

2018 TECHNOLOGY TRANSFER CONFERENCE**Time and Knowledge: Dynamics perspectives of Technology Transfer**

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The teams collaboration capabilities as drivers of technology-based startup's innovation performance.

ABSTRACT: *This research focuses on report the results of a study aimed to conceptualize and develop an aspect that has been scarcely addressed by research: Team Collaboration Capabilities. This a concept encompasses the interaction of the technology-based startups teams' organization and operations, it represent a set of interaction factors framing collaboration activities among the team members, such as trust, communication, problem-solving and team efficacy. This contributes to introduce team collaboration capabilities as a new approach to understand and measure the interaction conditions as drives that influence operational capabilities configuration, to develop their competitive advantage in rapid technological change environments, under dynamic capabilities framework.*

Keywords: Teams collaboration capabilities; Technology Based Startups; Dynamic Capabilities; Innovation Performance; operational capabilities

1. Introduction

Technology-based startups team: foundation and members characteristics

Technology Based Startups (TBSs) are considered key for economic development, given their contribution as drivers of innovation based on the creation and transfer of scientific and technological knowledge. Most TBSs are founded by a team with entrepreneurial basis that faces constant internal and external interaction factors that have an impact upon their operational processes. Their innovation capacity and the organization's sustainability over time connected with its ecosystem. TBSs are catalysts that often generate or transmit technological change. The concept of TBS team (TBST) involves an entrepreneurial and innovation team' organization, which usually emerge within, from, across or outside a firm or institution, such as an university, research institution or industry (Harper 2008). TBST's internal conditions are entrenched with a continual collaboration as: "... a social system of three or more people, which is embedded in an organization (context), whose members perceive themselves as such and are perceived as members by others (identity), and who collaborate on a common task work" (Hoegl and Gemuenden 2001, 436). The concept of team can be explained taking into account attributes such as complexity, adaptive capacity and dynamism (Ilgen et al. 2005) in a context that relates to the entities to which they belong (Bjornali et al. 2016).

The TBST requires a stock of human capital directly related to individual competences. The term competence encompasses traits, knowledge, previous experiences and abilities that should be 'orchestrated' to shape both the individual and organizational capabilities, linked to the strategy and performance (Azagra-Caro et al. 2017). Highly-skilled team's members become the TBST's human capital, which refers to individuals as source of knowledge who obtained and developed skills and competences through education, training and previous work experience (Attewell 1999). Highly-skilled human capital is perceived as unappreciated in private sectors; however, the potential of academic entrepreneurship lies in the researchers who founding university spin-offs, who represent an important source of profit (D'Este et al. 2012). The team depends on the motivation and commitment of the members, who should know and trust each other enough to share the same goals, intention, responsibility and decision making to start a company (Vyakarnam et al. 1999). The formation and professionalizing of the team consolidates over time, and it is shaped by new members and the growth of the organization.

2. Conceptual framework

Dynamic capabilities and TBSs

Dynamic capabilities aim to explain how a firm addresses turbulent market conditions by extending, modifying and reconfiguring existing operational capabilities into a better matching the environment conditions. In essence, as resources and competences they must be build inside the firm. Our analysis focalized on the basic of dynamic capabilities' definition and origins as a framework to understand the intra and extra organizational conditions that frames collaboration activities. Dynamic capabilities are "*the firm ability to integrate, build, and reconfigure internal and external resources/competences to address and shape rapidly changing business environments*"(Teece and Pisano 1994). In innovation environments collaboration and dynamic capabilities are integrated as an essential condition among different organizations and firms. Collaboration for innovation involves complex activities that requires a combination of inputs from diverse sources, most of them involves different dimensions between individuals, organization, teams and inter firms, most of them partners, suppliers or competitors. In a TBS, collaboration represents interaction among individuals inside the organization where all are working together to achieve a defined and common goal in a specific context.

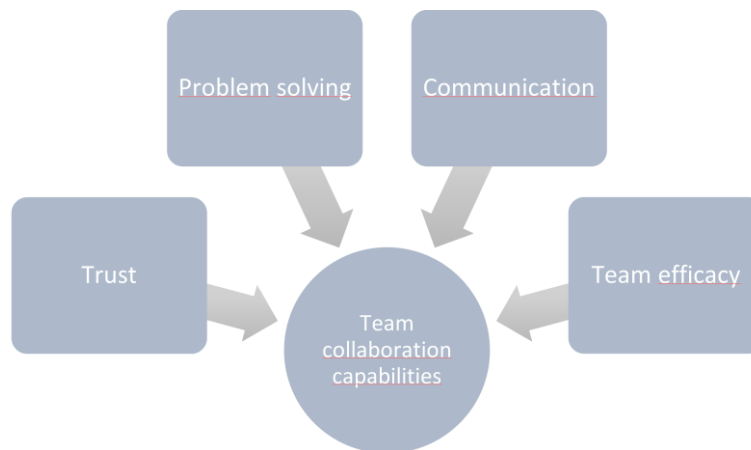
Conceptualizing TBS Team Collaboration Capabilities (TCCs)

To explain the theoretical concepts proposed in this empirical studio, the identification intra-organization activities, also known as collaboration capabilities. Collaboration capabilities is a multidimensional concept that can be observed in activities of individuals, groups, teams, organizations and even in intra-organizational activities. They have been described as part of in DCs. These factors and elements constitute the resource-base of the organization's operation and are essential resources for the TBS (Eisenhardt 2013; Klotz et al. 2014). Since innovation involves a set of factors to produce a novelty, among them there are the willingness, expertise, and coordinated interaction that lead collaboration.

Teams interaction is underlined by an intra-organizational collaboration that follows informal aspects among the team's members, especially the role of informal communication and direct interaction. 'Collaboration' in team has been referred as team integration (Swink 1999), and communication and problem solving in cross-functional cooperation (Pinto et al. 1993). Then, Holton (2001) implies it is necessary to have solid foundations of trust and collaboration in teams. Also, Järvenpää and Leidner (1998) consider trust and communication to be team success factors among the members' interaction. On the other side, according to Costa (2003) as well Khan et al. (2014) consider team trust, diversity impacts the team performance. Finally, Jansen et al. (2015) Jansen et al. find team cohesion and team efficacy support the team

members to overcome challenges together. Under these elements, we build the ‘*Team Collaboration Capabilities*’ (TCCs) model in figure 1.

Figure 1 TBS team collaboration capabilities construct



To capture of the complexity of TBS teams our model includes four dimensions of team interaction factors, such as trust, communication, problem-solving and team efficacy.

3. Hypothesis development

The concept of TBS team collaboration capabilities (TCCs) is based on the theory of entrepreneurial teams and the Dynamic Capabilities as framework. Hence, the following argument pursues to confirm to what extent the TCCs’ aiming its innovation performance. The innovation performance is considered the outcome produced by new product development processes. This mean that innovation performance is the innovation value-adding chain of activities and assets that all together successfully commercialized it. The complementing synergies in innovation processes are considered an added value to the firm (Lawson and Samson 2001; Laursen and Foss 2003; Zizlavsky 2016).

When a TBS entrepreneurial team exhibits high-levels of TCCs, the team will be active and flexible, thus enabling the organization to adapt and evolve quickly. This fosters an environment in which they can effectively build new capabilities which, in turn, contribute to innovation performance. This reasoning, based on research into teams and innovation, (see figure 2) we conclude that TCCs influence the innovation performance of TBSs. With that, our first hypothesis is:

H1. TCCs have a positive effect on TBS innovation performance

Operational capabilities (OCs) “*are firm-specific sets of skills, processes, and routines, developed within the operations management system, that are regularly used in solving its*

problems through configuring its operational resources” (Wu *et al.* 2010, p. 726). OCs are integrated by three essential capabilities: technical capability, marketing capability, and managerial capability (Winter 2003; Cepeda and Vera 2007; Wu, Melnyk, and Flynn 2010; Pavlou and El Sawy 2011). Based on this discussion the hypothesis suggested is:

H2. The TBS’ TCCs positively affect operational capabilities

The OCs are the TBS’ everyday functional activities and they are potentially breeding new capabilities building that represent competitive advantage for the firm. In TBS teams, there is a closed connection between OCs and innovation performance (see figure 1), linking specialized and specific routines towards the achievement of innovation (Shin *et al.* 2012). Therefore, we hypothesize that:

H3. The TBS’ operational capabilities positively affect their innovation performance

The OCs are defined processes with the potential to evolve in each of technical, marketing, and management areas. A TBS’s innovation orientation incentivizes the formation of organizational routines, processes, structures, and conditions that help to develop competencies required to reach their innovation goals. It encourages ‘*technical innovations*’ related to R&D, ‘*innovation improvements grounded on ‘market testing*’, and internal redesign of resources administration linked to ‘*administrative innovations*’ related to organizational processes and functions (Han, Namwoon, and Srivastava 1998; Siguaw, Simpson, and Enz 2006). All of this leads us to the fourth hypothesis:

H4. Operational capabilities mediate the relationship between TCCs and innovation performance

4. Research method

Sample and data collection

The empirical study is based on a survey of 45 organizations, mostly participants in programs established by startup accelerators. The sample includes TBSs established in Spain with activities focused on high technology and green technologies, including both hardware and software technologies, and the development of new products and services. Given the particular conditions of our sample, we used Structural Equation Modeling (SEM), which is a component-based estimation for cause-effect modeling with latent variables. The model has been estimated using the least squares system (PLS) with the support of the Smart PLS 3 software.

Measurement of variables

The TCCs is a specific construct that requires integrating different components also known as indicators (Curado *et al.* 2014). The values assigned to these indicators are in represent values assigned on an ordinal scale. Indicators build up a variable and can be defined as an item, or an observed measure, also as observed variable exchangeable (Bollen and Lennox 1991). The scales ranged from “strongly disagree” to “strongly agree”, with the items focusing on the degree to which the participants perform the stated routines.

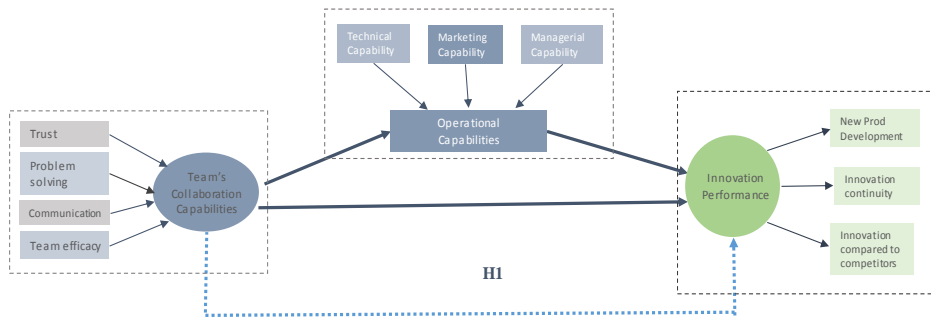
5. Results

The results suggest that the TBSs’ operational capabilities act as a mediator in the relationship between the team collaboration capability and innovation performance. The control variables considered, including the type of technology, the experience as a participant in the

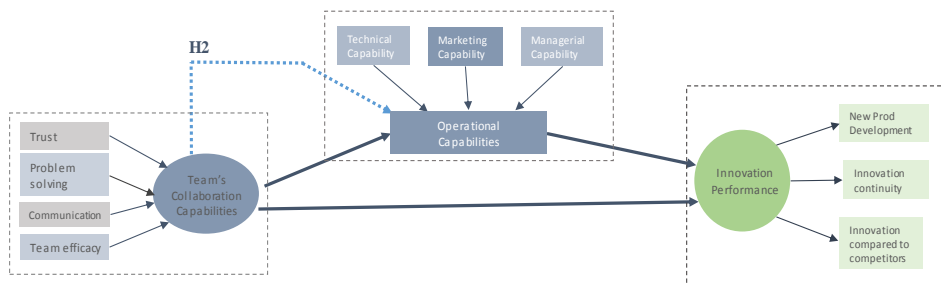
acceleration program, and the type of investment granted, are not significant in the innovative performance of the TBS. The findings suggest some opportunities for the development of competitive strategies within entrepreneurial teams attending to the measurement of their TCCs, as well as future lines of research on the role of the TCCs applying in investment, external collaborations and innovation ecosystems. Finally, also on the possibilities of implementing public initiatives oriented to contributes to the strengthen and funding of TBSs and incentive collaborations in innovation projects that encouraging and favoring creation and consolidation of TBSs, taking into account the critical phases of TBSs development.

Figure 2 TBS team’s collaboration capabilities’ hypothesis

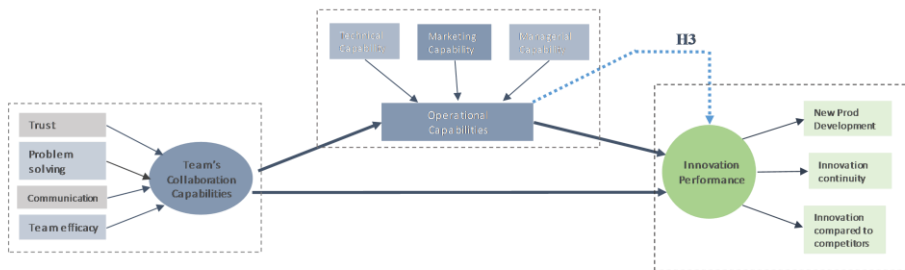
H1. TCCs have a positive effect on TBS innovation performance



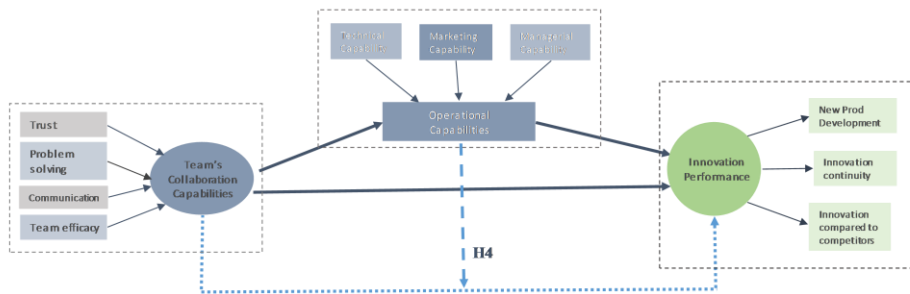
H2. The TBS' TCCs positively affect operational capabilities



H3. The TBS' operational capabilities positively affect their innovation performance



H4. Operational capabilities mediate the relationship between TCCs and innovation performance



References

- Attewell, Paul. 1999. "What Is Skill?" *Journal Work and Occupations* 17 (4): 422–48. doi:0803973233.
- Azagra-Caro, Joaquín M., David Barberá-Tomás, Mónica Edwards-Schachter, and Elena M. Tur. 2017. "Dynamic Interactions between University-Industry Knowledge Transfer Channels: A Case Study of the Most Highly Cited Academic Patent." *Research Policy* 46 (2): 463–74. doi:10.1016/j.respol.2016.11.011.
- Bjornali, Ekaterina S., Mirjam Knockaert, and Truls Erikson. 2016. "The Impact of Top Management Team Characteristics and Board Service Involvement on Team Effectiveness in High-Tech Start-Ups." *Long Range Planning* 49 (4). Elsevier Ltd: 447–63. doi:10.1016/j.lrp.2015.12.014.
- Cepeda, Gabriel, and Dusya Vera. 2007. "Dynamic Capabilities and Operational Capabilities: A Knowledge Management Perspective." *Journal of Business Research* 60 (5): 426–37. doi:10.1016/j.jbusres.2007.01.013.
- D'Este, Pablo, Surya Mahdi, Andy Neely, and Francesco Rentocchini. 2012. "Inventors and Entrepreneurs in Academia: What Types of Skills and Experience Matter?" *Technovation* 32 (5). Elsevier: 293–303. doi:10.1016/j.technovation.2011.12.005.
- Dodgson, M., and Roy Rothwell. 1994. "Technological Collaboration and Innovation." *The Handbook of Industrial Innovation*, 285–92. doi:10.1093/oxfordhb/9780199694945.013.003.
- Eisenhardt, Kathleen M. 2013. "Top Management Teams and the Performance of Entrepreneurial Firms." *Small Business Economics* 40 (4): 805–16. doi:10.1007/s11187-013-9473-0.
- Han, Jin K, Kim Namwoon, and Rajendra K Srivastava. 1998. "Market Orientation and Organizational Performance: Is Innovation a Missing Link?" *Journal of Marketing* 62 (4): 30–45. doi:10.2307/1252285.
- Harper, David a. 2008. "Towards a Theory of Entrepreneurial Teams." *Journal of Business Venturing* 23 (6): 613–26. doi:10.1016/j.jbusvent.2008.01.002.
- Hoegl, Martin, and Hans Georg Gemuenden. 2001. "Teamwork Quality and the Success of Innovative Projects: A Theoretical Concept and Empirical Evidence." *Organization Science* 12 (4): 435–49. doi:10.1287/orsc.12.4.435.10635.
- Ilgen, Daniel R, John R Hollenbeck, Michael Johnson, and Dustin Jundt. 2005. "Teams in Organizations: From Input-Process-Output Models to IMOI Models." *Annual Review of Psychology* 56: 517–43. doi:10.1146/annurev.psych.56.091103.070250.
- Jansen, Justin J.P., Konstantinos C. Kostopoulos, Oli Mihalache, and Alexandros Papalexandris. 2015. "A Socio-Psychological Perspective on Team Ambidexterity: The Contingency Role of Supportive Leadership Behaviors." *Journal of Management Studies*, n/a-n/a. doi:10.1111/joms.12183.
- Järvenpää, Sirkka L., and Dorothy E. Leidner. 1998. "Communication and Trust in Global Virtual Teams." *Journal of Computer-Mediated Communication* 3 (4): 0. doi:10.1111/j.1083-6101.1998.tb00080.x.
- Jassawalla, Avan R., and Hemant C. Sashittal. 1998. "An Examination of Collaboration in High-Technology New Product Development Processes." *Journal of Product Innovation Management* 15 (3): 237–54. doi:10.1111/1540-5885.1530237.
- Klotz, A. C., K. M. Hmieleski, B. H. Bradley, and L. W. Busenitz. 2014. "New Venture Teams: A Review of the Literature and Roadmap for Future Research." *Journal of Management* 40 (1): 226–55. doi:10.1177/0149206313493325.
- Laursen, Keld, and Nicolai Foss. 2003. "New Human Resource Management Practices, Complementarities and the Impact on Innovation Performance." *Cambridge Journal of Economics* 27 (2): 243–63. doi:10.1093/cje/27.2.243.
- Lawson, Benn, and Daniel A. Samson. 2001. "Developing Innovation Capability in Organisations: A Dynamic Capabilities Approach." *International Journal of Innovation Management* 05 (03): 377–

400. doi:10.1142/S1363919601000427.
- Pavlou, Paul, and Omar El Sawy. 2011. "Understanding the Elusive Black Box of Dynamic Capabilities." *Decision Sciences* 42 (1): 239–73. doi:10.1111/j.1540-5915.2010.00287.x.
- Shin, Shung J., Tae Yeol Kim, Jeong Yeon Lee, and Lin Bian. 2012. "Cognitive Team Diversity and Individual Team Member Creativity: A Cross-Level Interaction." *Academy of Management Journal* 55 (1): 197–212. doi:10.5465/amj.2010.0270.
- Siguaw, Judy A., Penny M. Simpson, and Cathy A. Enz. 2006. "Conceptualizing Innovation Orientation: A Framework for Study and Integration of Innovation Research." *Journal of Product Innovation Management* 23 (6): 556–74. doi:10.1111/j.1540-5885.2006.00224.x.
- Swink, Morgan. 1999. "Threats to New Product Manufacturability and the Effects of Development Team Integration Processes." *Journal of Operations Management* 17 (6): 691–709. doi:10.1016/S0272-6963(99)00027-3.
- Teece, D.J., and Gary Pisano. 1994. "The Dynamic Capabilities of Firms: An Introduction." *Industrial and Corporate Change* 3 (3): 537–56. doi:10.1093/icc/3.3.537-a.
- Vyakarnam, Shailendra;, Robin; Jacobs, and Jari Handelberg. 1999. "Exploring the Formation of Entrepreneurial Teams: The Key to Rapid Growth Business?" *Journal of Small Business and Enterprise Development* 6 (2): 153–65. doi:10.1108/EUM00000000006673.
- Winter, Sidney G. 2003. "Understanding Dynamic Capabilities." *Strategic Management Journal* J (24): 991–95. doi:10.1002/smj.318.
- Wu, Sarah Jinhui, Steven A. Melnyk, and Barbara B. Flynn. 2010. "Operational Capabilities: The Secret Ingredient." *Decision Sciences* 41 (4): 721–54. doi:10.1111/j.1540-5915.2010.00294.x.
- Zizlavsky, Ondrej. 2016. "Innovation Performance Measurement: Research into Czech Business Practice." *Economic Research-Ekonomska Istraživanja* 29 (1). Routledge: 816–38. doi:10.1080/1331677X.2016.1235983.