Chapter 1
The FABLAB Movement:
Democratization of Digital Manufacturing

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ABSTRACT

The arrival of collaborative contexts to the global economic stage is a latent reality which threatens to change the traditional production models' operation. Likewise, concepts such as Industry 3.0 or even 4.0 refer to the possibility of providing customers and users with unimaginable possibilities compared to the industrial manufacturing inherited from the past centuries. Within this environment, the fabrication laboratories (FabLabs) emerge. In this chapter, the authors approach an exploratory perspective in order to make known the FabLab movement origin and further worldwide development with the intention to highlight their characteristics and the main difficulties they face nowadays. The growing importance that the FabLabs have achieved despite their novelty justifies the precise study of their characteristics according to the importance related to the strong expansion of these laboratories in this decade and its contribution to a major revolution in the collaborative environments associated with the digital manufacturing.

INTRODUCTION

Tackling the characterization of the FabLab movement is not a simple task. Its novelty and the characteristics of its environments can justify the scope of the scientific literature, which limits the results in systematic reviews of documentary and academic bibliographic sources. In spite of this, the term FabLab -Fabrication Laboratory- can be defined with the words of its creator as: *A collection of machinery and pieces joined together by software and developed processes to create things* (Gershenfeld, 2008).

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The history of the FabLabs begins with the Professor Neil Gershenfeld own's hand as part of the deployment for the subject "How to Make (almost) Anything" in 2002 (Betts, 2010; George-williams, 2015; Gershenfeld, 2012; Hielscher, Smith, & Fressoli, 2015; Kohtala & Bosqué, 2013; Posch & Fitzpatrick, 2012; Willemaerts et al., 2011). This subject, developed in the CBA (Center for Bits and Atoms) dependent on the prestigious MIT -Massachussets Institute of Technology- (Gjengedal, 2010) and funded by the NSF (National Science Foundation) (Tiala, 2011), was needing a laboratory where materials could be generated and assembled at an atomic level (Capdevila, 2014; Cavalcanti, 2013; Eychenne, 2012; Hielscher et al., 2015; Walter-Herrmann & Büching, 2013) in order to analyze the computational properties inherent to the physical systems (International FabLab Association, n.d.).This laboratory was intended to become the cutting edge of a true revolution within manufacturing, leading the transformation through specialized tools in digital manufacturing (Eychenne, 2012; Herrera, 2012) including from 3D printers to laser and CNC cutting machines to allow small-scale production (Capdevila, 2014; Tiala, 2011) proving that FabLabs can be a powerful educational instrument for specific skills in official university programs (Guerra & Sánchez de Gómez, 2016), being used in some cases as a platform for Industry 4.0 development (Angrisani, Arpaia, Bonavolanta, & Lo Moriello, 2018) or even in middle school (Flores, 2018) or primary school (Gennari, Melonio, Rizvi, & Bonani, 2017) fostering que creativity of the students.

Through the CBA, and under the conditions imposed by the National Science Program, Gershenfeld aimed to *explore the union between the applied science of computers and the physical environment* (Troxler, 2014). In addition, as indicated by Eychenne (2012), for Gershenfeld, the Fablabs deserved the same consideration as the Internet development and the Web 2.0, functioning as a democratizing process of the technology usage -in this case, the digital fabrication- by users, converting them into prosumers (Kotler, 1986; Ritzer, Dean, & Jurgenson, 2012; Walter-Herrmann & Büching, 2013) transforming users from simple spectators into protagonists (Gershenfeld, 2005; Kohtala & Bosqué, 2013).

Gershenfeld's vision is complemented with the Sherry Lassiter's vision, president of the FabFoundation, who considers that, in regard to the new century, the emerging economy has new skills and new types of knowledge which will be necessary to compete in an economy based on communication, information and digital media. Agree to this, the FabLabs can provide people with the ability to do things on their own as the fastest mechanism to solve their problems, especially in communities with low access to education or technology (Beyers, 2010), helping people in development zones with the possibility of designing and creating tools to solve local problems (Paio, Eloy, Rato, Resende, & de Oliveira, 2012).

Thus, and with that objective in mind, after the creation of that first FabLab at MIT, it was followed by the construction of others within an interdisciplinary program: in Boston (in 2001 at the South End Technology Centre of Tent City), in Costa Rica (in 2003 at the Technology Institute of Costa Rica), in India (in 2003 at the Science School Vugyan Ashram) and Ghana (in 2003 at the Takoradi Technical Institute), being the FabLab of Norway -Lyngen- the first built in Europe (Hielscher et al., 2015; Troxler, 2014; Troxler & Wolf, 2010). From these first FabLabs creation, the popularity of these ones aroused the creation of a large number of laboratories spread out around the world (Posch & Fitzpatrick, 2012) without the direct funding of MIT, created by groups of people interested in digital fabrication, universities, foundations, etc., but maintaining in some way the CBA involvement in its foundations (Posch & Fitzpatrick, 2012). In spite of the fact that Neil Gershenfeld initially did not seem to want a strong organizational structure for the FabLab network management, their rapid growth -as seen on Table 1- required the creation of an organizational framework to manage different important aspects for the FabLab, resulting in the FabFoundation (Hielscher et al., 2015).