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Measurement of Entrepreneurial Dynamism Capabilities and Performance in Collaborative Networks

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Abstract. In turbulent markets and scenarios that require extremely competitive and innovative organizations, the need to transform the resource base in accordance with the changing markets and technology is apparent. In order to do this, it is necessary to quickly identify and incorporate market opportunities, provide high capacity for learning, innovation and work collaboratively with other organizations in a network – in a collaborative way - to coordinate and transform their resource base. It is based on this information that this work aims to discuss the association between the role of an organization in a collaborative network and the development of dynamic capabilities, in response to environmental pressures and turbulence. Similarly, we seek to identify the impact (the improvement, or not) that generates the dynamics of organizations in a collaborative network. This paper brings two main contributions: the first lists a theoretical framework associating three main constructs: Dynamic Capabilities, Collaborative Networks and Turbulent Environments. The second proposes a conceptual model involving these three main constructs, facing adaptation, resilience and competitiveness of organizations.

Keywords: Collaborative networks; Dynamic Capabilities; Turbulent Environments; Virtual Organizations Breeding Environments

1. Introduction

A number of studies highlight that the biggest challenges for managers in turbulent environments consist in making decisions quickly [1][2][3][4][5]. Most studies consider dynamic capabilities as a source of competitive advantage and as alternatives to guide these managers in rapidly changing contexts [6]. This context highlights the relevance of the Virtual Organizations Breeding Environments (VBE)[7][8][9][10][11] and the relations in collaborative networks [12][13] that enable organizations to increase resilience, maintaining the competitiveness and the capacity to enter into new businesses.

To adapt to this reality and promote growth, organizations must be able to recognize the evolution of the environment, as well as anticipate and react quickly and effectively. This makes necessary to identify and incorporate market opportunities rapidly, provide high capacity for learning, innovation and work collaboratively with other organizations to coordinate and transform the resource base [14].

In a context of collaborative networks, business success is closely related to the synergistic interactions of the organizations and involves achievements that cannot be reached individually or demand a high cost of the parts, when separated [15][16][17][18][19][20][21]. It is in this context that companies share resources and skills to achieve their missions and goals [22][23][24][25][26][27]. The organizational interrelationships may have a powerful influence on competitive advantage by reducing costs, increasing profits, revenue, or market differentiation.

This work aims at understanding the association between the role of an organization in a collaborative network and the development of dynamic capabilities, in response to environmental pressures and turbulence. Similarly, we seek to identify the impact (the improvement, or not) that generates the dynamics of organizations in a collaborative network.

This paper has two main contributions: the first is a theoretical framework associating three main constructs: Dynamic Capabilities, Collaborative Networks and Turbulent Environments. The second consists in proposing a conceptual model involving these three main constructs, facing adaptation, resilience and competitiveness of organizations. This model will support a future empirical study. In this sense, we present three main assumptions that will guide the research development: **P1** The set of dynamic capabilities (organizational level) is extended by Collaborative Networks; **P2** - The result of a collaborative network is leveraged by the Dynamic Capabilities of organizations; **P3** - The level of environmental turbulence is positively associated with the above assumptions

2. Theoretical Background

Dynamic capabilities consist in creating resources combinations that are hard to reproduce, including an effective coordination of inter-organizational relationships on a global basis that is able to provide competitive advantage to the company. Dynamic capabilities are conceived as a source of sustainable advantage in Schumpeterian regimes of rapid change [28]. Pavlou and El Sawy [3] identify a set of capabilities focused on the detection of opportunities, learning, coordination and integration aiming at reconfigure the existing capabilities, in order to better match the environment. Given these scenarios, it is important to explore market opportunities quickly, providing high capacity for learning, innovation and integration [14].

By definition [29], the environment is the "pattern of all external conditions and influences affecting the life and organizations development." In turbulent environments, such patterns present continuous and substantial changes that are uncertain and unpredictable [30]. A turbulent environment is difficult to predict and is composed by disruptive changes [31]. Ansoff and McDonnell [32] provide a multilevel

model with five stages (1 for minimum and 5 to maximum) of turbulence to categorize the current condition in which an organization operates.

Facing the need of rapid adaptation and resources reconfiguration, the establishment of Collaborative Networks appears as an emerging form of multidisciplinary cooperation between companies, involving different knowledge areas (eg socio-economic, cognitive science, operations research, organizational business and management, legal, social and ethical) to achieve common objectives [7] and respond, or even predict possible conditions imposed by the environment.

The operationalization of relations in collaborative networks may occur in specific (physical and conceptual) environments, known as Virtual Organizations Breeding Environments. Such environments are defined as an association of organizations supporting institutions related to them [10]. These organizations have the potential and willingness to cooperate with each other through the establishment of a cooperation agreement and an infrastructure for long-lasting interoperation, which has as its main objective to increase both their chances, as their preparation for a potential collaboration in the form of a Collaborative Network [33] [34].

Among the various cooperation activities cited by Vallejos [11] and the environment aspects needed for its operation, described by Loss [10], this proposal argues that the most appropriate form of cooperation (in this research context) occurs from Virtual Organizations or Virtual Enterprises operating in a Virtual Organizations Breeding Environments through Collaborative Networks. The arrangement that involves these organizations supports the maintenance and development of dynamic capabilities in high turbulence environments.

3. Methodological Procedures and Context Research

This research is proposed within the context of two ongoing projects in the CERTI[1] Foundation (Florianópolis, SC/Brazil). The first consists in the development of a VBE to host "innovative initiatives", seeking to converge efforts to generate value for nature conservation. It is focused in innovation to the conservation of private natural areas.

The second VBE is composed by an "Innovation Ecosystem", that identifies a purpose of innovation based on vocations, trends and potential for a given region. Based on this purpose, it integrates several actors, creating a synergistic and supportive environment. The organizations involved are connected to a differentiated market, formed by a coalition of "anchor companies" or angel investors. The knowledge generated in both VBEs aims to improve products, processes and business models for the Network.

The articles included in this study were obtained through a literature review in Scopus (Social Sciences & Humanities) and Web of Science databases (Social Sciences Citation Index / Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH)). The PRO-VE Proceedings of the last two years (Collaborative Networks

[1] Innovative Technologies Reference Centers / *Centros de Referência em Tecnologias Inovadoras* (www.certi.org.br)

in the Internet of Services (2012) and Collaborative Systems for Reindustrialization (2013)) were also analyzed.

The theoretical framework associated to dynamic capabilities and turbulent environments were accessed through the keywords "dynamic capabilities" (*dynamic capability**) and "turbulent environments" (*turbulent**) used in the search fields "*Article Title, Abstract, Key Words*" for Scopus and "*Topic*" for Web of Science. The articles included were located in "*Article, Review Papers and Proceedings*" formats. The reference associated with collaborative networks and VBEs was designed from the PRO-VE 2012 and 2013 Proceedings. The filter selection was applied according to the following steps: (1) Identification of the converging papers from titles; (2) Selection or exclusion in accordance with the Abstracts and; finally (3) the systematization and classification of adherent articles.

According to Table 1, the first step selected convergent articles through the *titles*, *keywords* and respective *themes* analysis. A total set of 61 papers was obtained. A second check was performed (by the abstracts analysis) in order to select only those papers that directly addressed the topic. A final set of 39 papers were obtained that were then classified according to their (1) objectives, (2) the research method (3) variables; (4) context / application level; (5) results; (6) main conclusions and (7) proposals for further research. These steps were the guiding factors for the development of the Results and Discussion Section.

Table 1. Quantitative paper analysis for the development of research.

Thematic	**Number of selected papers in the first stage**	**Number of selected papers in the final stage**
Dynamic Capabilities and Turbulent Environments	20	8
PRO-VE 2012	21	15
PRO-VE 2013	20	16
TOTAL	61	39

This work describes the first development stage of an instrument which aims to elicit organization's performance metrics operating in collaborative networks. Three milestones will be achieved through the application of future empirical study based on this Conceptual Model proposed in the next Section: (1) Understanding the associations between the organizations dynamic capabilities and activities in collaborative networks, through different levels of environment turbulence; (2) Examine how the relationship between the variables influence the practices and process analyzed and organization performance; (3) Develop a methodology to measure dynamic capabilities and activities in collaborative networks according different environmental turbulence levels and organizational performance. The instrument proposed will be applied in organizations involved in the VBEs described above.

4. Results and Discussion

In turbulent markets and scenarios that require extremely competitive and innovative organizations, it is apparent the need to transform the resource base in accordance with the changing markets and technology.

Based on previous research models focused on measuring dynamic capabilities [3] and performance [7] in collaborative networks [10] [11] [35] [36] [37] [38] [39], this research aims to identify an optimal solution according to the different turbulence and pressures levels imposed by the environment [3] [32]. This section presents and discusses the main issues identified in the universe of the articles selected for this research. Among the 39 papers that formed the basis for the contextualization and conceptualization of collaborative networks associated with dynamic capabilities in turbulent environments, three contribute directly to the proposition of the Conceptual Model: *Understanding the Elusive Black Box of Dynamic Capabilities* [3]; *Business Model Development for Virtual Enterprises* [35] and *A Method to Quantify the Power Distribution Networks in Collaborative nonhierarchical* [36].

Pavlou and El Sawy [3] research brings two main conclusions. First, it identifies and articulates a set of dynamic capabilities, and proposes a measurable model to represent the nature of dynamic capabilities. Second, it empirically supports a structural model in which dynamic capabilities have an indirect positive effect on performance by reconfiguring operational capabilities in NPD, an effect that is positively moderated (reinforced) by environmental turbulence. According to the authors, this study has implications for (i) conceptualization, operationalization and measurement of dynamic capabilities, and (ii) to understand the effects of dynamic capabilities in turbulent environments.

Rojas et al. [35] proposes a set of business model elements to be used by the virtual enterprise in order to explore a new business opportunity for its network. The authors identify sixteen elements needed to define the business model of virtual enterprise. These elements structure five main areas: Customers, Value Network, Value Exchange, Value Capture and Network Governance. The contribution of the authors is one of the cornerstones the Conceptual Model proposed in Figure 1. Following the authors recommendation, we intend to apply the model in two distinct contexts of collaborative networks, in order to validate it. Finally, the variables proposed by Andres and Poler [36] and the 7 steps to estimate the power distribution within the network will also be considered to have a better view of power interaction and collaboration.

The Conceptual Model associated to entrepreneurial dynamism and performance in collaborative networks of organizations proposed below, is the result of refinement, adaptation and creation of new perspectives from the studies identified in the researches described above. Based on this, we made some adjustments in the original model proposed by Rojas et al. [35].

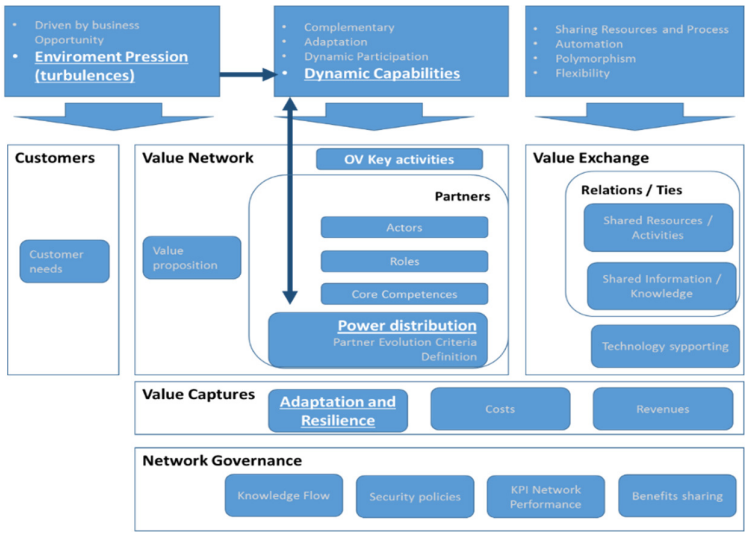

Fig. 1. Conceptual Model for business dynamism and performance in collaborative networks considering turbulent environments. Adapted from Rojas et al. [35].

The Conceptual Model will enable the system of metrics and indicators design for future application to organizations involved in VBEs cited in Section 3.

The presented Model considers the influence and pressure of high turbulent environments on the dynamic capabilities of organizations in collaborative networks. The relationship between dynamic capabilities and performance in a collaborative network has a positive direct relationship to the extent that the set of dynamic capabilities (measured according to the methodology proposed by Pavlou and El Sawy [3]) potentiate the result of a collaborative network (measured according to the methodology proposed by Andres and Poler. [36]) As the network relationships and results are able to be shared by all organizations involved, it also increases the possibility of dynamic capabilities development. A consequence of this process is the increase of the adaptive capacity and resilience of the organization while facing unstable, unpredictable and complex environments.

The present section briefly tried to understand how the literature addresses the dynamic capabilities and collaborative networks in contexts of high instability and rapid change. It is expected that the proposed conceptual model will further develop the operationalization and measurement of dynamic capabilities and collaborative networks to assist the quality of decisions in turbulent environments.

5. Conclusions and Further Research

The present research is still in its initial stage. We assume that there is a positive association between the environment pressure / turbulence, the development and maintenance of dynamic capabilities, and performance in organizations' collaborative

networks. From a systemic literature review, we identified 39 convergent studies to our research problem. As the main result, three key papers were selected and served as a cornerstone to the Conceptual Model proposed. The validation of the metrics system must be concluded and performed by consulting experts in related fields. After the validation and refinements, we intend to collect data from the Virtual Organizations Breeding Environments companies presented in Section 3.

The data collection will occur in three stages: (1) Diagnosis of VBE entry, (2) intermediate Tracking evolution and (3) final diagnosis evaluation to validate the assumptions from the research. From the evolution of the present research, we aim to answer the following questions through future empirical study: (1) How organizations allocate their resources (processes associated with dynamic capabilities and performance in collaborative networks) according to the different turbulence environment levels identified and what is the impact on organizational performance? (2) Dynamic capabilities could leverage a collaborative network? (3) A collaborative network can actually be a precursor of organizational reconfiguration (dynamic capabilities)? (4) How it affects organizational performance in a turbulent environment?

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