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FABRICATION LABORATORIES: WHERE NEW DIGITAL TECHNOLOGIES COME TO LIFE

Laura Bravi[1], Gilberto Santos[2(*)], Federica Murmura[1]

[1]Department of Economics, Society, Politics; University of Urbino Carlo Bo, Via Saffi 42, 61029 Urbino, Italy
[2]College of Design, Campos do IPCA, Rua do Aldão, 4750-810, Barcelos, Portugal
[(*)]*Email:* gsantos@ipca.pt

ABSTRACT

This work analyses the main international realities of Fabrication Laboratories, an international network of digital laboratories which provide a space with new technologies tools for digital manufacturing that can be used from individual users, small businesses and schools. The aim is to understand similarities and differences of skills, technologies used and customers served among the main European realities (Italy, France, Germany, Holand and Spain) and the American ones. The results show that each reality has some aspects that differ it from the others and among those considered, American Fab Labs are the largest and most developed ones.

Keywords: fabrication laboratories, industry 4.0, digital technologies, additive manufacturing.

INTRODUCTION

The meaning of the word "manufacture" is historically linked to that of "craftsman"; shops and large manufacturing industries often have a common past made up of creativity, inspiration, dedication and manual work. With the gradual adoption of Digital Manufacturing's own technologies, there is a gradual process of convergence and approach between the model of creation, design and handicraft production, and the manufacturing model on a large scale (Pricewaterhouse and Confartigianato Imprese Varese, 2015).

In this context lies the definition of Maker Movement which consists of a growing culture of hands-on making, creating, designing, and innovating (Dougherty, 2012). A hallmark of the maker movement is Do-It-Yourself (DIY) mindset that brings together individuals around a range of activities, including textile craft, robotics, cooking, woodcrafts, electronics, digital fabrication, mechanical repair, or creation, making nearly anything. Despite its diversity, the movement is unified by a shared commitment to open exploration, intrinsic interest, and creative ideas. It's spreading through online maker communities, physical makerspaces and Fab Labs, and Maker Faires are popping up all over the world and continually increasing in size and participation (Dougherty, 2013; Peppler and Bender, 2013).

The aim of this paper is to analyze where DIY comes to life, investigating the reality of Fablabs, an international network of digital laboratories founded by *Massachussetts* Institute of Technology's professor Neil Gershenfeld. These laboratories work with the typical mechanisms of the sharing economy: they provide a space with tools and equipment for digital manufacturing, making them available to individual users, small businesses and

schools. The investigation tries to understand who are the main customers, with which sector they operate more, which digital technologies they use most, what kind of services they deliver to customers and which are their main skills. Through the work it has been tried to identify the main differences and similarities among the European realities of Fab Labs, considering only the most important ones (Italy, France, Germany, Spain and England) and the American ones.

RESULTS AND CONCLUSIONS

The results from the survey conducted among Fab Labs, Table 1, show that the main technologies used in these laboratories are 3D printers and Laser cutters, followed by control cards, even if they seem to be less used in the American market.

Table 1 - Use of digital technologies in Fab Labs

	France 34,8% (16)		Germany 10,9% (5)		Holland 6,5% (3)		Spain 17,4% (8)		USA 30,4% (14)		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	Sig.
3D printer	4,19	0,655	4,60	0,548	4,67	0,577	4,38	0,916	4,29	1,069	0,379	0,823
3D scanner	2,13	0,957	2,40	1,342	2,33	0,577	2,25	1,282	2,50	1,557	0,178	0,948
Laser cutter	4,25	1,000	3,80	1,643	5,00	0,000	3,25a	1,982	4,64b	0,633	2,229	0,083
CNC milling machines	2,81	1,109	3,40	0,894	2,00	1,000	3,25	1,389	3,43	1,505	1,091	0,374
Vinyl cutter	2,31a	1,196	2,40	1,673	2,33	1,155	2,88	1,642	3,93b	1,269	3,077	0,026
Lathe	1,88	1,088	2,40	1,140	1,33	0,577	1,63	1,408	1,57	1,284	0,600	0,665
Control Cards (Arduino or similar)	3,75	0,931	3,80	1,414	3,00	1,732	3,50	1,414	2,79	1,369	1,459	0,232
Precision punches for printed circuits	1,88	0,885	2,40	0,894	1,33	0,577	2,25	1,488	1,71	1,437	0,650	0,630

This study shows that American Fab Labs are bigger in dimension and economic power compared to the European ones, even if some European realities are reaching good results in terms of economic importance in their reference market.

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