

Assemblage Theory to Explain the Information Technology Capability Development in Small Businesses

Completed Research

María Teresa Rodríguez V.
Universidad Nacional de Colombia
mtrorodriguezv@unal.edu.co

Beatriz Helena Díaz Pinzón
Associate Professor
Universidad Nacional de Colombia
bhdiazp@unal.edu.co

Abstract

Most studies about Information Technology Capability (ITC) are based on the Resource-Based Theory (RBT) and are focused on its impact on strategic organizational variables. However, the ITC formation and development processes have been less addressed, presenting several challenges such as the confluence of physical, human and organizational aspects and its dynamism. The lack of explanatory power of RBT for overcoming these challenges lead us to explore other views. In this paper, we propose a framework based on Manuel DeLanda's Assemblage Theory for conceptualizing the ITC and orienting the study of its development over time. The characteristics of the assemblage concept including heterogeneity, scalability, and dynamism allows us to tackle the ITC at the level of a whole, but also at the level of its components and the interactions between them. Additionally, we explore the fluid nature of ITC using the processes of stabilization and destabilization proposed in the theory.

Keywords

Assemblage Theory, SME, Information Technology Capability

Introduction

The ability with which an organization makes use of IT (Information Technology) has been studied using constructs of IT resources, IT competencies, and IT capabilities. These terms are often used indistinctly despite their differences (Butler and Murphy 2009; Mikalef and Pateli 2016). IT resources are tangible and intangible IT assets that an organization controls. The IT competencies refers to the activities and routines required for the management of IT resources. While IT Capability (ITC) refers to the strategic application of IT resources and competencies (Mikalef and Pateli 2016; Peppard and Ward 2004). Thus, ITC is found on a macro level, oriented towards the realization of strategic aims and supported with the IT resources and competencies of the organization.

The ITC involves dissimilar elements including the IT infrastructure, knowledge and the quality of internal and external relationships among others. This multidimensionality has generated discussions on how to address the study of the ITC, at the level of its resources and competences or by grouping these elements as a whole. Models that tackle ITC as a whole have shown better results when evaluating its influence on significant organizational variables (Kim et al. 2012; Lu and Rammamurthy 2011). Nevertheless, the packaging of IT resources and capabilities has been criticized because it may limit our understanding of the construct (Bi et al. 2015). Additionally, the development of ITC takes time, which increases the complexity of its study and requiring the use of process-based views that allow in deep explanations (Bhatt and Grover 2005; Crawford et al. 2011). On the other hand, the models for identifying factors that influence ITC proposed so far are, mostly, focused on large and medium enterprises. Thus, SMEs characteristics like resources constraints, centralization, informal management styles, flexibility and so on (Torres 2006; Zhang et al. 2013), have been hardly addressed in the ITC analysis.

The Resource Based Theory (RBT) is the most used to study the ITC, however, the usefulness of this theory to approach the subject of resource and capability formation and development has been questioned (Wade and Hulland 2004). The RBT is weak at explaining how resources are originated, how they integrate in the firm and how they are implemented and renewed (Wade and Hulland 2004). Studies that have adhered to RBT frequently develop ITC as a set of IT resources that a firm controls, assuming that their mere existence is associated with an appropriate strategic leverage (Mikalef and Pateli 2016). Considering the weaknesses presented by the RBT to explain the development of the ITC, the characteristics of SME context, the diversity of ITC dimensions and the need for dynamic and process-based views for explaining the ITC development over time, we will explore the usefulness of Assemblage¹ Theory for studying the development of ITC.

Assemblage theory originates from the work of the philosophers Deleuze and Guattari with the assemblage as the central ontological construct. The assemblage refers to a multiplicity formed by heterogeneous elements and the historical constructive process that leads to its emergence (DeLanda 2006, 2016; Nail 2017). Assemblage theory provides a range of tools for addressing the social world as messy and ongoing interrelations between diverse kinds of things at various levels (Canniford and Bajde 2016), focusing on flows and connections from a view more emergent than totalizing (Duff and Sumartojo 2017). By using the assemblage lens, we reconceptualize the ITC as the possibilities of an ITC assemblage in the organization that arises from the interrelations among IT material and expressive elements. Finally, we present a framework as a guide for analysing ITC development in small businesses.

The Assemblage Theory

The concept of assemblage refers to a whole composed by heterogeneous parts that, as a unit, is the result of historical processes (DeLanda 2006). The human and non-human components in the assemblage co-function like a whole, the interest of the assemblage theory is to explain how these parts function together to generate an experiential phenomena (Sesay et al. 2016). The main characteristics of the assemblage includes: temporal dynamism, the heterogeneity of its components linked by extrinsic relationships and the possibility to analyse it at different levels (DeLanda 2006; Roffe 2016)

Assemblages are singular and dynamic. Assemblages arise from a constructive process that lead to a specific arrangement, so they are unique, singular with its own properties, they don't belong to a category (DeLanda 2016; Nail 2017). Moreover, just as the assemblages come from historical processes, they can continue to change, they are not a final product (Nail 2017). This dynamism is related to the idea that properties of the whole are produced from the interaction between the components and their existence depends on those interactions that continue. Thus if the relationships between the components change, then properties and capabilities of the assemblage change too and, if the interaction terminates, then properties of the whole terminate as well (DeLanda 2016).

Assemblage is a collection of heterogeneous parts, including material forms (human and non-human) such as individuals, technologies, buildings among others and expressive forms such as standards, signs, norms. Despite the fact that these elements differ in their nature, they function together as a “fragmentary whole” (Duff and Sumartojo 2017; Nail 2017). The parts of the assemblage are linked through “exteriority relationships” (DeLanda 2006), that means the assemblage components subsist with its own properties independently of other parts and the relationships with them. The relationship itself is not constitutive of the part and it does not define it (DeLanda 2006). This notion is opposed to the interiority relationships that form a unit as an organic whole where the parts of the organism do not survive separately and the organism does not survive if one of its parts is missing (Nail 2017).

On the one hand, the exteriority relationships imply that the elements of an assemblage may be added, subtracted and recombined into another assemblage where its interactions may be different (DeLanda 2006; Nail 2017) and on the other hand, the bundle of components properties does not explain the properties of the whole. The relationships between components do not depend just on its properties rather

¹ The original term in the work of Deleuze and Guattari, developed in their documents *A Thousand Plateaus* and *What is Philosophy?*, is *agencement* and, in spite of existing critics regarding its translation into English as assemblage (Nail 2017), assemblage in this document is understood as that initially referenced by the work of Deleuze and Guattari and subsequently developed by DeLanda (DeLanda 2006, 2016)

on its capabilities. Such capabilities involve a reference to the properties of other elements that interact, and can be exercised or not (DeLanda 2016). According to the assemblage theory, the properties and powers of the whole are emergent, this means, they do not arise from the properties of its components, but rather from the exteriority relationships among them. In this sense, the properties of the whole may not be reduced to a set of properties of the components, the assemblage has properties and capabilities that its parts do not have (DeLanda 2016).

Furthermore, *assemblage is a scalar concept* that facilitates addressing issues at different levels of analysis using the same theoretical framework (Roffe 2016; Sesay et al. 2016). For instance, Sesay, Oh, and Ramírez (2016) use the assemblage for studying the relations and potentialities of the police and body-worn camera but the same concept is used in a macro level for studying a Police Department. With the assemblage concept, we have a tool to analyse down into detail or up towards the global level (Roffe 2016).

The assemblage is framed along two dimensions or axis: material – expressive forms and territorialisation – deterritorialisation processes. The first axis indicates the role that each component plays in the assemblage, material related to its content or expressive related to its forces (DeLanda 2006). Although, a component can be purely material (building, physical structures) or purely expressive (linguistic and non-linguistic expressions) the roles are variable and every component may play a mixture of these roles (DeLanda 2006). The vertical axis refers to the inclination of the assemblage towards dynamism or fixity (Roffe 2016). Through the territorialisation processes, the assemblage sharpens its boundaries by increasing its homogeneity and giving it its identity (DeLanda 2006; Sesay et al. 2016). At the other extreme of the vertical axis, processes of deterritorialisation destabilize the assemblage and lead it to change, deterritorialisation is the way in which assemblages transform themselves (DeLanda 2006; Nail 2017). For instance, in IS literature Henningsson and Hanseth (2011) analyse the evolution of the integrated IT solutions for traders in the European Union through the dynamics of stabilizing and destabilizing processes of the information infrastructure assemblage.

Reconceptualization of Information Technology Capability from Assemblage Perspective

The ITC construct arises from the RBT and is defined as the ability of an organization to move and implement IT resources in combination with other resources and capabilities (Bharadwaj 2000). ITC refers to the degree to which a company derives value from IT investment (Crawford et al. 2011), improves information management (Tippins and Sohi 2003) or achieves business goals (Lu and Rammamurthy 2011; Zhang et al. 2008) from the strategic use of IT resources.

Although the conceptualization of ITC is based on RBT, this theory has a limited explanatory power to address the study of the development of ITC. Firstly, the RBT explains neither the process of resources formation nor the complementarity of such resources nor the mechanisms that lead to obtaining benefits from their use (Mikalef and Pateli 2016; Wade and Hulland 2004). Secondly, in the ITC research based on the theoretical framework of the RBT, there is a scarcity of studies from a process perspective, instead focusing on the outcome variables, which little explains the dynamic nature of the capabilities, their creation, and application (Butler and Murphy 2009). Additionally, the RBT is limited in the inclusion of elements related to conscious human action. IT resources can lead to limited benefits when they are managed by incompetent individuals, who are unable to appreciate the utility and potential services of the resources and/or leverage on them to meet organizational goals (Katkalo et al. 2010).

ITC is a multidimensional construct that involves physical, organizational and human aspects related to IT, which are all oriented towards the achievement of the strategic aims of the organization. The multidimensional feature of ITC has been validated in several studies (Bharadwaj 2000; Lu and Rammamurthy 2011). Some dimensions, like IT infrastructure, are recognized in most of these studies, but the definition of such dimensions remains diverse. For example, the dimensions recognized by Bharadwaj are infrastructure, human resources and intangible enablers (Bharadwaj 2000). Other studies include IT knowledge (Crawford et al. 2011); the quality of internal and external relationships (Bhatt and Grover 2005); and aspects related to IT planning and management (Kim et al. 2012; Ravinchandran and Lertwongsatien 2005).

The diversity of dimensions strengthens the ITC construct in the sense of recognizing the multiplicity of aspects involved in obtaining benefits from the use of IT in the organization. However, the different nature of these aspects and the limitations of the RBT make the ITC study challenging, particularly regarding the explanation of the co-function of these resources and competencies and their evolution over time.

Using the assemblage theory, we propose IT Capability Assemblage redefining ITC as the possibilities and tendencies of an assemblage of IT material and expressive elements in the organization, from which mechanisms can be activated, enabling the organization to reach strategic objectives. When we refer to the ITC of an organization, we are approaching the characteristics of the IT Capability Assemblage components, the relationships among such components and the way in which this whole functions, in the organizational context, to support business goals.

The concrete IT Capability Assemblage is formed with material (human and non-human) and expressive components. Material non-human components like, hardware, software, networks and other IT artefacts that are used in the organization. The human components include social entities such as the group of people in an organization that manage such technologies, the group of IT users and the group of IT suppliers. Moreover, we can identify key individuals like CEO, CIO, who in their interaction with social and physical entities can influence the exploitation of IT on an organizational level. The expressive components refer to formal and informal IT procedures, policies, management routines among others.

The characteristics and potentialities of IT Capability Assemblage come from the relationships among its components, which depend, at the same time, on the properties of each component and the possibilities offered and executed during their interaction. Through these interactions in the organizational context, ITC assemblage may build individual and organizational IT knowledge related to the business; business alignment with IT and a proactive IT stance.

Some implications of the assemblage perspective on ITC are:

- The ITC arises from the relationships between IT infrastructure (computers, net, printers, software, etc) with human elements (IT staff, managers, IT users, IT suppliers) and expressive forms (IT routines, IT procedures, IT use and management policies, etc) in the organization, see Figure 1.
- The IT Capability Assemblage is unique for each organization because it depends on the connections and the composition of its elements in a specific period of time.
- The ITC is dynamic, the IT Capability Assemblage changes through stabilization and destabilization processes. A new technology, changes in the IT staff, a new relationship with an IT supplier, a new definition of IT security policy can change the possibilities of an assemblage, thus ITC assemblage is always capable of different things.
- The IT Capability Assemblage may overstep the physical organizational boundaries, for example when including the relationships with IT suppliers.
- The IT Capability Assemblage is not limited to the properties and capabilities of the IT Department.
- The assemblage is a scalar concept (Roffe 2016). In a certain level of analysis IT Capability Assemblage can be viewed like an assemblage of assemblages, every IT user with the computer and software form an assemblage, the IT Department may be an assemblage itself.
- The concept of assemblage involves not just a heterogenous composition, but a constructive process that lays out a particular arrangement (Nail 2017) in that sense, the ITC assemblage is path dependent, it is the result of a historical process.

IT Capability Assemblage in Small Businesses

Most of the studies about the development of ITC and the variables that affect it, focus on large and medium-sized companies, however, they have differences with small ones (Torres 2006; Torres and Julien 2005; Zhang et al. 2013). Hence, it is important to examine the implications of this particular context on the processes and factors that influence the ITC. First, we examine the context of small businesses and its implications on the development of ITC. Then, using the characteristics of this context, we explore the features and possible compositions of the IT Capability Assemblage in small businesses.

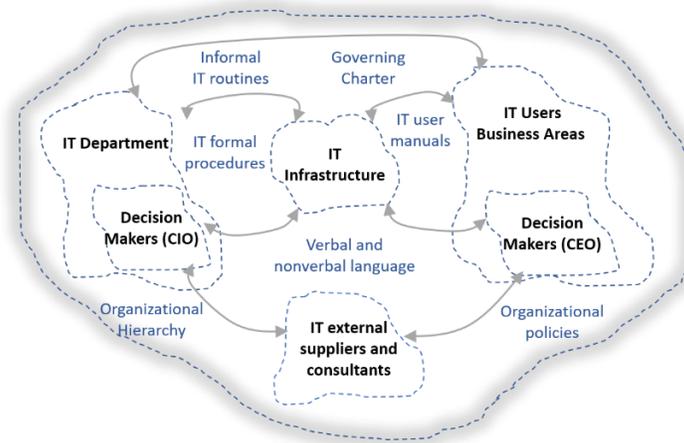


Figure 1. An example of ITC Assemblage into the organization

The Challenges of ITC in Small Businesses Context

The differences between large and small businesses are not limited to the size, there are other aspects that mark differences between them, such as the availability of resources, the organizational structure, the management style, the planning activity, and the interaction and communication in the organization.

Resources availability. Small businesses have human and financial resources constraints (Pan et al. 2014; Zhang et al. 2013) and they are more susceptible to the availability of resources in the environment (Neirotti et al. 2018). This situation may influence the development of ITC in two ways, first, because the continues development of ITC requires investments over long periods of time (Schäfferling and Wagner 2014) and second, the implementation of IT requires a certain level of expertise that the company can rarely assume alone, which is why SME can be highly dependent on external consultants (Costello et al. 2007).

Management. The management style in small businesses use to be informal and centralized. Both management and decision-making in small businesses are concentrated in the CEO/owner (Neirotti et al. 2018; Torres 2006), and therefore IT investment decisions, relationships with IT suppliers, the execution or delegation of functions related to IT management may require the intervention of the owner-director, as well as, the alignment of IT and business strategies will depend, to a great extent, on the decisions of the CEO/owner (Neirotti et al. 2018). Furthermore, in small businesses, it is usual to follow informal management approaches, written policies are not common (Zhang et al. 2013). Such informality in management and policies would affect the development of ITC in SMEs in two ways: firstly, the management of IT routines can be executed in a disordered and chaotic manner. Secondly, without policies and written processes, it would be difficult to build IT organizational knowledge.

Strategic Planning. The strategic planning in small businesses is informal and dynamic (Bhagwat and Sharma 2007; Costello et al. 2007; Pan et al. 2014). The alignment between the business strategy and IT is one of the factors of ITC development (Peppard and Ward 2004), in the context of SMEs, achieving such alignment is arduous, not only due to informal planning, but also, the vision of IT used in SMEs focuses on solving operational problems in a short time instead of supporting long-term strategic goals (Costello et al. 2007)

Organizational Structure. The SMEs have a more flexible, informal and flat organizational structure (Gray and Mabey 2005; Street and Meister 2004). SMEs are flexible and as a result they are able to reconfigure their processes and business models at short notice (Sunday and Vera 2018; Zhang et al. 2013). Furthermore, in this kind of organization, the tasks and labours have a low level of specialization (Torres 2006), so that an employee can be in charge of very diverse tasks. Particularly IT management can be handled by people with little technical knowledge, it is not common that SMEs have a CIO or an IT department formally established (Gutierrez et al. 2009). For some authors, the construct of ITC itself is linked to the skills of the IT department in the organization, the technical and business knowledge of this

IT staff is a fundamental element in the ITC (Butler and Murphy 2009; Ravinchandran and Lertwongsatien 2005). Hence, developing the ITC without having explicit IT staff can be a challenge for SMEs and lead them to seek technical knowledge from external consultants who do not necessarily know the business.

Interaction and communication. Within SMEs, communication channels tend to be mostly face-to-face, rather than through regular meetings or formal reports (Street and Meister 2004), which is favoured by the physical-spatial proximity of the employees and the owner-manager. Small businesses use informal social networks as a basis to formalize business links (Zhang et al. 2013).

The Components and Relationships in Small Businesses IT Capability Assemblage

Using the characteristics of SME, we can analyse some implications of this context on the ITC Assemblage (Table 1). However, the composition and possibilities of a specific ITC assemblage depends on singularities of each organization in a particular time. Therefore, the generalization is not possible.

SME characteristics	Implications on material and expressive forms of ITC Assemblage	Implications on the relationships among ITC Assemblage components
<i>Financial resources constraint</i>	Constraints in the IT infrastructure properties according its cost and availability	Limitations in the possibilities that arise from the interaction between IT users and IT infrastructure
<i>Human resources constraint</i>	It may stimulate the inclusion of IT suppliers and consultants as components in ITC assemblage	These constraints can lead to strong relationships with external IT suppliers, thus avoiding the cost of having expert IT staff in the organization (Figure 2a). At another extreme, the resource restrictions can limit the relationships with external IT suppliers and constrain the ITC assemblage possibilities (Figure 2b)
<i>Centralization on CEO/owner</i>	The characteristics of the CEO / owner including his/her charisma, leadership, knowledge, etc. would affect significantly the properties of the whole ITC assemblage	The possibilities of the ITC assemblage can be highly dependent on the relations of the CEO / owner with the other components
<i>Informal and no written policies</i>	Absence or lack of formally documented expression, informal and flexible practices	Building relationships with low level of coding, that is, without formal guides. For example, no definition of rules for the use and management of the IT infrastructure
<i>Flexible organizational structure</i>		Promotes processes of destabilisation, change, and transformation of the ITC assemblage
<i>Low level of labour specialization</i>	Diversity of tasks may be centralized in a single individual or in a single IT artifact, which impacts the properties and possibilities of these components	Strength the relationships between human components into de ITC assemblage due to the increasing interaction with others in the execution of diverse labours
<i>High interaction face to face</i>	The importance of nonverbal language increases	It would facilitate the construction of relationships between human components
<i>Informal channels of communication</i>	Discourage the generation of formal, documented expressions in the ITC assemblage	The relationships are not mediated for rigid rules or fixed politics

Table 1. Implication of SME context on IT Capability Assemblage

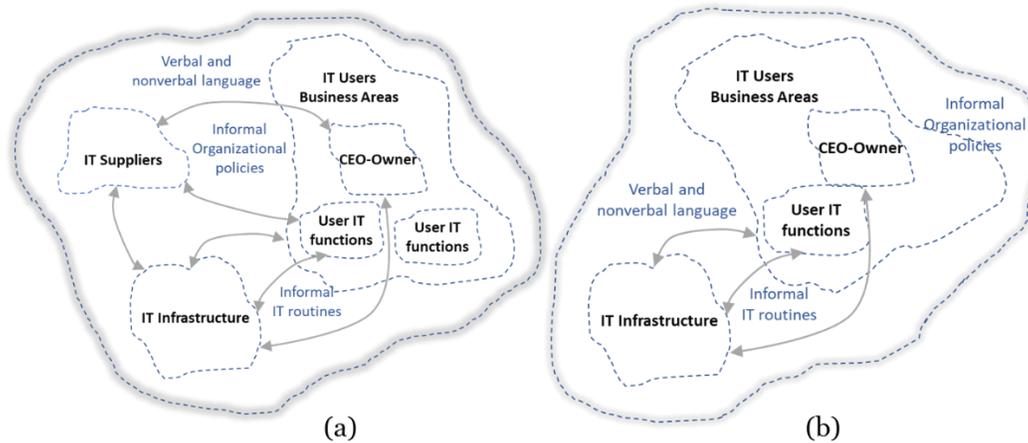


Figure 2. Examples of possible ITC - Assemblages in Small Businesses

The Development of ITC as a Formation and Stabilization Process of IT Capability Assemblage

The assemblages emerge from connections, from forces rather than subjects (Lagendijk and Boertjes 2013), the relationships define the assemblage, hence, different set of connections form different assemblages (Nail 2017). In this perspective, the capabilities are always relational and always specific to a concrete act of relation-building (Lagendijk and Boertjes 2013). Therefore, we propose that, in a small business and from an organizational level, the interactions between IT infrastructure, IT users, CEO-owner and users with IT functions initiate a relationship-building process that leads to the formation of ITC assemblage in the organization. And it is in this process that other elements arise, expressive elements as IT usage rules, IT security policies, etc and other relationships are established, for example, with IT suppliers. The ITC assemblage resulting from this relationship building process is particular to each company, it is unique, it is temporary, and it is path dependent, a product of multiple determinations.

Through processes of territorialisation and deterritorialisation the assemblages remains fluid and unstable, these processes are intervened by historical, political, social and economic forces (Duff and Sumartojo 2017). The territorialisation processes stabilize the assemblage, making structures more rigid, turning it into a recognized and reutilized set of practices (Aryal et al. 2014; Lagendijk and Boertjes 2013). The repetition and coding (as a formalization of rules for how the assemblage works) are processes of assemblages stabilization (DeLanda 2006; Henningson and Hanseth 2011). Whereas other processes or components can destabilize the assemblage, for instance, offering new alternatives to the already established expressions, thus increasing heterogeneity (Henningson and Hanseth 2011)

To guide the study of the development of ITC in small businesses, we propose a framework from a critical realist view (Bhaskar 1998) that implements the concepts related to the assemblage discussed above (Figure 3). The analysis starts with the identification of events (Mingers and Standing 2017) of interest (for example, strategic IT use events, IT function change events, IT adoption events, the successful implementation of a tool in the organization or its failure, among others) and afterwards try to explain why and/or how they are generated. A rich explanation would include the characterization of the interactions that connect material and expressive elements in the ITC assemblage from which mechanisms were activated generating the observed events (Mingers and Standing 2017). Additionally, we must consider that if we wish to understand how an ITC assemblage works, we should ask about what the assemblage can do at a specific time. The changes in the elements and relationships of the ITC assemblage lead it to reach the point where it is able to do new things and this requires a constant renovation of the assemblage analysis (Nail 2017). Through the analysis of successive events at the time, we can identify ITC assemblage changes and mechanisms involved which gives us an explanation of ITC development in a particular organizational context.

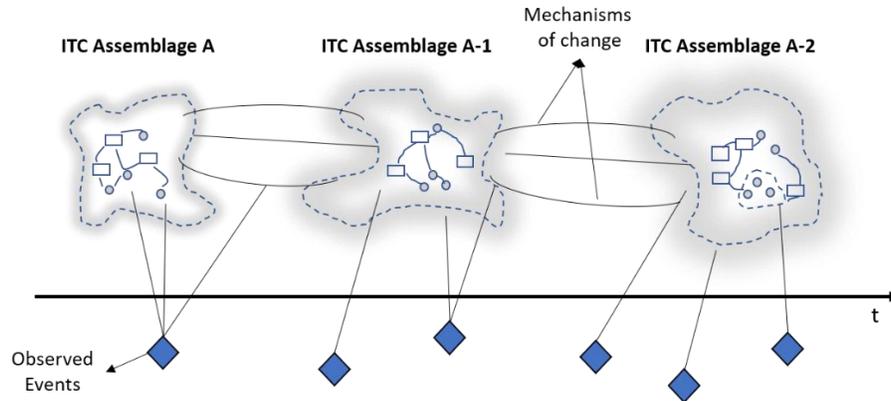


Figure 3. Framework based on Assemblage to Analyse ITC Development

To illustrate the processes of change in the assemblages we will use some events described in the study by Henningson and Hanseth (2011) regarding the dynamics of information infrastructures related to customs and trade in the European Union (EU). The study presents the complexity of trade and customs among countries, each one with their own rules and requirements. In this context, each country may represent a national assemblage that consists of the national information infrastructure, national legislation, national authorities, among others, and all of these national assemblages are part of an overall customs assemblage. One of the events described in the study is the introduction of a single administrative document (SAD), this document helped to standardize the customs declaration in 18 EU countries, the process to implement the use of this document contributed to stabilize an overall customs assemblage. In this case, from the interaction between national assemblages arose an agreement for using the SAD and in turn, the use of SAD helped to homogenize the assemblage. Another event described in the study by Henningson and Hanseth (2011) refers to the development of eCustoms solutions by several EU countries, this enabled traders to declare exported products electronically. But these systems were developed separately, and although this event contributed to stabilizing the national assemblages, it also destabilized the European SAD-based assemblage.

In an organizational context and to draw on the assemblage theory, the ITC Assemblage is dynamic, changing through stabilization and destabilization processes. The development of the ITC assemblage would depend on the mechanisms that can emerge to strengthen their components and also strengthen the properties and capabilities that are the product of the relationships among them. However, changes in the assemblage or in external forces can influence destabilization and lead to transforming the ITC assemblage. This kind of destabilization may be more frequent in a small business context, because of its characteristics of structure flexibility, lack of formal procedures and high dependence of external environment.

Conclusion

By using assemblage theory including the assemblage concept, the heterogeneous components, the properties and possibilities that emerge from interaction among these components and the assemblage changes through stabilization and destabilization processes, we reconceptualized ITC and proposed a framework to address the study of its development in a small businesses context.

The view proposed contributes not only to the study of ITC in organizations but also to address complex socio-technical systems by using a social philosophy theory. The reconceptualization of ITC through IT Capability Assemblage allows us to overcome the idea of ITC as an “end state” (Mikalef and Pateli 2016), by proposing a view that provides dynamism for the concept of ITC, particularly, the changes of IT Capability Assemblage may lead its strengthening and development but may also impair it. Furthermore, the IT Capability Assemblage helps to integrate and explain the multidimensionality of ITC because it does not focus just on independent constructs but also on relations among themselves, pointing the emergent character of ITC. Finally, the ITC assemblage is suitable for small businesses, since it does not focus solely on the IT function but also highlights the role of CEO/owner and it involves the IT users and IT suppliers.

The proposed framework guides the implementation of the assemblage theory concepts as a tool to analyse a particular IS problem and in a specific context of small businesses. However, assemblage theory is relatively new and despite the fact that the assemblage concept has been used in IS literature (Aryal et al. 2014; Henningsson and Hanseth 2011; Sesay et al. 2016), it has not been widely developed or used in the discipline and its potential to approach these subjects remains unclear.

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