Perennializing Information Technology Infrastructures: A Dynamic Capabilities Perspective

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Abstract

In a global context of intense volatility, uncertainty, complexity and ambiguity, robust and flexible information technology infrastructures (ITI) – arrangements of shared IT services and technical components that power and support an organization's strategy and processes – are vital to organizations. ITI play key strategic roles, are at the core of business operations and directly affect performance. However, managing the evolution and perennializing transformations of ITI can be very challenging. To cope with this perennity challenge, organizations must develop specific dynamic capabilities to perennialize ITI and their evolution under turbulent and changing business contexts. Still, the question for managers is: What actions should be deployed to perennialize ITI and their transformations? Twenty key organizational actions that were identified by twenty-nine ITI experts, were grouped into three interrelated vectors: (1) *Watching and developing knowledge and know-how to perennialize ITI;* (2) *Visioning and governing ITI; (3) Standardizing and adopting a flexible approach to ITI.*

Keywords: Digital transformation, IT infrastructure, dynamic capabilities, organizational actions, Delphi.

1. Introduction

In an era of heightened volatility, uncertainty, complexity, and ambiguity (VUCA) (Bennett & Lemoine, 2014), organizations must transform/reinvent themselves to enhance their products and processes, improve their customer engagement, and provide digital-based services and experiences. In such context, robust and flexible information technology infrastructures (ITI) – arrangements of shared IT services and technical components that power and support an organization's strategy and processes – are vital to organizations. It is even more of concern as ITI are "the heart of almost every enterprise (p.1)" (Weill et al., 2002). Indeed, ITI

enable competitive performance and help organizations generate strategic advantages and organizational value (Aral & Weill, 2007; Piccoli & Lui, 2014). As the pace and scope of technological evolutions and market turbulences are increasing in today's world, organizations have to respond swiftly to the opportunities resulting from these technological and market shifts, while mitigating the associated threats and transforming their ITI (Benitez et al., 2018; Bhatt et al., 2010). To do so, organizations must invest a great deal of effort and energy in transforming their ITI to adapt to technological change and market disruption while creating and supporting the organizational value proposition (Vial, 2019; Wessel et al., 2021).

Developing flexible and shareable ITI through transformations represents significant investments in time, money and energy as well as less profitability for organizations, but in the long run, it can decrease operational costs, generate profits and more importantly contribute to organizational agility and business value (Aral & Weill, 2007; Bonnet & Westerman, 2021). However, managers face difficult decisions regarding the maintenance and perennity of their ITI (Pipek & Wulf, 2009). Perennializing an IT infrastructure represents the continuous adjustments deployed to adapt the IT infrastructure to the demands of changes arising from the context and to prolong the functioning of the IT infrastructure at an adequate operational level if possible, without having to make major investments and changes.

These managers are constantly trying to balance their desire to forge organizational agility with their desire to perennialize their ITI's operational excellence (Tallon et al., 2019). Managers must become tightrope walkers to find the right balance between perennializing and transforming their ITI; between exploiting, maintaining, and perennializing their existing ITI and exploring, developing, and integrating new ITI components; between short-term and long-term ITI requirements; between limiting spending and maximizing ITI efficiency. Over time, the number of diverse IT components forming an

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organization's ITI is continuously increasing, and managing and perennializing ITI has become very challenging for practitioners as it could potentially jeopardize an organization's agility, limit its value creation and weaken the ability to cope with further technological changes (Hernantes et al., 2015; Lu & Ramamurthy, 2011). Thus, managing and perennializing ITI and their transformation while maintaining organizational agility is complex and perpetual work in progress (Benbya et al., 2020; Pentland et al., 2020).

Managers must therefore have an articulate vision of their ITI and develop the appropriate dynamic capabilities to perennialize their ITI and their transformations (Lu & Ramamurthy, 2011; Ravichandran, 2018). Organizations must sense, seize, and adapt their ITI through their dynamic capabilities. Dynamic capabilities refer to an organization's capacity to sense opportunities and threats, seize opportunities, and maintain competitiveness by reconfiguring its intangible and tangible assets (Teece, 2007; Teece et al., 2016). In terms of ITI perennity, such capabilities reflect how an organization integrates, builds, and reconfigures its competencies, processes, and practices to perennialize its ITI and related transformations.

Given that dynamic capabilities are generated through clusters of organizational actions working jointly (Parmigiani & Howard-Grenville, 2011; Vaara & Whittington, 2012), organizations must have a combination of strategies, processes and practices in place to help managers perennialize their ITI and their transformations (Li & Chan, 2019; Yeow et al., 2018). Yet, what is lacking is an understanding of these organizational actions. The question for managers is: What actions should be deployed to perennialize ITI evolution and transformations? Based on a Delphi study, 29 ITI experts identified 20 organizational actions as "best practices" which were grouped into three interrelated vectors: (1) *Watching and developing knowledge and know-how to perennialize ITI*; (2) *Visioning and governing ITI*; (3) *Standardizing and adopting a flexible approach to ITI*. These actions should help organizations stimulating the transformation of their ITI, while advancing scholars' understanding of the dynamic capabilities needed to foster ITI transformations.

2. Theoretical background: Organizational agility and dynamic capabilities

Nowadays, organizations are evolving in turbulent business environments which directly and indirectly affect their ITI. In an environment characterized by globalization, shifting customer demands, and rapid technological shifts, constant change and adaptability have become the norm (Benitez et al., 2018). To cope with these environmental pressures and technological shifts, organizations must deploy organizational actions, i.e., processes, practices and strategies to exploit the opportunities triggered by these technological changes, while minimizing their threats (Tallon et al., 2019). Regarding the ITI, the one key challenge for organizations is to transform their ITI to match both the actual and future organizational needs, i.e., an ITI reliable for today's operations, and open for tomorrow's changes. To do so, organizations must build their organizational agility.

Organizational agility represents the "ability to take some action based on external stimuli" (Tallon et al., 2019, p. 15)". It relates to an organization's ability to access and use information resources to accommodate changes and shifts occurring in their environment. It can be offensive, defensive or both and is contingent to internal or external threats and opportunities (Lee et al., 2015). Four categories of organizational agility enablers have been identified: 1) *technological*, i.e., the key properties of ITI resources (hardware, software, and networks) in terms of their flexibility, modularity, connectivity, adaptability and compatibility; 2) *behavioral*, i.e., the management practices, in terms of sense and response capabilities regarding ITI; 3) *organizational/structural*, i.e., the high-level issues and decision-making regarding the orientation, the business model selection, the degree of centralization, etc. and; 4) *environmental*, i.e., the contextual factors which affect and shape organizational agility.

The essence of these organizational agility enablers is captured by the concept of organizational capability (Chen et al., 2014). This concept is originally based on the idea that each organization possesses certain unique and rare resources. According to this view, the idiosyncratic features of an ITI represent its strategic value (Yeow et al., 2018). However, in today's world, in which many components of ITI are standardized, are becoming more of a commodity, and are easily imitable, an ITI's strategic value stems from its ability to change – to be dynamic (Zardini et al., 2016).

Dynamic capability can be defined as "a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness" (Zollo & Winter, 2002, p.340). Thus, a dynamic capability represents an organization's ability to reconfigure its resources, practices, and processes in

order to respond to changing environmental conditions. In terms of ITI, such capability represents an organization's ability to sense technological evolution and market disruption, respond to the underlying opportunities and threats and transform its ITI accordingly.

Dynamic ITI capabilities govern how organizations purposefully integrate, build, and reconfigure its resources to manage the transformation of their ITI. This concept captures an organization's ability to deploy shareable and flexible ITI; to envision IT resources to support and enhance business objectives and; to proactively create business opportunities by exploring IT innovations and exploiting existing IT resources (Lu & Ramamurthy, 2011). Dynamic capabilities are built overtime, are context-specific and are embedded within an organization (Helfat & Martin, 2015). For Zollo and Winter (2002), an illustration of dynamic capabilities is an organization that modifies its operating processes through practices dedicated to process improvements.

Dynamic ITI capabilities, which are enacted by an organization's managerial and technical processes, practices, and strategies (Aral & Weill, 2007), play a central role in terms of generating organizational value, perennializing competitive advantage as well as forging organizational agility (Zardini et al., 2016). Organizational agility will flow from an organization's dynamic ITI capability by facilitating the development and transformation ITI without creating important delays or engendering additional costs (Fink & Neumann, 2007). Once developed and transformed, ITI will provide the foundations for the business operations but also for the integration and exploitation of new emerging technologies as well as for further digitalization of an organization's strategic initiatives. Since ITI play a foundation role for operations and future initiatives, it is imperative that organizations ensure the perennity and stability of these ITI.

Organizations must ensure that, on the one hand, their ITI support organizational agility and enable them to build emerging capabilities and creating workable business options for the future and, on the other hand, that their ITI is efficient, perennial, and stable. Therefore, organizations must develop dynamic capabilities to explore new opportunities and transform their ITI and, at the same time, develop dynamic capabilities to exploit and perennialize their ITI (March, 1991; Queiroz et al., 2018; Syed et al., 2021; Tallon et al., 2019). While previous studies have highlighted the relations and impact that dynamic capabilities have on organizational agility (e.g. Chen et al., 2014; Queiroz et al., 2018; Tallon et al., 2019), little light has been thrown on how dynamic

capabilities can perennialize ITI and foster their transformations. Thus, the present study focuses on better understanding the dynamic capabilities to perennialize ITI and more specifically explores the microfoundations of these dynamic capabilities by identifying organizational actions though which they are enacted (Schilke et al., 2018; Yeow et al., 2018).

As dynamic capabilities enhance organizations' ability to identify opportunities, threats and trends, to solve problems, to make decisions and to adapt existing resources (Barreto, 2010), scholars have called for research to further study the microfoundations supporting and enabling dynamic capabilities (Schilke et al., 2018). Teece's (2007) typology of dynamic capabilities can be used to explore the practice enacted by organizations to allocate, reallocate, combine and recombine ITI resources and to engage with the nature of the work performed by organizations and IT managers to manage and perennialize ITI (Schilke et al., 2018).

Thus, identifying the organizational actions by which dynamic ITI capabilities that perennialize ITI are enacted is essential to guide practitioners, and advance scholars' understanding of dynamics capabilities for perennializing ITI and their transformations. We conducted a Delphi study with 29 ITI experts who identified key organizational actions to perennialize ITI. The methodology and results are provided in the following sections.

3. Methodology

This article is based on a Delphi study conducted with 29 information technology infrastructure (ITI) experts. The Delphi method allows a panel of experts to communicate and discuss, in an interactive and structured manner, to identify, select, and categorize different ideas such as problems, key success factors or best practices (Okoli & Pawlowski, 2004; Paré et al., 2013). This method was chosen over surveys, interviews, or case studies because of the complexity and scope of the phenomenon studied and the richness and breadth of the information and knowledge contributed by the experts.

The main features of the Delphi method – anonymity, multiple iterations, controlled feedback, and statistical aggregation of group responses – make it ideal to identify the organizational actions (OA) deployed to perennialize ITI and its transformations. Choosing the appropriate experts is one of the most important steps in the Delphi process, as it directly affects the quality of the results. A panel of 29 ITI experts was recruited from both the public (Pub.) and the private (Pri.) sectors. Table 1 presents the main demographic data on the experts.

Table 1. Demographics of experts in the Delphi Study

Sectors	Public	Private	Total
Nb. of respondents	14	15	**29**
Age (avg.)	48	48	48
Work experience (yrs.)	25.3	23.3	24.3
ITI experience (yrs.)	19	18.2	18.6

Step 1: Brainstorming. In this step, a questionnaire was used to collect demographic data on the experts and ask them the following question:

What organizational actions (e.g., practices, processes, strategies) should be deployed by organizations to perennialize ITI and its transformations?

Experts were asked to provide at least six detailed responses. A total of 180 different organizational actions, along with explanations, were collected and analyzed. Analogous and overlapping responses were grouped under the same label by two of the authors. A description was prepared for each label based on the responses provided by the experts. In total, 40 OA were identified.

Step 1.1. Brainstorming Validation. The experts were contacted a second time to validate the list generated during the first part of the brainstorming step. Experts had to validate the consolidated list of 40 OA for meaning and representativeness. They also had to comment on and/or suggest changes or corrections to any of the labels or descriptions. They were given the opportunity to add OA that they might have missed or forgotten before. The experts' comments and additions were analyzed by two of the authors. A final list of OA was generated.

Step 2: Narrowing. In the second step, each expert received the list of the 40 OA. They were asked to select the ten most effective OA, without ranking them. Experts were also asked to assess the *ease of implementing* the different OA. To avoid selection bias, the OA were randomly ordered. The questionnaires received during the second step were analyzed and a selection rule was applied to narrow the list of the most important OA. To be selected, a specific OA had to be identified by at least 40% of experts. In the end, 20 OA were discarded (e.g., develop openness and a transparency, outsource, adopt agile methodologies) and 20 were identified and used in step 3.

Step 3: Ranking. In the final step, the experts received the lists of the most important OA identified during step 2 and were asked to rank them in order of effectiveness. To assess the level of consensus among experts, Kendall's W coefficients (Kendall & Gibbons, 1990) were calculated for the rankings of the most effective OA. A Kendall coefficient of W = 1.0 means that all the participating experts perfectly agree with one another regarding the rankings. A consensus level of W < 0.3 is considered low, between 0.3 and 0.5 is considered moderate, between 0.5 and 0.7 is considered good, and greater than 0.7 is considered strong (Cafiso et al., 2013). Since all consensus coefficients (W) were less than 0.3 in the first round, a second ranking round was conducted where experts received a list presenting the main results obtained during the first round. The consensus levels improved significantly between the two rounds, from 0.13 to 0.50, and could ultimately be considered as "good."

Caution is required when Kendall's W coefficients are interpreted using these guidelines since they are not meant to be used as exact cut-off points. Moreover, the higher the number of elements on which experts must establish a consensus in a Delphi, the harder it is to achieve a good or strong consensus. The consensus levels obtained in this study are adequate since the experts had to reach a consensus on lists at contain a high number of items, i.e., 20 OA (Siegel & Castellan, 1988).

4. Results

Our study identified 20 key organizational actions (OA) to perennialize ITI and its transformations. We define OA as organizational strategies, practices, and/or processes deployed over a period of time with varying magnitude of effort, i.e., ease of implementation. As dynamic capabilities are enacted through clusters of interrelated OA (Li & Chan, 2019; Yeow et al., 2018), the 20 OA were grouped into three vectors according to their nature[1]. The three dynamic capabilities proposed by Teece (2007), i.e. Sensing, Seizing and Transforming served as basis and guide for the authors to classified the actions in each cluster.

The vector analogy should help managers who must provide directions and ensure sufficient levels of resources and efforts when deploying the OA. Each vector represents one dimension of the dynamic ITI capabilities: (1) *Watching and developing knowledge and know-how to perennialize ITI*; (2) *Visioning and governing ITI*; (3) *Standardizing and adopting a flexible approach to ITI*. Table 2 presents the 20 OA grouped by vector along with their effectiveness and ease of implementation score. Appendix 1 presents detailed explanations of each OA.

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[1] Two of the authors classified each OA into one of the three vectors and inter-rater reliability was calculated using Cohen's kappa. A value of 0.79 was obtained, which can be interpreted as strong.

Based on our data analysis, we conjecture that while the dynamic capabilities to perennialize ITI are concretely enacted by various OA, some of these OA have similar goals and nature. We have therefore grouped these OA into three vectors. First, within *Vector #1- Watching and developing knowledge and know-how to perennialize ITI*, are grouped the OA related to collaboration and learning aspects of ITI such as engaging with communities, partners and consultants to acquire knowledge and best practices as well as ensuring that an organization maintain and duplicate the key ITI skill. Other OA are more strategically focused and related to the development of an ITI vision, architecture plan and governance framework as well as monitoring and continuous improvement of ITI, i.e. *Vector #2 – Visioning and governing ITI*.

Finally, some OA seems to be technologically focused and related to the operationalization and standardization of ITI, i.e., *Vector #3 Standardizing and adopting a flexible approach to ITI*.

Table 2. Organizational actions to perennialize ITI

	Labels	Eff.[2]	Ease
VECTOR #1 – Watching and developing knowledge and know-how to perennialize ITI			
1.1	Get involved in communities of practice	3.1	3.7
1.2	Develop technological watch	3.3	3.5
1.3	Establish inter-organizational partnerships	3.3	2.8
1.4	Call on external consultants specialized in perennializing ITI	3.4	3.9
1.5	Maintain ITI skills	3.9	3.3
1.6	Transfer and duplicate IT skills	3.6	2.7
VECTOR #2 – Visioning and governing ITI			
2.1	Develop a strategic vision of the ITI	4.0	2.9
2.2	Establish an ITI governance framework	3.9	3.3
2.3	Establish a continuous improvement program	3.8	3.3
2.4	Develop and document the business architecture plan	4.0	3.2
2.5	Ensure short-term and long-term business needs	4.1	3.0
2.6	Analyze operating data of ITI using artificial/business intelligence tools	3.3	2.7
VECTOR #3 - Standardizing and adopting a flexible approach to ITI			
3.1	Automate and digitize monitoring and maintenance tasks	3.7	3.1
3.2	Promote the use of standardized technologies	4.0	3.5
3.3	Optimize and reuse technological components	3.9	3.3
3.4	Implement a Service Oriented Architecture (SOA)	3.0	3.0
3.5	Virtualize storage, infrastructure, and servers	3.9	3.8
3.6	Adopt a modular approach	3.6	2.8
3.7	Establish standards and performance norms for the ITI	3.8	3.3
3.8	Develop and monitor maintenance and replacement plans	3.9	3.6

5. Discussion

As mentioned in the introduction, organizational agility allows an organization to create new practices of sensing, decision making, and reacting in timely and efficient manner to the environmental changes regarding their customers, technologies, competition, and regulations. Although existent studies have suggested ITI as a key factor to achieve organizational agility, little light has been thrown on how dynamic capabilities can be enacted to perennialize ITI. It is even more important to address the perennity of ITI as they play a foundation role for the business operations as well as for further digital initiatives.

The outcomes of our study suggest that organizations may engage in different OA (see Table 2) to perennialize their ITI in accordance with different context-based organizational goals (Lu & Ramamurthy, 2011). It is through these OA that dynamic capabilities to perennialize ITI are enacted. We conjecture that investing in different types of OA

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[2] Eff. = Effectiveness of the OA; Ease = Ease of implementation of the OA. These scores represent the mean scores provided by the respondent. Scales of 1 to 5. Eff.: 1 = Not very effective and 5 = Very effective; Ease: 1 = Not easy to implement and 5 = Not easy to implement.

should be considered in supporting high-level organizational capabilities (i.e., organizational learning, innovation, etc.) because sensing, seizing and reacting abilities of an organization involve developing and deploying different types of OA (Chen et al., 2014; Lu & Ramamurthy, 2011).

It would be risky, even unwise, for ITI managers to deploy only technology focused OA to cope with the challenges of ITI perennity. Indeed, it is the intertwined nature of technology (V3), strategy (V2) as well as collaboration and learning (V1) OA that will allow ITI managers to successfully overcome these challenges. As Figure 1 shows, the 20 OA underlying

each vector are interrelated and complementary: the outcomes of the actions underlying each vector such as, for instance expertise, knowledge, or information, will serve as inputs for actions in other vectors.

Therefore, the deployment of the OA must be done continuously while adapting to the changing context in which they are carried out (see Figure 1). Nevertheless, ITI managers must remember that, to cope with the opportunities and threats perennializing ITI presents, the OA they decide to deploy must take all these aspects into consideration
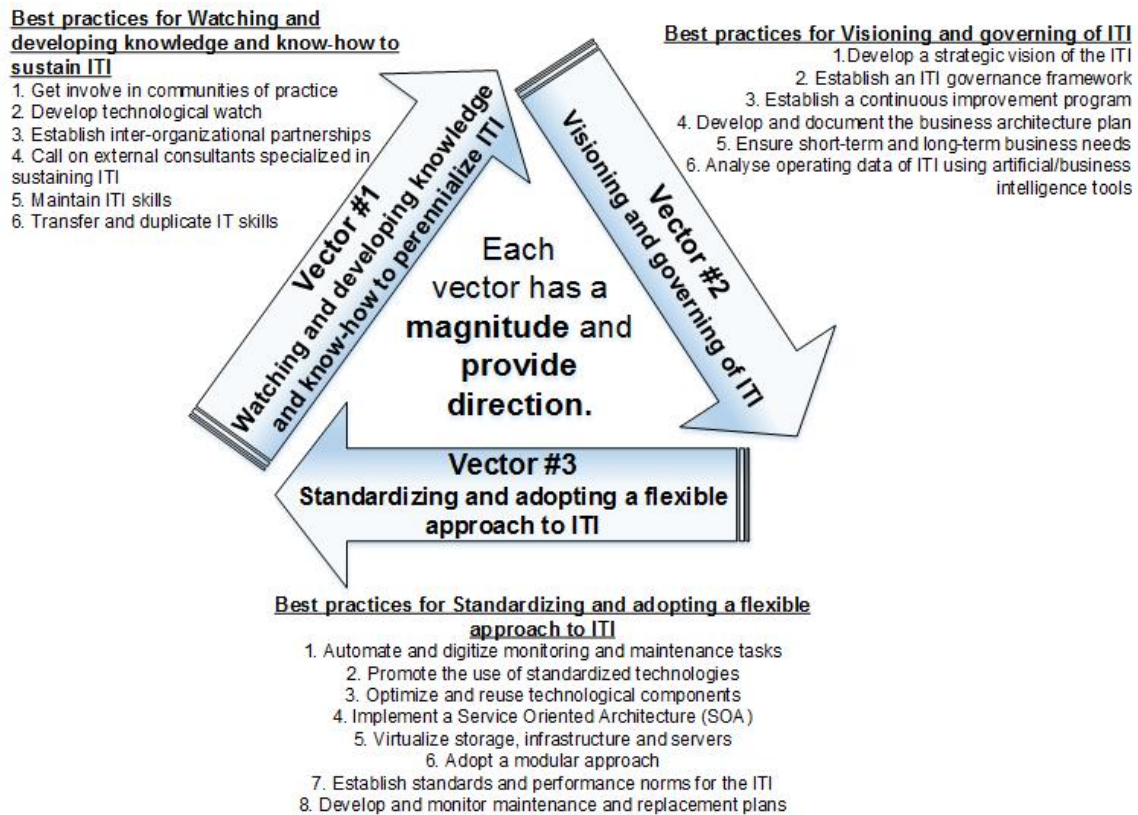
Best practices for Watching and developing knowledge and know-how to sustain ITI
1. Get involve in communities of practice
2. Develop technological watch
3. Establish inter-organizational partnerships
4. Call on external consultants specialized in sustaining ITI
5. Maintain ITI skills
6. Transfer and duplicate IT skills

Vector #1 Watching and developing knowledge and know-how to perennialize ITI

Best practices for Visioning and governing of ITI
1. Develop a strategic vision of the ITI
2. Establish an ITI governance framework
3. Establish a continuous improvement program
4. Develop and document the business architecture plan
5. Ensure short-term and long-term business needs
6. Analyse operating data of ITI using artificial/business intelligence tools

Vector #2 Visioning and governing of ITI

Each vector has a **magnitude** and **provide direction.**

Vector #3 Standardizing and adopting a flexible approach to ITI

Best practices for Standardizing and adopting a flexible approach to ITI
1. Automate and digitize monitoring and maintenance tasks
2. Promote the use of standardized technologies
3. Optimize and reuse technological components
4. Implement a Service Oriented Architecture (SOA)
5. Virtualize storage, infrastructure and servers
6. Adopt a modular approach
7. Establish standards and performance norms for the ITI
8. Develop and monitor maintenance and replacement plans

Figure 1. Best practices (organizational actions) to perennialize ITI and its transformations

While ITI are managed and evolve over a long period, managers must deploy OA to perennialize their ITI that will be suited to overcome the threats and exploit the opportunities related to relentless, rapid, and uncertain technological shifts and market turbulence. Overall, managers should emphasize on engaging with partners, learning from them, developing a vision and an architecture plan of the ITI, ensuring to have the appropriate ITI skills, and adopting a flexible approach to perennialize ITI. It is

essential for managers to collaborate with users, business units, and decision-makers to identify the needs and expectations, develop a common vision, ensure that efforts are appropriately aligned and share knowledge between ITI managers and business units. All those concrete actions will help organization to perennialize their ITI.

Practitioners should be cautious when interpreting and applying the rankings of the OA presented in Table 2. These OA were compiled based on their

anticipated effectiveness. However, they should also be interpreted by taking into consideration their ease of implementation, as some highly ranked actions may require extensive efforts, in terms of time, cost and attention. It might be wiser for ITI managers to first focus on OA that are easier to implement, such as *Get involve in communities of practice (V1.1), Develop technological watch (V1.2), Establish an ITI governance framework (V2.2)* or *Promote the use of standardized technologies (3.2)*, so as to ensure "quick wins" and create organizational momentum.

On the other hand, some OA are more demanding to deploy, take longer to implement and require more careful planning, but the benefits can be greater and longer-lasting. These include *Establish inter-organizational partnerships (V1.3), Develop a strategic vision of the ITI (V2.1), Fostering collaboration between IT and business units (V2.1)* and *Automate and digitize monitoring and maintenance tasks (V3.1)*. ITI managers must remember that managing an ITI will always be a work in progress that requires continuous attention and adjustment. The three interrelated vectors in Figure 1 show the dynamic capabilities needed to exploit the benefits and minimize the threats related to perennializing ITI and how these capabilities are enacted by a process of iterative OA.

6. Conclusion

We identified a set of 20 organizational actions to perennialize ITI that were grouped into three vectors: 1) *Watching and developing knowledge and know-how to perennialize ITI*; (2) *Visioning and governing ITI*; (3) *Standardizing and adopting a flexible approach to ITI*. Each one represents a cluster of specific organizational actions that are taken to enact dynamic capabilities to perennialize ITI.

The main theoretical contribution of this study stems from the identification of key organizational actions though which IT capabilities are enacted to overcome the challenges of perennializing ITI (Rivard, 2014). Indeed, our study sought to clarify the ITI perennity capability construct (Suddaby, 2010) which hopefully would help scholars better understand the way ITI dynamic capabilities are enacted, as well as how organizations cope with maintaining and perennializing their ITI and their transformations. From a practitioner's point of view, the study should help IT managers better manage their ITI with an perennial mindset (Solberg et al., 2020). It should also be beneficial for practitioners to learn how their colleagues adopt and implement various organizational actions to perennialize their ITI. By adopting the set of organizational actions as

illustrated, IT managers can enhance their entrepreneurial skills and develop a practical approach toward perennializing their ITI.

In terms of future research, it would be interesting to evaluate the impacts of the organizational actions identified in the present study on organizational agility and performance (Ravichandran, 2018; Sambamurthy et al., 2003). Another research avenue would be to explore how the identified organizational actions are enacted in different contexts (e.g., technological vs. manufacturing sectors, large vs. small and medium enterprises, etc.). Finally, since the organizational actions by which IT capabilities are enacted usually operate through a cluster (Yeow et al., 2018), it would be interesting to explore if certain combinations or configurations of organizational actions are more efficient than others (Doty & Glick, 1994; Fiss et al., 2013)

Finally, some limitations of the present study need to be acknowledged. First, even if the organizational actions were identified by 29 ITI experts and that a rigorous Delphi study was used, caution must be exercised before generalizing the results and systematically apply them in any organizational context. Second, the cross-sectional nature of the data collection limits the ability to explore how organizational actions might have interacted with one another throughout time.

We hope this study will support practitioners in their decision-making processes and help scholars explore issues related the opportunities and threats of perennializing ITI and their transformations.

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Appendix 1 - Details of the organizational actions to perennialize ITI transformations

#	Labels	Descriptions
VECTOR #1 - Watching and developing knowledge and know-how to perennialize ITI	
1.1	**Get in communities of practice**	Engage in communities of practice to share and collect experience and knowledge regarding approaches to manage and perennialize ITI and its transformations.
1.2	**Develop technological watch**	Put in place practices and a culture that fosters the monitoring of technological developments, to learn from other organizations, to discover new tools or approaches, etc. in relation to the perennity of ITI and its transformations.
1.3	**Establish inter-organizational partnerships**	Engage in partnerships with external organizations facing similar technological infrastructure challenges / issues regarding the perennity of ITI and its transformations to share resources, expertise, knowledge, costs, and risks.
1.4	**Call on external consultants specialized in perennializing ITI**	Use external consulting services specializing in perennializing ITI and its transformations, e.g., development, maintenance, and evolution, with the appropriate skills and experience.
1.5	**Maintain ITI skills**	Support IT employees in updating their ITI skills and knowledge by providing in-house training and/or by financing specialized external training, conferences, etc. These competencies must be aligned with organizational needs, the evolution of ITI in the marketplace as well as the latest developments in terms of perennializing ITI and its transformations.
1.6	**Transfer and duplicate IT skills**	Ensure constant and ongoing transfer of IT skills, especially in relation to perennializing ITI and its transformations, between internal employees and, where possible, between external specialists and internal employees. In the case of critical ITI skills, ensure a duplication of these ITI skills within the organization.
VECTOR #2 – Visioning and governing of ITI	
2.1	**Develop a strategic vision of the ITI**	Develop a vision of the ITI, with all stakeholders of the organization to meet current needs, anticipate future needs and prioritize investments. It is important to establish an IT strategic plan (i.e., objectives, roles, impacts, risks, etc.) aligned with the organization's strategic objectives to prioritize IT investments and to perennialize ITI and its transformations.
2.2	**Establish an ITI governance framework**	Establish an ITI governance framework (e.g., IT orientations, values, guidelines, objectives, RACI matrix, decision-making processes, committees, etc.), based on perennity principles, and which should support all employees involved in the development, maintenance, and evolution of the technological infrastructure.

2.3	**Establish a continuous improvement program**	Deploy a continuous improvement program of the ITI, focusing among other things on perennity issues, that involves both IT employees as well as internal and external users.
2.4	**Develop and document the business architecture plan**	Develop and document a business architecture plan, including the ITI components, to meet future needs and to ensure that new and/or outsourced components are consistent, perennial, and fit into the business architecture plan.
2.5	**Ensure short-term and long-term business needs**	Ensure that business units can evaluate, formulate, and communicate their short-term and long-term business needs to IT employees. IT employees must understand these business needs and their knowledge should be up to date, to ensure that the ITI solutions they propose to business units are aligned with the business needs while perennializing ITI and its transformations
2.6	**Analyze operating data of ITI using artificial/business intelligence tools**	Use business intelligence tools such as machine learning, data analysis, etc. to better understand, for example, energy consumption curves, break patterns, etc. and support the ITI evolution and transformations.
VECTOR #3 - Standardizing and adopting a flexible approach to ITI		
3.1	**Automate and digitize monitoring and maintenance tasks**	Automate and digitize certain ITI monitoring and maintenance activities, such as automatic computer shutdown or automatic updates, to reduce manual tasks, improve identification and problem solving, optimizing the use of resources, etc.
3.2	**Promote the use of standardized technologies**	Promote the use of standardized technologies (avoid over-tailoring) that are compatible and mastered by the organization and whose reliability, perennity and performance have been demonstrated.
3.3	**Optimize and reuse technological components**	Optimize and reuse technology components from some business units in other units with smaller needs or in development environments (R&D).
3.4	**Implement a Service Oriented Architecture**	Use web services, i.e., software (SaaS), infrastructure (IaaS) and/or platform (PaaS), through public, private and / or hybrid clouds.
3.5	**Virtualize, storage, infrastructure, and servers**	Virtualize all components of the ITI and network to separate the hardware and software layers to extend the life of physical equipment, simplify the physical infrastructure and extent ITI perennity. Virtualizing storage technologies will provide longer amortization for older and less efficient storage technologies. Virtualizing some applications and workstations (VDI - Virtual Desktop Infrastructure) on servers should significantly reduce the cost of power, heating / cooling, human resources, the number of workstations, data center, etc.
3.6	**Adopt a modular approach**	Adopt a modular approach by establishing a strong and perennial ITI foundation that can be extended, modified, and readjusted with additional modules.
3.7	**Establish standards and performance norms for the ITI**	Define technical standards and performance norms in terms of speed, volume, safety, risks, etc. to ensure that the ITI's performance, perennity, and capacity planning are optimally managed.