stakeholders to maintain a positive attitude towards the ERP system and its future benefits [108]. Past research has conceptualized all these previous actions as TMS [see e.g., 25, 109].

As expected, many errors and problems occurred after the installation was finished. The COO argued: "*we are still putting out diverse fires [referred to SAP]*", i.e., they have not achieved 'normal operation'. We observed that only two departments had already been placed into the new system: finance and operations. Indeed, the KAM said: "*I am still waiting for my turn, still using the legacy system when I create queries on historical data*". SHOWERSCREEN was working for two years with SAP R/3, and as the CEO stated, "*we still have 60% pending to accomplish SAP R/3 project goals*". However, substantial improvements in service processes have resulted and are visible both internally and externally. Hence, the analysis of the interviews reveals that in the interviewees' SAP R/3 project experience, SHOWERSCREEN is at the dawn of the shakedown stage.

Markus and Tanis' [12] four 'ideal' phases of the ES experience describe the process of achieving ERP business value as a series of four linked and necessary conditions that are assumed to be insufficient but necessary for the outcome to occur [110]. However, our empirical results show that SHOWERSCREEN's TMT members perceive significant IT value without having accomplished the mandatory previous processes or stages. Why does this happen?

4.3.1. Perceived ERP value

We observed that SHOWERSCREEN's top managers perceived high ERP value–from interviews 70%=3.5/5 and from surveys 74%; see Table 2 and 3, respectively–regarding impacts at both the intermediate process level and organization-wide level in aspects such as branding–which was mentioned 5 times in the conversations and was pondered 3.6 by interviewers on average using a magnitude scale ranging from 1 to 5; see Table 3–, communication, control, differentiation, efficiency, customer reliability, flexibility, and analytical decision making. Mostly, they perceived high ERP value in enabling differentiation, efficiency, control, flexibility and reliability.

Table 2. Top managers' perceived ERP value based on interview analysis

IT value expression	Count	Min	Max	Mean	Median
Branding	5	3	4	3.6	4
Communication	7	1	4	3.1	4
Control	15	3	5	4.1	4
Decision making	16	1	5	3.6	4
Differentiation	7	3	5	4	4
Efficiency	25	3	5	4	4
Flexibility	5	4	5	4.2	4
Innovation	3	1	4	2.7	3
Process redesign	1	2	2	2	2
Reliability	14	3	5	4	4
Sales increase	4	1	4	2.8	3
Total	102	1	5	3.5	4

Magnitude coding scale ranging from 1 to 5

The deputy CEO experienced three SAP projects in industrial settings in past positions. In this project, for example, he perceived affordances in breaking down the silos of customer information located in the back office and sharing that information with frontline sales reps through their mobile devices. Now, account managers have been empowered with the information they need to nurture each opportunity. Another perceived affordance was related to customer order tracking. Accordingly, a web service was developed that provides information about current orders and their positions in the manufacturing process. Moreover, supporting videos and instructions addressing customers' needs are available on the website. Furthermore, top managers produced an online catalogue, i.e., a virtual setting that allows customers to create their own budget by choosing between different layouts, colors, materials, etc. This setting will boost new ecommerce actions. Additionally, they improved call center management and tracking performance, and they also ensured an optimal customer service experience.

Previous examples show that the deputy CEO pays substantial attention to the possibilities for action due to the new SAP/R3 functionality, including call center operations, CRM, and e-commerce storefronts. As a result, SAP/R3 has been adjusted to fit the TMT's goals and intentions. All these changes create the infrastructure that people use to get their jobs done. Indeed, previous arguments show that the deputy CEO is highly involved and actively participates in the resource provision and structural arrangements needed for the SAP/R3 implementation and use. He also participates in the interface design of mobile apps for account managers to improve usability and, hence, reduce barriers to use.

The deputy CEO's IT vision mainly focuses on using IT for improved decision making and increased sales revenue, which agrees with the CEO's view. As the deputy CEO said, "*our CEO believes in professionalism, analytical decision making, digitalization, […] and he is positive and permeable for IT projects*". The deputy CEO considers that the

introduction of SAP/R3 is an opportunity to make process changes, but he recognizes that it triggers diverse and conflicting views among the TMT members. As previously mentioned, the business process redesign was not as extensive as desired. Because of the new affordances perceived by the TMT members in the shakedown stage, the company launched new initiatives around the SAP R/3 system, such as order tracking, e-commerce and business intelligence. As shown, SHOWERSREEN's TMT members paid substantial attention to the possibilities for action due to the new SAP/R3 materiality.

Proposition 5: In the shakedown stage, the devoted and persistent TMT's involvement in the ERP implementation and use–hereafter coined as TMT-IT imbrication–creates infrastructure in the form of routines and technologies that people use to carry out their work. TMT members perceive this infrastructure as ERP business value at the intermediate process level.

Proposition 6: In the shakedown phase, the TMT's IT attention and use are needed to perceive ERP affordances and constraints, the catalyst for imbrication.

4.3.2. An attempt at the operationalization of TMT-IT imbrication

In this paper, we argue that the TMT should consider the potential benefits of ERP systems and how to obtain them, i.e., by changing routines or by molding the ERP system. However, an understanding of ERP potentialities can be achieved not only through continuous attention to ERP affordances and constraints but also through convenient use of the ERP system, as the realized benefits from enterprise systems emerge when people interweave with the system in practice to generate new uses for it [48]. Thus, to operationalize TMT-IT imbrication, we have added 'attention' and 'use' to the two dimensions of the TMS construct: involvement–subdivided into importance and personal relevance–and participation [25].

SHOWERSCREEN's TMT members consider IT especially important (89.3%; see Table 3) and very personally relevant (75.0%), thus participating in IT activities (71.4%) while paying attention to ERP affordances and constraints (64.3%) when using the ERP system in their everyday working activities (71.4%).

Table 3. Top managers' perceived ERP value, IT competence and imbrication

| Top manager | Total perceived value | IT competence | TMT-IT imbrication dimensions | | | | | Total imbrication |
			Importance	Personal relevance	Participation	Attention	Use	
Deputy CEO	82.2%	67.4%	4	4	4	4	3	95.0%
CFO	77.8%	68.0%	4	4	4	4	4	100.0%
COO	55.6%	31.4%	4	4	4	3	4	95.0%
CMO	66.7%	68.6%	4	4	4	4	4	100.0%
KAM	62.2%	38.9%	3	3	2	1	3	60.0%
ORM	95.6%	67.4%	3	1	1	1	1	35.0%
HRM	77.8%	54.3%	3	1	1	1	1	35.0%
Total	74.0%	56.6%	89.3%	75.0%	71.4%	64.3%	71.4%	74.3%

Dimensional scales of TMT-IT imbrications ranging from 1 to 4

As Figure 1 shows, we found three imbrication factions, i.e., subgroups comprised of TMT members who have similar imbrication patterns that differ from other subgroups of members. Four members are clustered around the high imbrication faction but show disparity between IT perceived values. The deputy CEO shows the highest perceived IT

value within the high imbrication faction (82.2%; see Table 3) and holds a prominent level of managerial IT competence (67.4), particularly, valuable experience in adopting and implementing ERP systems. Conversely, the COO perceives the lowest IT value within the high imbrication faction (55.6%) and records the lowest level of managerial IT competence (31.4%). Almost certainly, the COO views the new ERP implementation as a technology decision rather than a business decision, where the system in-progress benefits are not as large as those achieved with the previous legacy system. The COO experienced a high degree of ERP customization to replace the previous legacy system's functionality, enduring the problems of both the project and shakedown phases. People will resist an application when the costs outweigh the benefits [received wisdom; see 111].
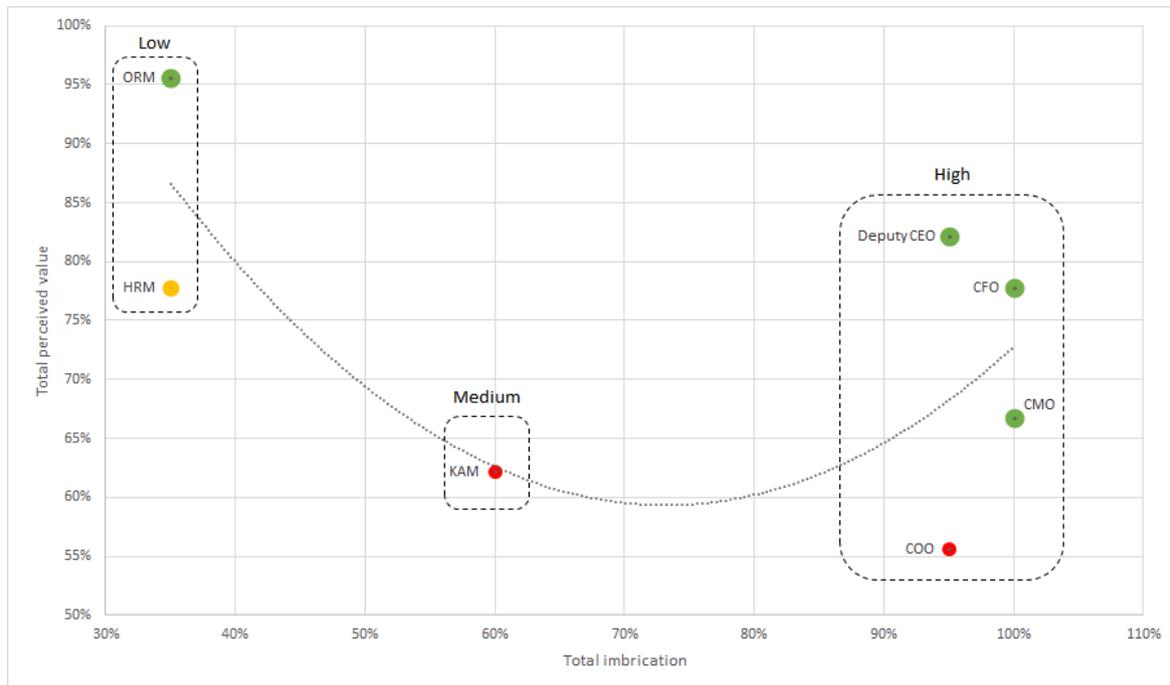

Figure 1. TMT-IT perceived value vs. TMT-IT imbrication, with the addition of managerial IT competence

Size and color–green, yellow and red for the smallest values–of data labels indicate managerial IT competence (see Table 3)

Otherwise, the KAM is the only member clustered around the medium imbrication faction. KAM's goals are relatively low with respect to the new system, and he has not yet been impacted by the new ERP solution. Moreover, the KAM pays low attention to affordances and constraints and holds a low level of managerial IT competence. Finally, two members are clustered around the low imbrication faction. The ORM shows a particular commitment to IT, stating, "*IT is important for every business*" because "*IT improves self-control and productivity*" while claiming that "*we are always trying to improve efficiency through IT*". The ORM is a long-tenured member who can explain every IT project previously carried out. He stated: "*previous experience has shown us that we had to implement new IT quickly, diligently, and conscientiously*". Although he was a main actor in previous IT projects, he has become a guest in the SAP/R3 project. Similarly, the HRM exemplifies low imbrication but high perceived IT value. Notably, they support ERP initiatives because they consider the ERP system to be important for organizational goals. However, they do not pay much attention to the new ERP affordances and constraints.

Proposition 7: Top manager's goals and functional position may determine his or her imbrication pattern–high, medium or low–. That is, high imbrication may be associated with top managers of functional positions related to the key areas covered by an ERP solution: finance, marketing, commerce, manufacturing, supply chain management, and service. Conversely, medium or low imbrication may be related to the marginal areas of an ERP solution, such as human resources management, sales, R&D, and sourcing and procurement.

Proposition 8: Within a particular imbrication pattern, managerial IT competence may have a positive influence on individually perceived ERP value, whereas the manager's implementation efforts may have a negative influence on its own perception of ERP value.

Proposition 9: The presence of imbrication factions may have a negative influence on total TMT's perceived ERP value. While highly imbricated TMT members create the ERP value that may be perceived by everyone in the organization, TMT members clustered around the low or medium imbrication factions are just supporting ERP initiatives but hardly generating ERP value. Therefore, the more TMT-IT imbrication, the more ERP value.

5. Discussion

Our aim of resolving how exactly top managers can create more organizational value with ERP systems was the theoretical challenge at the inception of this research. What follows is a collective synthesis of our empirical findings– summarized in Figure 2–embedded in the existing literature but also including theoretical and practical implications, study limitations, and future research directions.
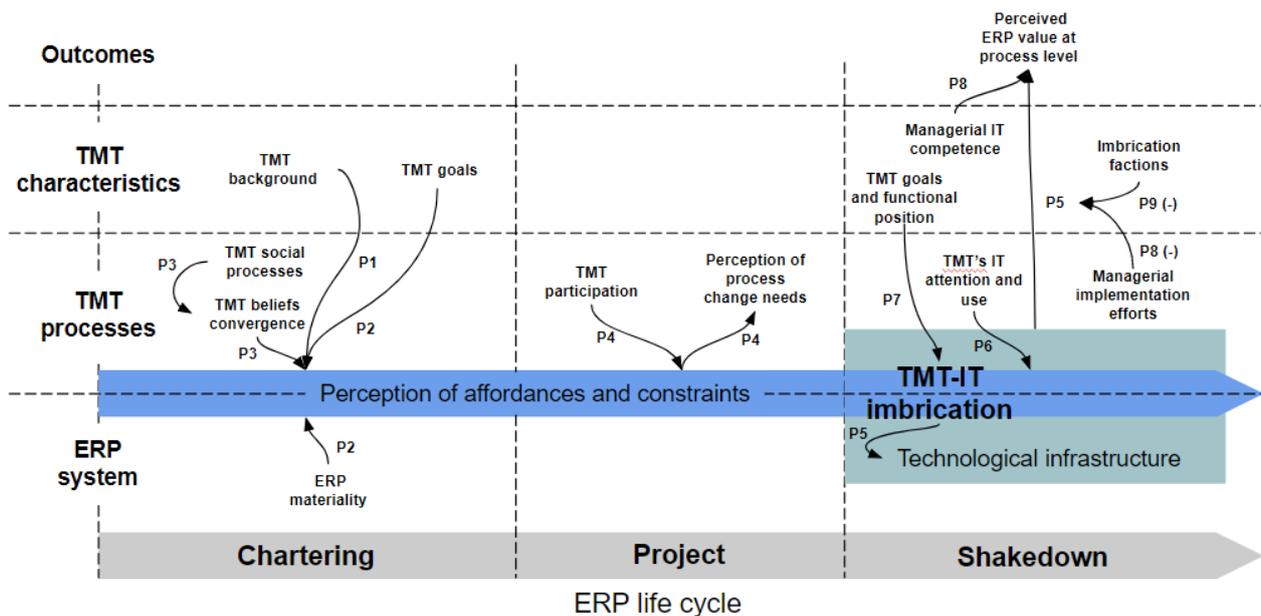

Figure 2. Research findings framework

In the chartering phase, TMT members make sense of the affordances and constraints of the new ERP system by both transferring interpretations from past practice and by actively constructing them when they attempt to reconcile their own goals with the ERP materiality. Power and contagion are the primary cause of convergence of attitudes, values, and beliefs among the TMT members, thus favoring the adoption of an ERP system. Largely, the technology acceptance model [112] provided a general explanation of the determinants of computer acceptance across a broad range of end-

user computing technologies and user populations. In contrast to the technology acceptance model and specific extensions that have been made for it in an ERP implementation environment [e.g., 113, 114], our results particularly show that, in the case of TMTs, social construction, social influence processes, social perception, and power play a crucial role in shaping perceptions of the ERP system's utility. Moreover, our interpretation of the results suggests that, in the project phase, perceived affordances and constraints by participative TMT members may frame current and future process change needs, thus delineating potential ERP benefits.

Furthermore, we interpret from our results that, in the shakedown phase, the TMT's devoted participation, called TMT-IT imbrication, creates the technological infrastructure, which is perceived by TMT members as ERP business value at the intermediate process level. At this stage, the TMT's attention and use are needed to perceive ERP affordances and constraints. Our results add to Anaya's work [48, 115], which provided a discussion of how sociomateriality can enrich the understanding of benefits realization from ES because benefits emerge after using the system and cannot be fully identified beforehand, when organizations are not completely aware of the system potentials, especially of the integration possibilities. Our results are also consistent with Hallikainen and Seethamraju [116], who explored the alignment of enterprise systems and organizations in the post-adoptive phase, focusing on the understanding of what managers actually do and how they interpret what they are supposed to do. In line with Jarvenpaa and Ives [25], who found that top managers with career backgrounds in output functions–i.e., marketing, sales, R&D–were typically more open to exploiting IS for competitive advantage, we suggest that top managers' goals and functional position may determine their imbrication pattern and thus the potential value that they might create. Moreover, we found that within a particular imbrication pattern, managerial IT competence may have a positive influence on perceived ERP value, while the manager's implementation efforts may have a negative influence on perceived ERP value; finally, the presence of imbrication factions may have a negative influence on total TMT's perceived ERP value.

A variety of techniques have been used to explore and extend ERP systems: business process management (BPM), workflow management, enterprise application integration (EAI), service-oriented architecture (SOA), grid computing, and enterprise architecture (EA), among others [117]. Precisely, at the core of EA lies the idea that IS and the business should be considered holistically and consistently [118] in order to drive the business benefits of IT [119-122]. The research reported in this paper is in line with the ideas of EA but also in agreement with Loonam et al. [123], who call for a more holistic approach to 'support' for organization-wide implementation while suggesting that top managers who foster a positive attitude toward IS can build a powerful coalition group to develop a vision aligned to the corporate strategy, thus creating organizational value.

We collected our data from only one organization. Therefore, we cannot claim that our findings have provided a complete overview of the issues surrounding TMT-IT imbrication in distinct types of ERP projects. Although we used multiple methods to triangulate our findings, we relied greatly on data from our interviews with top managers. Interviews with middle managers, users, IT staff members, and external consultants might have resulted in richer perspectives on our research topic. We hope that this interpretive study will promote additional qualitative and quantitative studies on the role of top managers in ERP value creation. Although many factors that we did not examine in this study are needed to fully capture potential ERP value, we have answered two important questions. First, *how* can top managers contribute to obtaining ERP value? In our view, they should establish a closer relationship with ERP systems and consider not only supporting ERP initiatives but also becoming involved in, participating in, attending to and using ERP solutions. However, we should be aware of the TMT's characteristics, such as functional position or top managers' goals or intentions, that can greatly influence imbrication with ERP systems. We suggest that top managers with high managerial IT competence levels are most suitable to create more ERP value for their organizations. Second, *why* do top managers play a role in obtaining ERP value? The answer to this question is because they perceive ERP systems as affording distinct possibilities for action or goal-oriented action [42]. However, top managers perceive ERP's affordances only when they pay attention to the ERP's materiality. In sum, this paper has offered practitioners a more complete path to obtaining value from ERP investments. Provisioning TMS is not enough. Hence, top managers should imbricate with ERP systems from the post-implementation stage. The TMT-IT imbrication multidimensional construct can be used in discussing, planning, tuning, and evaluating top managers' specific behavior with respect to ERP systems. Many practical questions may arise. For example, what if a company does not have a suitable TMT to imbricate with IT? What should they do? Make or buy it? We argue that a firm can hire top managers with high levels

of managerial IT competence; however, TMT-IT imbrication is path-dependent and requires time and effort, attention to IT affordances and constraints, and appropriate IT use. Therefore, it can be leveraged to create heterogeneous and imperfectly mobile resources and capabilities, thus building differential IT value.

In general, we believe that top managers' imbrication with ERP systems is a fruitful research area. This empirical research has left a number of questions unanswered. For example, how do institutional and technological contexts explain, shape, or inhibit various top management behaviors and actions? Moreover, quantitative studies may help to test the validity of the propositions. Future research needs to test the generalization of our findings and gain a better understanding of the conditions and mechanisms governing the effects of participation, involvement, attention and use over the progressive adoption of ERP systems in order to create more value in organizations. Future researchers need to study the differences between TMT-IT imbrication in diverse degrees of organizational centralization. As Jarvenpaa and Ives [25] noted, TMT's IT attention could be more tied to specific business needs in firms in which contact with IT function is more frequent and direct compared to highly decentralized or multi-business firms. Organizational size may also influence the role of top managers in obtaining ERP value [124]. Hands-on IT management might be much more important for small organizations, in which the CEO or TMT typically makes most of the key decisions and is the only person who can attach IT to corporate objectives and strategy [25]. Finally, longitudinal studies should test whether the imbrication process maintains the continuous commitment of the entire TMT, how IT leadership might change across distinct TMT members or along the phases in the ES life-cycle [125], and why this change may occur.

6. Conclusion

Research on ERP systems has called for the consideration of alternative theoretical assumptions regarding ERP implementation. In contrast to deterministic accounts of ERP journeys, we have examined the emergent four-phase process of enterprise systems implementation [12] with the support of the theoretical lens of the affordances and imbrication perspectives. As noted by Majchrzak and Markus [40], technology affordances and constraints theory might be appealing to those who aim to build theory, aim to interpret human and organizational technology-use behavior, aim to construct post-hoc explanations of behaviors and outcomes in individual case studies, or even to those who are interested in more precisely defining 'alignment' or 'fit' between people and technology. On the other hand, constructivist studies of technology and organizing have generally sidestepped the role powerful actors play in shaping technologically occasioned organizational change [36]. In line with Leonard-Barton's [126] statement on '*implementation is innovation*', we focused on top managers as powerful actors who can obtain the great benefits of ERP investments, which we consider as emerging during the course of the TMT's encounters with the ERP system as they use it in the conduct of their everyday work through pragmatic action and situated improvisations. During the ERP journey, TMT members have shown different patterns of participation, thus differently contributing to ERP value creation. In contrast to the TMS literature, which is somewhat deterministic and uses a bottom-up approach to ERP implementation, we propose a change in the conversation by emphasizing the idea of a tighter and more continuous relationship between the TMT and the ERP system that extends beyond *support* to create ERP value. Consequently, we have intentionally paid attention to the content and effects of top managers' imbricated behavior, thus contributing to the specific body of knowledge about managerial agency on ERP value creation.

Acknowledgments

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Appendix

SCRIPT FOR INTERVIEWS

Questions related to investments in IT:

1. What kind of investments have you made? Why? How much did they cost?

2. In what functions or departments? At what level? In other words, at the management level for decision-making or at the operational level?

3. What kind of analysis was made of these investments? Is it documented? If so, could we see it?

4. Highlight the best and the worst of them.

Questions related to the relevant impacts of investments in IT:

5. Do you think that the IT you use can help you, or on the contrary, prevent you from achieving your goals? Why?

6. To achieve your objectives, do you consider it necessary to make any change in IT? And in the organization? If you remember other previous adjustments, why and how were they made?

7. What benefits have these investments had for your organization? This question will be triangulated with the impact section of the questionnaire.

8. If you have not had the expected benefits, why?

Questions related to the individual characteristics of managers:

9. What knowledge do you have on IT? This question will be triangulated with the competency of the questionnaire.

10. What experience do you have related to IT? This question will be triangulated with the competency of the questionnaire.

11. What is your vision of IT in this organization? That is, what role do you think they should play in this organization?

12. Do you have freedom of action to carry out your particular vision? That is, what is your degree of freedom with respect to investment, management and use of information technology? In case of a negative response, who should decide?

Questions related to the management processes:

13. Who participates in decisions related to information technologies? How do you make those decisions? If decision-making is not participatory, who usually makes those decisions?

14. Do you agree on how to make better use of information technologies? Why?

Questions related to the characteristics and organizational culture:

15. How does management support the use of new IT? Is there evidence? If so, could we see them?

16. Who leads the adoption and use of IT?

17. What level of competence in IT do people (staff) have here? Why?

18. Are your IT adjusted to your business strategy? Why?

19. Regarding other previous IT (which you no longer use), what inertias do you observe?

20. What relationship do you think exists between your organizational flexibility and the IT you use?

21. And with your communication habits?

22. And with your work environment?

23. And with your orientation to innovation?

Questions related to the environment:

24. Do you think that your direct competitors take more advantage of IT? Why?

25. From what you have done with IT, what actions have been motivated by the competitive pressure of your environment?

26. And, what actions have been motivated by government support, subsidies, etc.?

27. And, what actions have been motivated by the support of suppliers, external consultants, etc.?

28. And, what actions have been motivated by other business partners?

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