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THE DIGITAL MANUFACTURING REVOLUTION

DOCUMENT: The Digital Manufacturing Revolution; **VERSION:** 1.0; **DATE:** 09/07/2015; **AUTHOR:** Massimo Zanardini; **STATUS:** final; **CIRCULATION:** Public

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NEW COMPETITIVE FORCES

VOLUME

The global manufacturing demand is more fragmented on a growing range

FRAGMENTATION

UNIQUENESS

Customers require a personalized products rather than standard ones

CUSTOMIZATION

SERVICE

Customers require a solution instead of only a physical products

SERVITIZATION

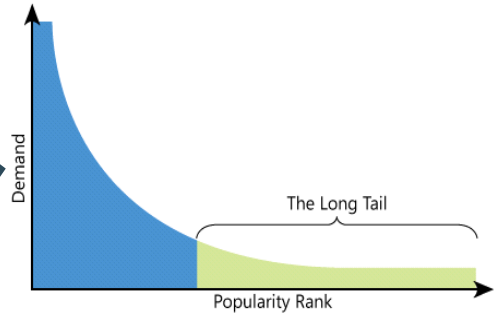
MANUFACTURING PARADIGMS ARE EVOLVING

Mass Production

- Physical product
- Plant saturation
- Large series production
- Standard product

Mass Customization

- Solution
- Flexibility
- Small series production
- Customized product



Chris Anderson, "*The Long Tail: Why the Future of Business is Selling Less of More*", 2006

*The factory of the past was based on cranking out zillions of **identical products**. The factory of the future will focus on **mass customization**.*

The Economist, 2012

DIGITAL TECHNOLOGIES ARE NOW AVAILABLE…

Additive Manufacturing

it refers to the possibility to manufacture products layer by layer thought an additive process, in opposition to the traditional subtractive manufacturing processes

GE Aviation

Internet of things

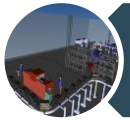
Pervasive presence around us of a variety of things or objects, such as (RFID) tags, sensors, actuators, mobile phones, etc., which, through unique addressing schemes, are able to interact with each other and cooperate

Rolls Royce CAT

Augmented reality

Novel human–computer interaction tool that overlays computer-generated information, providing digital data in order to support the human operations in a real context

Boeing



Virtual reality

Computer interface that strives to immerse the user completely within an experimental simulation

Balfour Beatty Rail

Artificial intelligence (expert systems and advanced robotics)

Technology and to a branch of computer science that studies and develops intelligent machines and software, able to reproduce human behaviour and support critical decisions

Google car

Nanotechnologies and advanced materials

Manipulation of matter on an atomic and molecular scale, in order to obtain materials with higher characteristics and features

Aston Martin

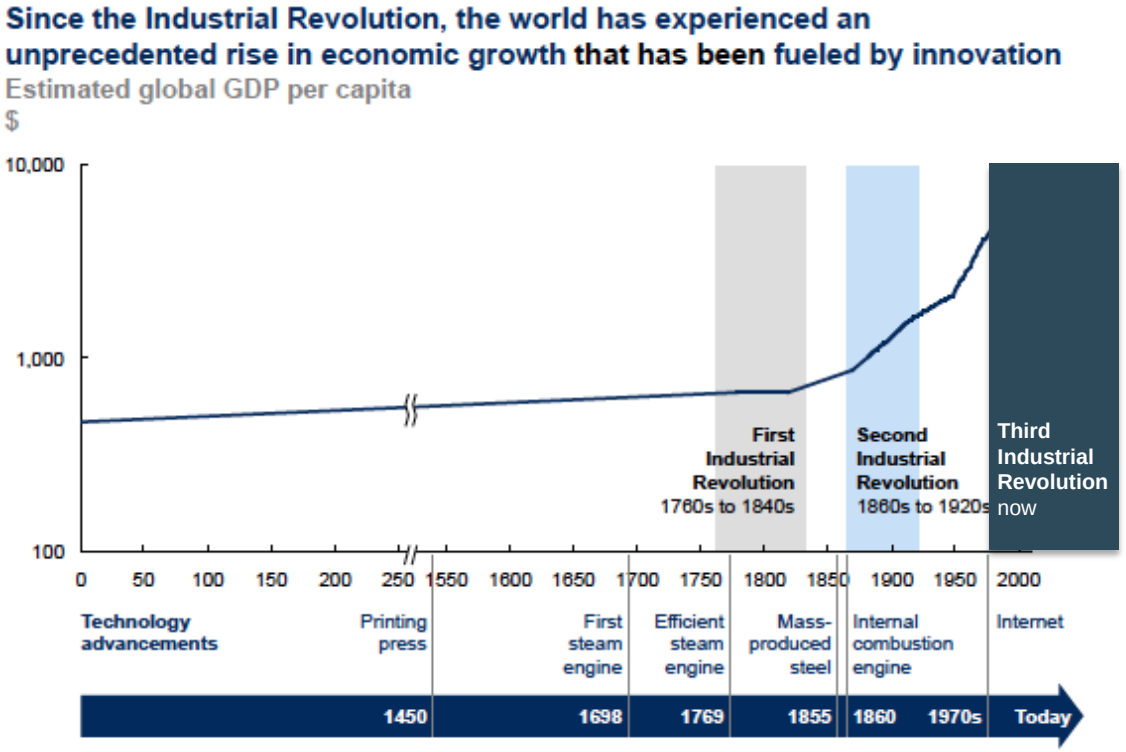
Social Manufacturing / Cloud Manufacturing

It refers to the possibility to exploit a widespread set of design, developing and production assets and skills for manufacturing products, collaborating with customers and suppliers instead of owned assets localized into specific production plants.

Starbucks

…AND A NEW REVOLUTION IS HAPPENING

- The First Industrial Revolution happened with the introduction of machines that substitute the man work (UK, XVIII century)
- The Second Industrial revolution manifested with the development of the mass production paradigm (USA, XX century)
- Now a **Third Industrial revolution is on going**, concerning a **digitization of manufacturing processes**



Angus Maddison, "*Statistics on world population*", 2008

Rapidity | Cross sectorial | Democratic | Flexibility | Sustainable

WHY THIS RESEARCH?

"A new digital revolution is coming, this time in fabrication."
Neil Gershenfeld

CLUES OF A REVOLUTION

Different authors claim that industrial sector are involved in third revolution

"

A growing number of industrial applications of digital technology are present

"…now what is being programmed is the physical world rather than the virtual one..."
Neil Gershenfeld

LACK OF SPECIFIC EVIDENCES

- Literature is poor of evidences
- Few papers deal with this topic
- Most of them analyze only the technological aspect
- There is no empirical relations about type of technology and innovation generated

"As manufacturing goes digital is out of all recognition..."
Paul Markillie

PARTNERSHIP

MAIN PARTNER

SIEMENS

TECHNOLOGY PARTNERS

ADDITIVE MANUFACTURING

3D SYSTEMS

AUGMENTED REALITY

AR-media™ AUGMENTED REALITY MEDIA

ARTIFICIAL INTELLIGENCE

AIA 25°

NANOTECH

moma nanotech

VIRTUAL REALITY

CENTRO SVILUPPO REALTA' VIRTUALE

MEDIA PARTNER

TECHNOPOLIS

IT IS INFORMATION TECHNOLOGY INTELLIGENT SOFTWARE

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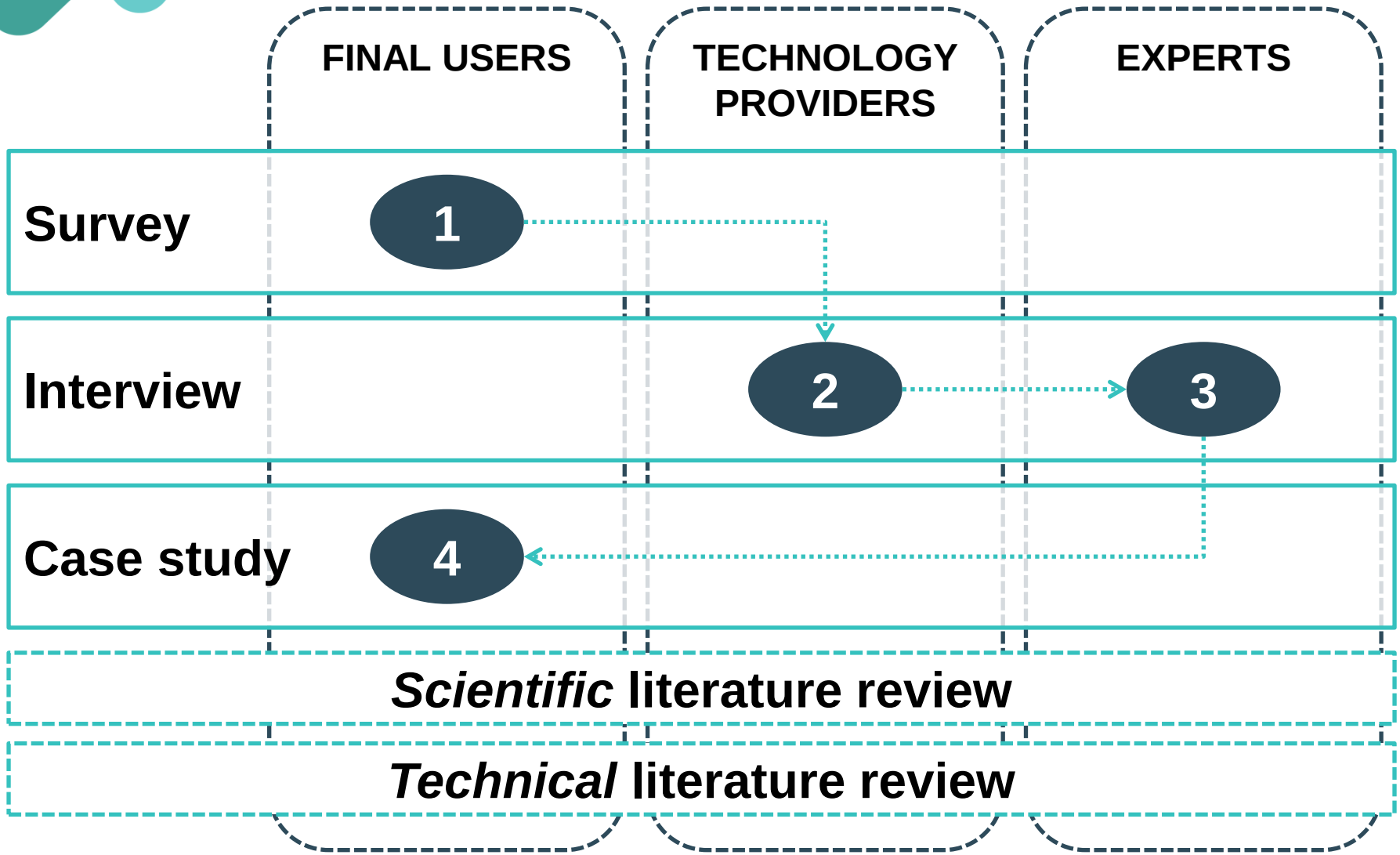
RESEARCH PROTOCOL



RESEARCH TIMELINE

Years	2014	2015
1. Final users survey		
2. Provider interviews		
3. Expert interviews		
4. Case studies		
Dissemination		
Dissemination events		

1. FINAL USERS SURVEY
Completed phase

Research questions

1. Which of these technologies are known by manufacturing companies?

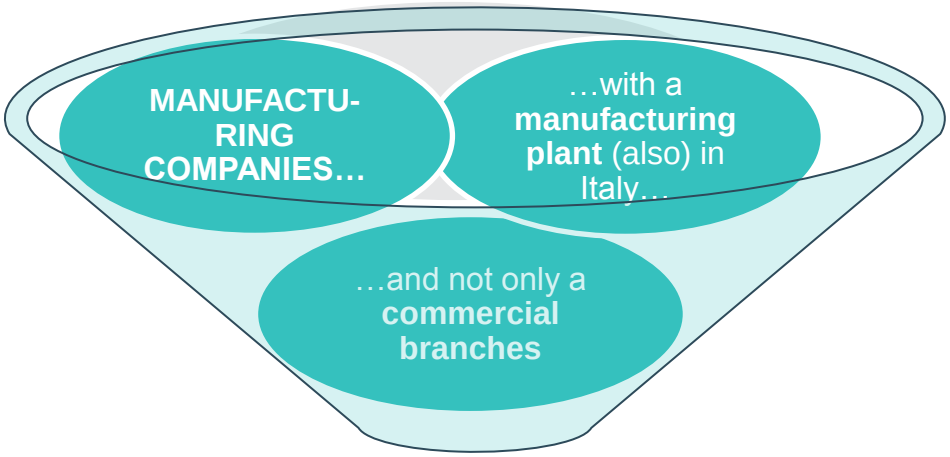
2. How many companies are considering them, and how?

3. Which are the main benefits enabled by these technologies?

4. Which are the main inhibitor elements?

5. Is this revolution really democratic and cross sectoral?

Target



Final sample:
70 COMPANIES

2. PROVIDER INTERVIEWS
On-going phase

Research questions

1. Which is the market composition? Which are the target sectors and industries? (customer segments)

2. How is composed the offer provided ? Which products and services are provided? What are the main customers' requirements fulfilled? (value proposition)

3. Which channels are exploited by the providers? How do they communicate with the customers and deliver the value proposition? (channels)

4. Which are the main activities, assets, resources, that make the business model operative? (key resources)

5. Which are the revenue streams adopted? How do providers earn from their customers? (revenue streams)

Logical path

Provider selection

- Identification of the main companies that provide the considered technologies

Interviews

- Development of an online questionnaire
- Direct interviews to a short list of providers

Analysis

- Analytical analysis of the collected data
- Understanding of the main business models features

3. EXPERT INTERVIEW
Scheduled phase

	EXPERT CATEGORIES					
EXPERT SUPPORT	Users	Provider	Academic	Consultancy	Media	PA
TECHNICAL *(for each technology)*	X	X	X			
OPERATIONS	X		X	X		
INDUSTRIAL ECONOMY			X	X	X	X
SOCIAL IMPACT			X		X	X

4. CASE STUDIES
Scheduled phase

1 Guidelines

2 Data collection

3 Analysis

AS-IS map

- **Company context** (sector, dimension, products portfolio)
- **Exogenous elements** (volume, products range, production paradigm, …)
- **Endogenous elements**(company organizational structure, processes formalization, …)

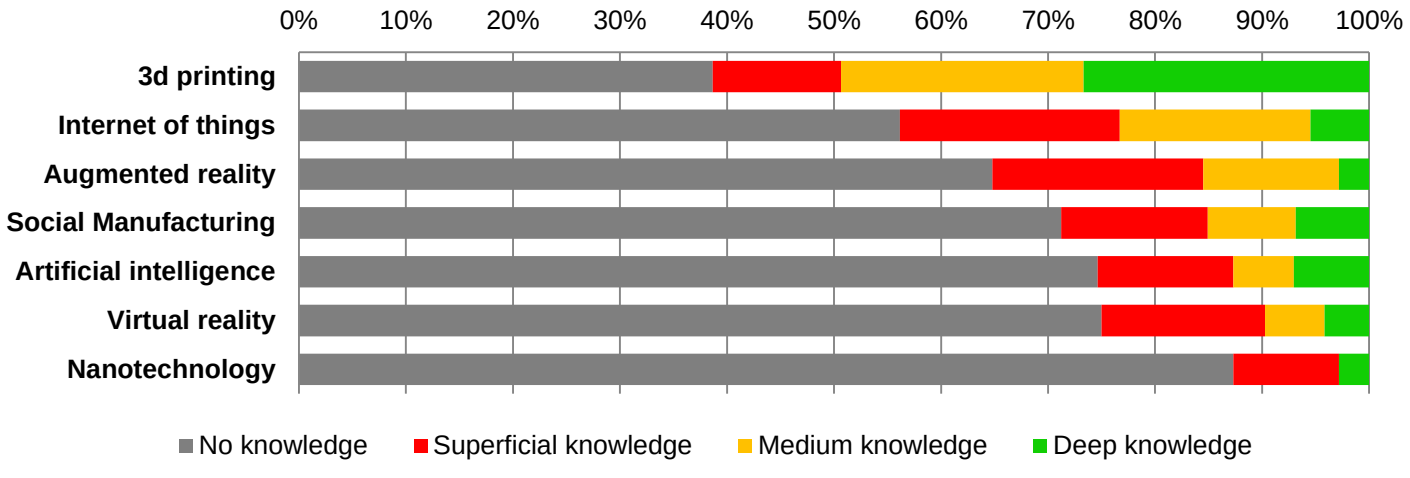
Motivation

- **Competitive forces** (opportunities *vs* threats): customization, servitization, …
- **Criticalities & company's objectives**

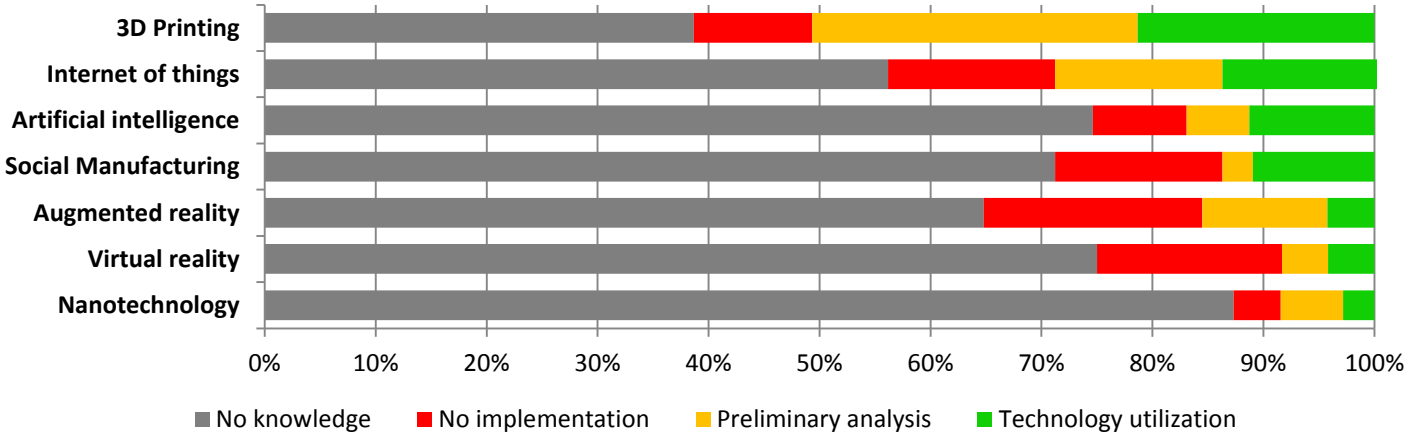
Technology application

- **Technologies applied (field of applications)**
- **Company's functions and processes involved**
- **Benefits and economic results**

FOCUS ON 3D PRINTING



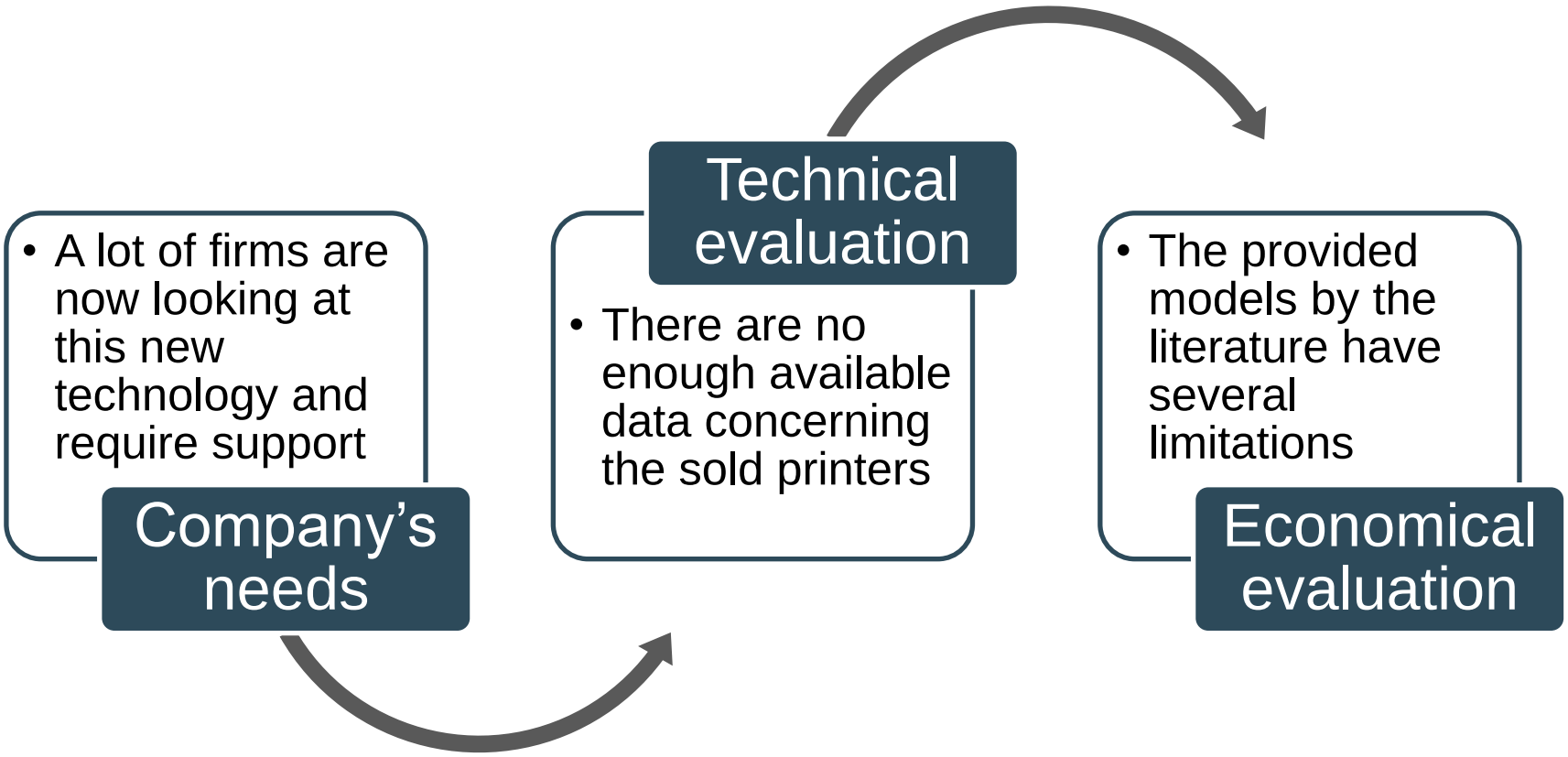
3D Printing is the **best known** of the analysed technologies among the sample companies.



3D Printing is also the **most diffused** of the scrutinized technologies among the sample companies.

REASON WHY

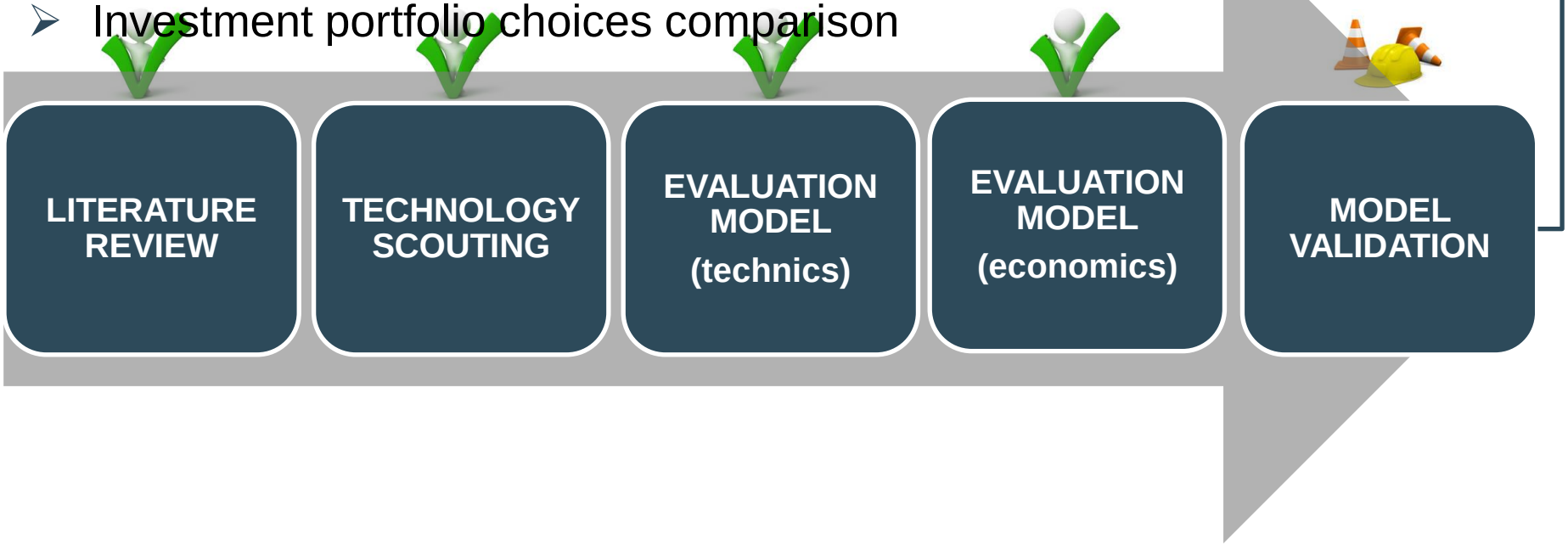
Taking into account the main results of the survey, we decided to develop a branch of the research focusing only on 3D Printing



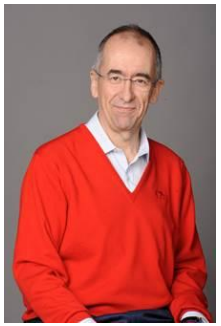
OBJ & METHODOLOGY

- Feasibility study
- Evaluation of the economic benefits
- Investment portfolio choices comparison

Some more case studies are required for a complete validation



CONTACTS



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