



**Volume 5**

# **Fab Labs**

*Innovative User*



**Laure Morel and Serge Le Roux**

**ISTE**

**WILEY**

**Smart Innovation Set**

coordinated by  
Dimitri Uzunidis

Volume 5

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First published 2016 in Great Britain and the United States by ISTE Ltd and John Wiley & Sons, Inc.

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27-37 St George's Road  
London SW19 4EU  
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John Wiley & Sons, Inc.  
111 River Street  
Hoboken, NJ 07030  
USA

[www.wiley.com](http://www.wiley.com)

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Library of Congress Control Number: 2016939640

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British Library Cataloguing-in-Publication Data  
A CIP record for this book is available from the British Library  
ISBN 978-1-84821-872-7

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## Preface

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In a world that perpetually seeks productive and financial competitiveness, where innovation is (very) often used to serve this purpose, the massive development of Fab Labs or additive manufacturing laboratories in both developed and developing countries provides an original alternative to the consumer–producer relationship. Presented as the third industrial revolution, three-dimensional (3D) printing techniques provided by these laboratories overturn the current manufacturing and industrial production patterns and the associated business models. Indeed, they offer the ability to produce complex objects much faster by using fewer raw materials and less energy. In a now-famous article “Print me a Stradivarius”, *The Economist* goes so far as to say that 3D printing could eventually be a promising innovation leading to a technological breakthrough identical to the invention of the steam engine or the printing press. Similarly, numerous analyses were performed predicting that by 2025, most households will be equipped with a 3D printer for home use, allowing anyone to make or repair items for daily-life. Until then, the deployment of 3D technologies will especially be through Fab Labs, a real place to share intellectual and physical work. It is specifically this

particular aspect of the “prosumer”<sup>1</sup> viewed from the perspective of the innovator-user, *de facto* manufacturer, which we want to investigate in this book. Indeed, beyond the techniques and technologies, users see themselves as the bearers of knowledge and various skills that they can put at the service of a community at their location. In this sense, the question we raise herein is whether the Fab Labs are, or will be, a smart innovation of new values of sharing and mutual aid, heralding a profound change in the behavior of our societies, by allowing the birth of community-based local entrepreneurship.

This is precisely the issue we want to address in this book, inquiring into the phenomenon of Fab Labs from both conceptual and practical points of view. Indeed, it is worth noting that this book is the result of a collaboration between two researchers from the Research Network on Innovation (<http://rrien.univ-littoral.fr/>), whose aim is threefold: to observe and analyze the processes of innovation, to theorize innovation systems and to promote research about the economics and management of innovation. Laure Morel, director of an industrial engineering laboratory specialized in the study of innovative processes<sup>2</sup>, which has developed, during the last 5 years, a Fab Lab to support the ideation processes not only in business but also in educational framework; Serge Le Roux is an economist (PhD in Economics, former associate professor at the University of Marne-la-Vallée, France), specialized in the interaction between technology, work and creative territory<sup>3</sup>. Thus, this

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1 Translation of the neologism term “prosumer” coined by Alvin Toffler in 1980 in his book *The Third Wave*, to describe this rise in power of the consumer–producer.

2 ERPI Laboratory, Innovative Processes Research Team, University of Lorraine.

3 Member of the Research Unit in Industry and Innovation, University of Lille Nord de France.

book is not about a philosophical discussion of the concept of the Fab Lab, rather it aims to be a realistic contribution based on concrete experiences of users placed in an entrepreneurial position, in order to mobilize these skills to meet their needs.

Laure MOREL  
Serge Le Roux  
April 2016



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## Introduction

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“Connecting people” is a very common expression nowadays, often used in digital business communication strategies. However, beyond the catchy slogan, connecting people or objects has become a real challenge for companies to remain competitive. Indeed, we are living the end of the myth of the “mad” isolated inventor in favor of collective and collaborative creation. In this context, the concept of Fab Labs emerged to meet new user expectations in terms of future product design. Essentially, a Fab Lab is an equipped physical space, enabling communities of users to imagine and produce specific objects using digital tools. In this way, the Fab Labs foster a “do-it-yourself” culture, accompanied by a new paradigm promoting open access to knowledge and collaboration as a natural environment for innovation and creation. Indeed, it is clear that in practice, beyond the “do-it-yourself”, the Fab Labs also work according to the principle of “do-it-with-others”, because if you can do it alone, you can do it with others through trial and error by allowing all participants to contribute to a project.

However, as Chris Anderson pointed out in his book *Makers* [AND 12]: “having an equipped space such as the Fab Lab is not enough to create virtuous innovation dynamics”. It is also necessary to build a community around

it, which is based on practical collaboration and sharing and which promotes a new player: the “producer–consumer” or the “innovator–user”. Thus, the creation and maintenance of a community of users turn out to be two key factors of the success and sustainability of a Fab Lab. As highlighted by the same author [AND 12], when it works properly, the design process and R&D are carried out more quickly and efficiently. Note also that the question of competence in the conception of Fab Lab users is raised: are these places dedicated to awareness of design techniques, buddy spaces or just individual and collective experimentation centers, requiring a long-term engineering contribution? In this context, and faced with these questions, it seems interesting to analyze how these new places, which favor both collective creativity and design through their use, participate in a new definition of “connecting people”, which is embodied in the ability of territories to promote the development of spaces suitable for new creative communities that revolutionize our relationship with the status of knowledge and intellectual property. Ultimately, our goal is to underline that beyond participating in a new industrial revolution, the Fab Lab contributes to restoring a privileged position to the entrepreneur, under a new dimension that we call, at this stage of our reflection, the innovator–user. The innovator–user engages in the development of local community entrepreneurship based on a new balance between the exchange value and the value of the use of a product.

Thus, in the first part, we discuss the state of the art of the notion of “Fab Labs”, from the origin of the movement to its current state of diffusion. In particular, we will show that this phenomenon is constantly progressing: Fab Labs have emerged in various countries to achieve currently about 327 platforms in the world, and perhaps more, if we consider those that have not been recorded yet by the Fab Lab Foundation (“Fab Foundation–Fab Labs”). After a definition of what a Fab Lab is, we will also analyze these places in



terms of production of knowledge and expectations regarding their creation. Finally, we will focus on an aspect that seems essential to delimit the profile of the users of these places, and the way they design and work in order to establish a real community of practice.

The second part of the book is devoted to the possible or conceivable consequences of this personal fabrication “revolution”, particularly how it questions numerous statuses acquired over decades or even longer, such as intellectual property or labor wage. This “revolution” not only involves these achievements but also offers new fields for human action, for example, in the fight against global warming. In any case, it questions the individuals and institutions that have been created throughout history, to review their current relevance and, through the inherent power it generates, the new potential worlds that may arise.

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## Fab Labs: Observations on a Topical Phenomenon

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If today paralleling “democratization” and “three-dimensional (3D) printing” is possible, it is largely due to the emergence and the significant development of the Fab Lab concept. Not a day goes by without the media writing an article or reporting on this global phenomenon that is announced as the third industrial revolution. But before delving further into a discussion on the potential of these places to encourage creation and collective innovation, we consider that it is important to review the origins of this concept and its current state of diffusion worldwide, as well as to clarify the specifics to be recognized by the community as “real” Fab Labs. Finally, it is necessary to clarify the terms used and the nature of the users in order to understand the challenges that these knowledge and skill-sharing facilities introduce.

### 1.1. Origins and an attempt at a definition

#### 1.1.1. *The origins: a concept from MIT*

The first Fab Lab appeared in the late 1990s at Massachusetts Institute of Technology (MIT) in the Center for Bits and Atoms (CBA) at the instigation of Neil

Gershenfeld [GER 07]. After obtaining funding for his research, Gershenfeld decided to gather high-technology machines in one place that would allow him to work and produce materials, and to design electronic circuits and microprocessors. However, faced with the challenge of training his students to use these machines, he conceived his famous course “How To Make (Almost) Anything”, which has become a full educational program within the MIT syllabus under the code 863.08. Students were encouraged to develop personal fabrications using the available equipment. Gershenfeld observed that the students did not hesitate to divert machines to fit their needs. In this context, in 2001 the MIT Media Lab set up the Fab Lab program whose principles are set out in a Charter (<http://fab.cba.mit.edu/about/Charter/>) which aims to promote the creation of a global Fab Labs network.

As a genuine workshop with learning tools, the Fab Lab is thus a place where data and objects (Bits and Atoms) can be manipulated through special machines that can transform data from a computer into a tangible object [GER 06].

However, to be called a Fab Lab, a digital workshop has to respect the Fab Lab Charter established by MIT. With the development of the Charter came a form of empowerment of the concept, leading to consider that the new entrants did not necessarily follow the process to join the MIT Charter. Rather, they are referenced by the national networks of Fab Labs by demonstrating that they respect the initial prerequisites. Thus, adhering to the concept is easy: it is enough to fix a time for public opening of the Lab, providing a typical park of rapid prototyping machines, as mentioned in the Charter. The advantage is participation in the life of the network by sharing a logo (see Figure 1.1) and a wiki ([http://wiki.fablab.is/wiki/Main\\_Page](http://wiki.fablab.is/wiki/Main_Page)) on which both projects and practices can be discussed.

Although this freedom of action favors the network, it also constitutes one of its limitations. Indeed, faced with the popular and industrial craze for the Fab Lab, many spaces were then renamed using this term, leading to further drift and confusion between a Fab Lab, a rapid prototyping workshop, a TechShop, etc., which we will address in the next section.

Finally, note that “most of the labs are associative or owe their functioning to public funds. This policy marking openness and reappropriation is an essential point of all current labs” [COL 13b].

In order to carry the title of “Fab Lab”, a structure must, *inter alia*, respect the Fab Labs Charter, as laid out by MIT. The Charter below was updated in November 2012, based on minor amendments addressed by the global network:

– **What is a Fab Lab?**

Fab Labs are a global network of local laboratories, which boost inventiveness by providing access to digital fabrication tools.

– **What can we find in a Fab Lab?**

Fab Labs share the evolving catalog of core capacities to make (almost) any object, allowing people and projects to be shared.

– **What does the Fab Labs network provide?**

Operational, education, technical, financial and logistical assistance beyond what is available in a single Lab.

– **Who can use a Fab Lab?**

Fab Labs are available as a community resource, offering free access to individuals as well as subscribers within the framework of specific programs.

– **What are your responsibilities?**

- Safety: do not hurt anyone and do not damage the equipment.
- Operation: help clean, maintain and improve the Lab.
- Knowledge: contribute to the documentation and knowledge of others.

**– Who owns inventions made in a Fab Lab?**

The designs and procedures developed in Fab Labs can be protected and sold as desired by their inventor, but must remain available so that individuals can use and learn from them.

**– How can businesses use a Fab Lab?**

Commercial activities can be prototyped and incubated in a Fab Lab, but they should not conflict with other uses; they must grow beyond the Lab rather than within it, and they are expected to benefit their inventors, Labs and networks that contributed to their success.

The original Charter in English is available at: <http://fab.cba.mit.edu/about/Charter>.

**Box 1.1.** *The Fab Labs Charter (source: Rennes Fab Lab)*

**1.1.2. Definition of a Fab Lab**

The global nature of Fab Labs complicates the standardization of the concept. However, a plethora of definitions can be found on the website <http://fablabs.tumblr.com/>, classified according to several points of view:

*The Fab Lab is a place to do things (perhaps within the meaning of doing things for oneself, either physically or not):*

– According to Frosti Gislason, from Iceland, it is a place where you can make almost anything.

– Lindi, from Pretoria, defines it as a place where everyone can write their own stories.

– Abubakar Adam, from Ghana, believes that it is a community for doing things.

– Alan Alborough, from Cape, considers that a Fab Lab is an environment for designing and developing information technology (IT) and other technologies.

*The Fab Lab is a way to implement ideas:*

– According to Dhananjay Gadre, from New Delhi, it is a collection of rapid prototyping tools allowing people to concretize ideas, to make prototypes and ultimately to produce.

– For Steven, from South Africa, it is a place where ideas become realities.

*A Fab Lab is synonymous with sharing knowledge, resources and skills:*

– For Haakon Karlsen Jr, from Norway, it is a global network of people willing to cooperate and share knowledge.

– For Kipp Bradford, from Providence, it is a community of resources.

– Sherry Lassiter, from MIT, defines it as a digital cauldron.

– For Maxim Lobovsky, from MIT, it is a community workshop.

– Kenny Cheung, from MIT, considers that it represents “open source” resources.

*The Fab Lab is an educational tool:*

– According to Klaas Hermans, from Amsterdam, it is a way to stimulate curiosity.

– For Nadia Peek, from MIT, it is a technological “empowerment” (accountability, empowerment, skill acquisition) to achieve what we want.

– Israr-u-din Talwar, from Jalalabad (Afghanistan), thinks it was a way to increase knowledge of the Internet.



– According to Ilam Moyen, from MIT, it is a way to arouse people’s curiosity about things.

– For Alex Schaub, from Amsterdam, it is a new way to learn, because everyone likes to do things.

*The Fab Lab allows problems to be solved locally:*

– For Skhumbuzo Ndlovu, from Soshanguve (South Africa), it is a place where you can use available equipment to solve local problems.

– Thomas Diez, from Barcelona, considers it to be a way to find solutions to problems, thanks to machines and computers.

In other words, and according to the definition provided by Wikipedia, a Fab Lab is a contraction of “FABrication” and “LABoratory”<sup>1</sup> and refers to any type of workshop consisting of computer-controlled machine tools (by means of NTIC) that can manufacture various kinds of goods rapidly and on-demand. In summary, it is a place equipped with a number of low-cost tools covering all the aspects of the technological development process: design, manufacturing, testing and debugging, monitoring and analysis, and documentation. “In order to carry out these tasks, this space offers: computers, 3D printers, vinyl cutting, CNC, laser cutting and 3D scanning” [MIK 02]. We will discuss this aspect in depth in section 1.3.

In a Fab Lab, one can experience, learn or manufacture any type of object desired by the users. Indeed, community members without an initial idea may discuss, design, test and manufacture a desired object or solution with the Fab Lab Manager and the other members, based on the two dimensions that coexist in this place, namely DIY

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1 Or “Fabulous Fabrication” as Sherry Lassiter calls it.