DIGIT-FUR

IMPACTS OF THE DIGITAL TRANSFORMATION IN THE WOOD FURNITURE INDUSTRY

DIGIT-FUR Forecasting Survey: Survey and Results Summary

- 05/04/2018 -

LEAD PARTNER:

cenfim
Home & Contract Furnishings

Furnishing Cluster and Innovation Hub

ASSOCIATED ORGANIZATIONS:

European Federation of Building and Woodworkers

European Federation of Building and Woodworkers

UEA

European Furniture Manufacturers Federation

EFIC
European Furniture Industries Confederation

European Furniture Manufacturers Federation

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1. Introduction

1.1 Introduction to the DIGIT-FUR project and survey

The **DIGIT-FUR** project http://www.digit-fur.eu (Impacts of the digital transformation in the wood furniture industry) will focus on the changes caused by the **Industrial Digitization** on the **European wood furniture sector in 2025**. It is a two years project (2017-2019) funded by EU trough the call Support for Social Dialogue. The project main deliveries will provide a better understanding of the possible **scenario of the sector due to digitization in 2025** and the effect of this process on sector **jobs** in terms of changes in occupations, **health and safety risks** at work and new **skills** needed and thus support the social dialogue during next years.

The **partners** of the DIGIT-FUR project are: **CENFIM** - Furnishings Cluster and Innovation Hub (Lead Partner); **EFBWW** - European Federation of Building and Woodworkers; **UEA** - European Furniture Manufacturers Federation and **EFIC** - European Furniture Industries Confederation.

This **DIGIT-FUR forecasting survey** was the first step of the **DIGIT-FUR Forecasting Research** and it is a key part of the DIGIT-FUR project. The **survey results** provide a **ranked list of factors** that will affect the wood furniture sector in 2025, considering their probability of happening (success) and the relevance of their impact on the sector. In details, the **survey objectives** were:

- Identify **which factors / situations / impacts are more probable to happen in 2025** (which list was pre-identified by a previous industrial study, later on presented).
- Identify which of the **factors and situations will have a more important impact** on the wood furniture sector**.**
- Create a **draft list of key drivers of change and factors** that are supposed to be the most relevant for the wood furniture sector.

This survey has **involved more than 50 professionals**, experts in different fields: furniture sector, industrial digitization, Occupational Health & Safety, VET systems and Economy. The survey was the first step of the DIGIT-FUR Forecasting Research that was followed by the project Workshop in Brussels on the 25th of October 2017. The Survey has taken place between the end of August and the end of September and it has required to the experts a working commitment of some hours. Experts were provided with a new specific report on the status of the EU furniture sector, which supported them to better understand the current situation. The report was specifically prepared by the DIGIT-FUR team with the support of some external experts.

Survey results were **discussed** in Brussels on the 25th of October 2017 **at the DIGIT-FUR Project Workshop**, the second step of this forecasting research that has involved around twenty experts and professionals from different European countries, specialized in different fields such as the Furniture Sector, Digitization, VET systems, Occupation H&S and Economy.

The design of the Survey was prepared with main contributions from:

Mr. Joaquim Solana	- CENFIM
Mr. Julio Rodrigo	- CENFIM
Mr. Massimiliano Rumignani	- CENFIM
Mr. Hildebrand Salvat	- CERES

1.2 Structure of the questionnaire and questions description

The DIGIT-FUR project team identified an **existing study** focusing on forecasting the European industrial sector in 2025 and its key drivers of change. This **foresight study** was published by the Joint Research Centre in 2014, with the title "**How will standards facilitate new production systems in the context of EU innovation and competitiveness in 2025?**" (**Authors**: Fabiana Scapolo, Peter Churchill, Vincent Viaud, Monika Antal, Hugo Córdova, Peter De Smedt).

The team decided to adopt this research results as basis for the implementation of its forecasting research. Indeed, the questionnaire implemented by the DIGIT-FUR project is based on a selection of the factors / situations / impacts already identified by the JRC foresight study. They were selected according to the potential impact they could have on the wood furniture sector.

Five different surveys were prepared, one for each expertise category. The questionnaires were organized in different sections (7 in total) and subsections (26) depending on these categories and each subsection contained the description of a set of factors / situations / impacts. The experts were required to answer to different questions according to their field of expertise. The on-line web service Survey Monkey was used to prepare and implement the Survey.

The 7 sections were: 1.- Business Environment, 2.- Infrastructure, 3.- Materials, 4.- Knowledge Management, 5.- Services, 6.- Technologies and Production Processes, 7.- Overall opinions.

For each factor / situation / impact the approach was the same, respondents were required, with two closed questions, to rank their probability to happen and their impact on the sector. Then a third open question required allowed open comments. In details:

- The concept: A future potential situation, based on the results of the JRC foresight research, is exposed in a summarized way.
- 1st Question: a question about the probability that a specific event / situation / impact will occur, using a probability scale:

How probable do you consider this is going to happen? (scenario 2025 in the furniture sector in Europe)

Where the scale goes from "0 - Not at All probable" to "100 - Completely probable"

- 2nd question: importance of the impact on the furniture sector if the success will occur, using a numeric scale from "not at all" to "extremely strong"

How strong do you consider the impact of this on the furniture sector production in 2025?

Where the scale goes from "0 - Not at All" to "10 - Extremely strong"

- 3rd question: open question for comments:

If you consider it relevant, please, explain shortly the reasons (max. 500 characters with spaces)

Finally, the survey asked to the respondents:

- How they considered the EU furniture sector would evolve in relation to competitiveness and economical sustainability for 2025.
- To look at the survey subsections list and rank the first three subsections for relevance of their impact within the Furniture Sector and its Occupations (jobs) in the 2025 Scenario.

1.3 Complete list of sections, subsections and survey questions

1 - Business Environment
1.1 - Global Integration
1.1.1 New Global Markets
1.1.2 Global Production System
1.1.3 Distributed Production Near To Consumption
1.1.4 Production Near To Skills and Talents
1.1.5 Production Near To Raw Materials
1.2 - Value Chain Optimisation
1.2.1 Complex Value Chain
1.2.2 Vertical Integration
1.2.3 Niche Industries
1.2.4 Value Chain Ecosystems
1.2.5 Virtual Enterprise Environments
1.3 - Dynamic and Sustainable Business Models
1.3.1 Dynamic and Agile Business Models
1.3.2 'Circular Economy' Business Models
1.3.3 New Business Models for Integrated Prod. & Serv.
1.3.4 Ethical Business Practices
1.3.5 'Craftsmanship' Approach
1.4 - New Innovation Schemes
1.4.1 Open Innovation
1.4.2 Consumer Innovation
1.4.3 Service Innovation
1.4.4 Frugal Innovation
1.4.5 Integrated Innovation
1.4.6 Eco-innovation
1.5 - New Business Partners
1.5.1 Strategic and Loose Alliances
1.5.2 Corporate Social Responsibility
1.5.3 Collaborative Regulatory Science
1.6 - Skills and Talents
1.6.1 Competition for Skills and Talent
1.6.2 Effective Use of Talent
1.6.3 Developing Talents
1.6.4 New Human Management Models
1.6.5 Technological Human Enhancement
1.7 - Customer Involvement
1.7.1 Social Manufacturing
1.7.2 Mass Customisation
1.7.3 Personalisation
1.7.4 Customer-Oriented Design
1.7.5 Collaborative Consumption

2 - Infrastructure
2.1 - Smart and Interoperable Physical Infrastructure
2.1.1 Upgraded, Integrated Infrastructure Networks
2.1.2 On-Site Energy Generation
2.1.3 Intelligent & Intermodal Transport Infrastructure
2.2 - ICT Infrastructure
2.2.1 Upgraded ICT Networks
2.2.2 Secure and Resilient ICT Infrastructure
2.3 - Knowledge Infrastructure
2.3.1 Knowledge-Based Environment
2.3.2 Collaborative Knowledge Networks
2.3.3 Sustainable Knowledge Infrastructure
2.4 - Financial Infrastructure
2.4.1 Efficient Financial Infrastructure
2.4.2 Innovative Systems of Payment
2.4.3 Digital Security in Financial Infrastructure
2.4.4 New Providers of Financial Services
2.4.5 International Payments

3 - Materials
3.1 - Materials and Reusable Parts for Sustainability
3.1.1 Secure Material Supply
3.1.2 Circulation of Materials and Parts
3.1.3 Replacement Materials
3.2 - Advanced Materials for Performance
3.2.1 Material Science
3.2.2 Smart Materials
3.2.3 Nanomaterials

4 - Knowledge Management
4.1 - Data Capture
4.1.1 Big Data and the Internet of Things
4.1.2 Data Visualisation
4.1.3 Data Storage
4.1.4 Data Process for Knowledge Acquisition
4.1.5 Cybersecurity
4.2 - Knowledge Generation
4.2.1 Knowledge Management
4.2.2 Knowledge Sharing / Harvesting
4.2.3 Standards
4.3 - Intellectual Property Management
4.3.1 Collaborative IP Management
4.3.2 IP Trade Market

5 - Services
5.1 - Services for Customers
5.1.1 Integrated Products and Services
5.1.2 Service as a Key Source of Profit
5.1.3 Service-Oriented Design
5.1.4 Experience Economy
5.1.5 Servitization
5.2 - Services for Production
5.2.1 Enhancement of Traditional Services
5.2.2 Virtual Service Management
5.3 - Services for Business
5.3.1 Enhancement of Traditional Services
5.3.2 Eco-Industry Services

6 - Technologies and Production Processes
6.1 - Resource-Efficient & Clean Production Processes
6.1.1 Sustainable Manufacturing
6.1.2 Disassembly, De-Manufacturing and Recovery
6.1.3 Waste Minimisation
6.1.4 Smart and Agile Maintenance Approaches
6.1.5 Traceability
6.1.6 Circular Economy
6.2 - Flexible, Smart & Customer-oriented Technologies

6.2.1 Advanced Robotics
6.2.2 Additive Manufacturing
6.2.3 Technological Adaptation
6.2.4 Agile Manufacturing
6.2.5 Personalised Production Lines
6.2.6 Zero Defect Manufacturing
6.3 - Human-Centered Factories
6.3.1 Socially Responsible Manufacturing
6.3.2 Human-Robot Symbiosis
6.3.3 Enhanced Human Performance
6.3.4 Safe Workplace
6.3.5 Inclusive Workplace
6.3.6 Attractive Workplace
6.3.7 Factory as a Good Neighbour
6.3.8 Community Production Sites
6.3.9 Demanding Workplace
6.4 - Digital Factories
6.4.1 Digital Modelisation, Simulation & Visualisation
6.4.2 Digital Engineering Tools
6.4.3 Factory Life Cycle Management
6.4.4 Factory Data Management
6.5 - Logistics and Supply Chain
6.5.1 Smart Logistic Tools
6.5.2 Asset Management
6.6 - Holistic Design
6.6.1 Design for User Well-Being
6.6.2 Smart Products Design
6.6.3 Design for Sustainability
6.6.4 Full Eco-Design Integration
6.6.5 Cradle-to-Cradle Design
6.6.6 Design for Performance
6.6.7 Safety and Security by Design
6.6.8 UX Design (User Experience Design)

7 - Overall opinions
7.1.1 Overall opinion on the Furniture Sector
7.1.2 Ranking of Subsections

1.4 Participants selection and description

The respondents' sample of this prospective survey is made up of experts in different fields related with the goals of the research. The fields are: Furniture Sector, Industrial Digitization, Health & Safety at Work, VET Systems and Economy.

The total number of experts that have answered to all survey questions is 57. The distributions of expertise among the respondents was:

Digitization:	10
Economy:	8
Furniture sector:	19
Occupational Health & Safety	10
VET Systems	10

Twelve of these experts were women and the other 45 men.

The respondents came from 15 different countries across the EU:
Belgium, Czech Republic, Denmark, France, Germany, Greece, Hungary, Italy, the Nederland, Portugal, Romania, Slovenia, Spain, Sweden and United Kingdom.

The complete list of participants is the following:

Person	Company
Mr. Thomas Skjødeberg Toftegaard	Aarhus University
Mr. Andrea Meneghel	Assarredo-FederlegnoArredo
Mr. Rüdiger Granz	Beratungsstelle Arbeit & Gesundheit, Hamburg
Mr. Christian Felten	Berufsgenossenschaft für Verkehr
Mrs. Araceli Cabello	CEMER
Mr. Toni Zaragoza	CENFIM
Mrs. Stefania Borghetti	Centro Studi FederlegnoArredo
Mr. Nicolas Sangalli	Centro Studi FederlegnoArredo
Mr. Albano Vasconcelos Rodrigues	CFPIMM

Person	Company
Mr. Francesco Balducci	Cosmob S.p.A.
Mr. Rolf Gehring	EFBWW
Mrs. Tracey Barron	Eureka Flooring, S.L.
Mrs. Marie-Amélie Buffet	EUROGIP
Mrs. Dolores Romano Mozo	European Environmental Bureau
Mr. Paolo Fantoni	Fantoni spa
Mrs. Valerie Gourves	FCBA
Mrs. Margherita Miceli	FederlegnoArredo
Mr. Giovanni Albetti	FederlegnoArredo
Mrs. Chiara Terraneo	FederlegnoArredo
Mr. Marc Mengual	FERRETERIA MENGUAL S.L.
Mr. Denis Boglio	Fitaller Project, S.L.
Mr. Àlex Ros	Francesc Ros Fusteria Decoracio S.L.
Mr. Ramon Gabarró	GABARRÓ HERMANOS SA
Mr. Henrik Ørskov Pedersen	Grundfos Holding A/S
Mr. Kenneth Johansson	GSFACKET
Mr. Frans Veringa	HM College
Mr. Darko Zimbakov	HOMAG
Mr. Maximiliano Casas	HOMAG Machinery Barcelona
Mr. Xavier Pi	i4.0 Commission - Catalan Engineering Ass.
Mr. Javier Creus	IDEAS FOR CHANGE
Mrs. Alexandra Costa Artur	Imanovation,Lda
Mr. Raluca Stepa	INCDPM
Mr. Sasa Jevtic	Independent Expert / Business Consultant
Mr. Francisco J. Jariego	Indie Research
Mr. Uwe Kies	InnovaWood Secretariat
Mr. Michel Hery	INRS
Mr. Jordi Juvé Udina	Institut Escola Industrial de Sabadell
Mr. Jaume Cárceles	Institut Pere Martell
Mr. Mario Dobernowsky	Kooperationsstelle Hamburg IFE GmbH
Mrs. Ellen Schmitz-Felten	Kooperationsstelle Hamburg IFE GmbH
Mr. Arne Müller	Kooperationsstelle Hamburg IFE GmbH
Mr. Nazzareno Mengoni	Kubedesign
Mr. Xavier Rosales	LamiGraf
Mr. Nigel Edmondson	Manufacturing Academy of Denmark
Mrs. Sara Forné	MOBI CENIA S.L.
Mr. George-Christopher Vosniakos	National Technical University of Athens
Mrs. Nur America-Erol	Newness
Mr. Ferenc Kudász	OMFI
Mr. Claudio Dondi	Senior Expert in Education and Training
Mr. Juan Manuel Nuñez	Sueños Logística SL
Mr. Martin Løkke Nielsen	Terma A/S
Mr. Martin Pavlis	UEA
Mr. Tomas Lukes	UEA
Mr. Tamas Kiss	University of Westminster
Mr. Jeroen Doom	WOODWIZE
Mr. Chris De Roock	WOOD.BE
Mr. Emili Arasa	WorldWide Vision Business Solutions SL

2. Data collection and elaboration

After having collected all respondents' answers, we grouped them according to the different experts' categories and then we implemented the following actions:

a) We calculated for all 108 survey factors their:

I. Average
II. Standard deviation
III. Probability multiplied for the impact

b) We analysed if each expert answers had high deviation averages in relation to the overall average

c) We identified and ranked the factors with highest probability, highest impact and the highest value resulting from probability multiplied for impact.

d) We calculated the average value of the respondents answers about the forecast of the EU furniture sector evolution in relation to competitiveness and economical sustainability for 2025.

e) We ranked the survey subsections list that the respondents ranked as the most relevant for their impact within the Furniture Sector and its Occupations (jobs) for the 2025 Scenario.

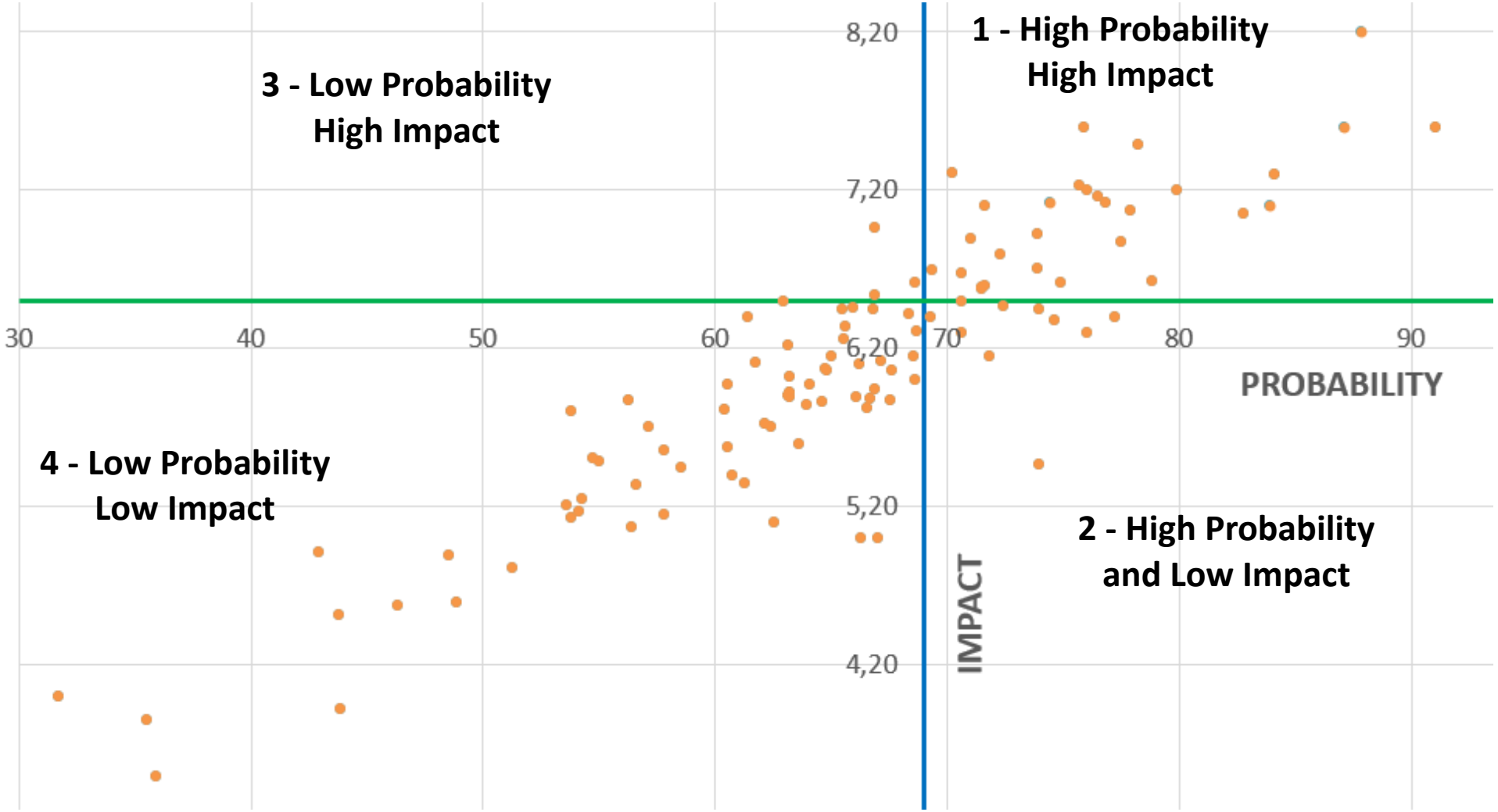
f) We have selected three groups of factors to be discussed at the DIGIT-FUR workshop. This selection was based on their average value of probability and impact and on their value of their standard deviation: In details:

I. 28 factors of the first quadrant: the ones with probability higher or equal than 70 and impact higher or equal than 6,5
II. 4 factors of the third quadrant: high impact (> 6,5) and lower probability (< 70)
III. 5 factors with medium-high impact and high standard deviation for impact values

During the workshop, held in Brussels on the 25th of October 2017, the participant experts discussed the possible reasons for their strong impact and tried to identify concrete actions to capitalise opportunities from each of these factor.

A first clear consideration about the collected data is that we found a high correlation between the value of impact and the value of probability for almost all the factors.

The following figure shows the positions of all the 108 factors that we analysed (note: see next sections for further details).
The horizontal X axis represents the Probability (Scale 0-100). The vertical Y axis represents the Impact (Scale 0-10)



3. Ranking of subsections relevance

In the section 7 of the survey, respondents gave us feedback about the relevance they considered the survey different subsections (group of factors) will have on the wood furniture sector in 2025.

This is the ranking based on the number of appearances:

rank.	SUB SECTIONS	SUBSECTION TITLE	N. of Appearances	N. 1st position	N. 2nd position	N. 3rd position
1	6.2	**6.2 - Flexible, Smart and Customer-Oriented Technologies**	**21**	5	7	9
2	6.4	**6.4 - Digital Factories**	**14**	3	3	8
3	6.1	**6.1 - Resource-Efficient and Clean Production Processes**	**13**	5	6	2
4	1.2	**1.2 - Value Chain Optimisation**	**12**	8	3	1
5	1.3	**1.3 - Dynamic and Sustainable Business Models**	**11**	5	4	2
6	1.6	**1.6 - Skills and Talents**	**9**	4	3	2
7	1.7	**1.7 - Customer Involvement**	**9**	5	3	1
8	5.1	**5.1 - Services for Customers**	**9**	5	3	1
9	6.3	**6.3 - Human-Centered Factories**	**9**	5	2	2
10	3.1	**3.1 - Materials and Reusable Parts for Sustainability**	**7**	1	3	3
11	3.2	**3.2 - Advanced Materials for Performance**	**7**	0	4	3
12	6.5	**6.5 - Logistics and Supply Chain**	**6**	1	4	1

This is the ranking based on the number of appearances over number of respondents to that subsection:

rank.	Num. Appearances / N. Respondents	SUB SECTIONS	SUBSECTION TITLE	N. of Appearances	N. 1st position	N. 2nd position	N. 3rd position
1	0,50	1.2	**1.2 - Value Chain Optimisation**	**12**	8	3	1
2	0,50	1.6	**1.6 - Skills and Talents**	**9**	4	3	2
3	0,48	6.2	**6.2 - Flexible, Smart and Customer-Oriented Technologies**	**21**	5	7	9
4	0,46	1.3	**1.3 - Dynamic and Sustainable Business Models**	**11**	5	4	2
5	0,32	6.4	**6.4 - Digital Factories**	**14**	3	3	8
6	0,30	6.1	**6.1 - Resource-Efficient and Clean Production Processes**	**13**	5	6	2
7	0,27	5.1	**5.1 - Services for Customers**	**9**	5	3	1
8	0,27	3.2	**3.2 - Advanced Materials for Performance**	**7**	0	4	3
9	0,22	4.1	**4.1 - Data Capture**	**2**	0	1	1
10	0,22	4.2	**4.2 - Knowledge Generation**	**2**	0	1	1
11	0,21	1.7	**1.7 - Customer Involvement**	**9**	5	3	1
12	0,20	6.3	**6.3 - Human-Centered Factories**	**9**	5	2	2

4. Overall opinion on the furniture sector evolution

The question asked was the following:

How do you consider the EU furniture sector will evolve in relation to competitiveness and economical sustainability for 2025 ?

This table show the average for all the experts and for each expertise category:

AVERAGE	TOT	6,2
AVERAGE	DIGITIZATION	6,1
AVERAGE	ECONOMY	6,6
AVERAGE	FURNITURE	6,4
AVERAGE	H&S	5,3
AVERAGE	VET	6,5

The scale in this question goes from 0 to 10.

5. The key drivers of change

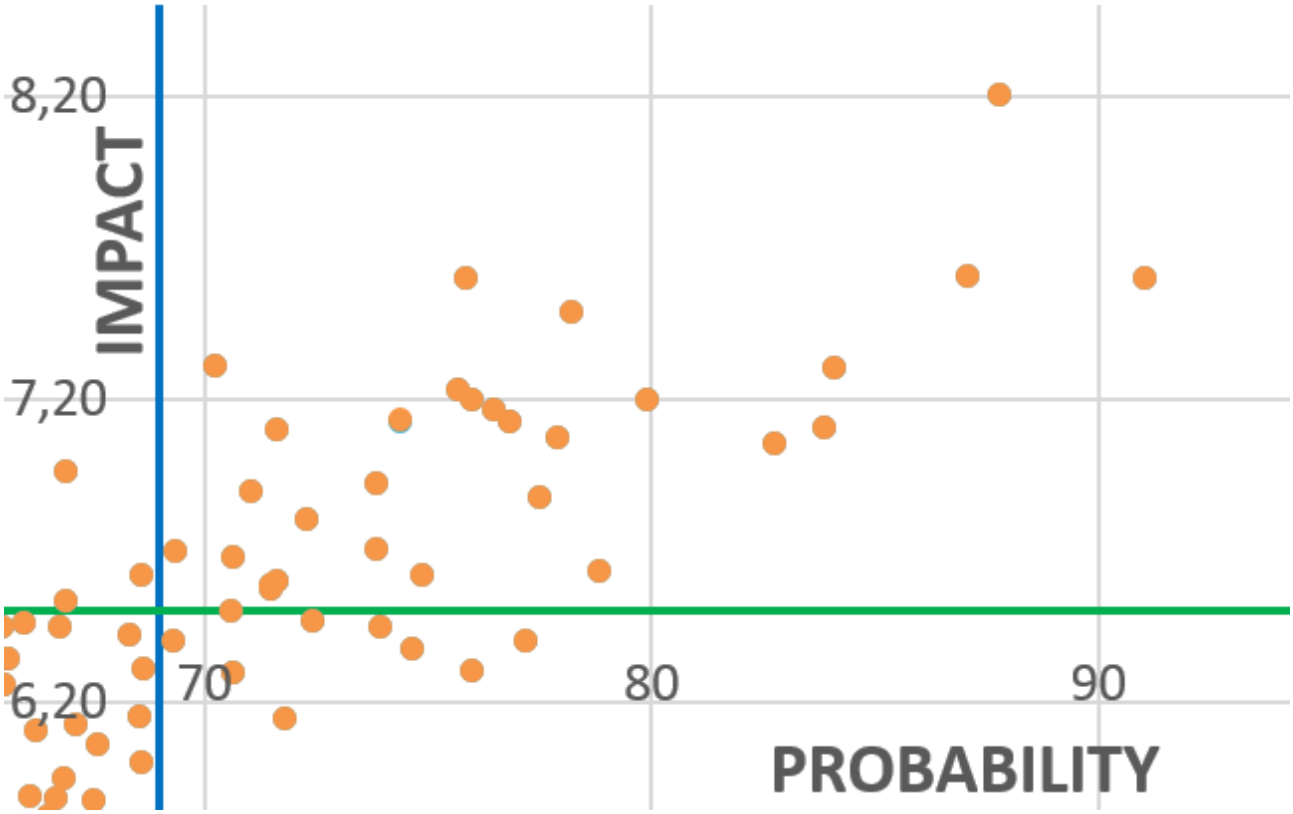
In this chapter, we enlist all those factors that the survey results identified as the ones that will have a stronger impact on the wood furniture sector in 2025, quadrant 1 and 3, and those factors having a medium high impact, but for which the results have shown an high standard deviation. We considered relevant to discuss this high standard deviation during the workshop in order to better understand the disagreement among the different experts and thus understand the real impact of these factors on the sector.

5.1 Factors in the 1st quadrant

In this first quadrant we find the factors with a HIGH PROBABILITY (≥ 70) and a HIGH IMPACT (≥ 6,5), where **28 factors** are positioned.

QUADRANTS	Ranking	ID	FACTORS	IMPORTANCE (PROB. x IMP.)	PROBABILITY (Mean Value)	PROBABILITY (Standard Deviation)	IMPACT (Mean Value)	IMPACT (Standard Deviation)
1	1	54	4.1.1 Big Data and the Internet of Things	719,96	88	15	8,20	0,92
1	2	39	2.2.2 Secure and Resilient ICT Infrastructure	691,60	91	11	7,60	2,37
1	3	55	4.1.2 Data Visualisation	661,96	87	14	7,60	2,17
1	4	57	4.1.4 Data Process for Knowledge Acquisition	613,93	84	19	7,30	2,21
1	5	38	2.2.1 Upgraded ICT Networks	595,69	84	15	7,10	2,47
1	6	33	1.7.4 Customer-Oriented Design	585,76	78	21	7,49	1,88
1	7	42	2.3.3 Sustainable Knowledge Infrastructure	583,39	83	13	7,05	2,01
1	8	25	1.6.1 Competition for Skills and Talent	576,46	76	20	7,60	1,93
1	9	35	2.1.1 Upgraded, Integrated Infrastructure Networks	575,28	80	13	7,20	1,81
1	10	32	1.7.3 Personalisation	550,99	78	16	7,07	2,18
1	11	31	1.7.2 Mass Customisation	548,05	76	18	7,17	2,04
1	12	80	6.2.1 Advanced Robotics	547,62	77	21	7,13	2,02
1	13	17	1.4.2 Consumer Innovation	547,20	76	13	7,20	1,62
1	14	99	6.5.1 Smart Logistic Tools	546,96	76	22	7,23	2,14
1	15	74	6.1.1 Sustainable Manufacturing	532,46	77	18	6,87	1,96
1	16	83	6.2.4 Agile Manufacturing	530,18	74	19	7,13	1,76
1	17	8	1.2.3 Niche Industries	522,51	79	19	6,63	2,31
1	18	10	1.2.5 Virtual Enterprise Environments	513,22	70	21	7,31	1,59
1	19	73	5.3.2 Eco-Industry Services	511,24	74	19	6,92	2,13
1	20	27	1.6.3 Developing Talents	508,36	72	20	7,10	2,18
1	21	81	6.2.2 Additive Manufacturing	495,43	75	21	6,62	2,04
1	22	6	1.2.1 Complex Value Chain	495,08	74	12	6,70	1,61
1	24	16	1.4.1 Open Innovation	491,64	72	13	6,80	1,48
1	25	30	1.7.1 Social Manufacturing	489,59	71	21	6,89	2,19
1	29	37	2.1.3 Intelligent and Intermodal Transport Infrastructure	472,56	72	28	6,60	2,76
1	30	49	3.1.2 Circulation of Materials and Parts	471,51	71	23	6,68	2,03
1	31	76	6.1.3 Waste Minimisation	470,57	71	21	6,58	2,05
1	32	84	6.2.5 Personalised Production Lines	470,00	71	20	6,57	2,17

1st quadrant graphic



FACTOR: 4.1.1 Big Data and the Internet of Things

FACT SHEET ID 54 // Working Group: DIGITIZATION

Factor:

4 - Knowledge Management

4.1 - Data Capture

4.1.1 Big Data and the Internet of Things

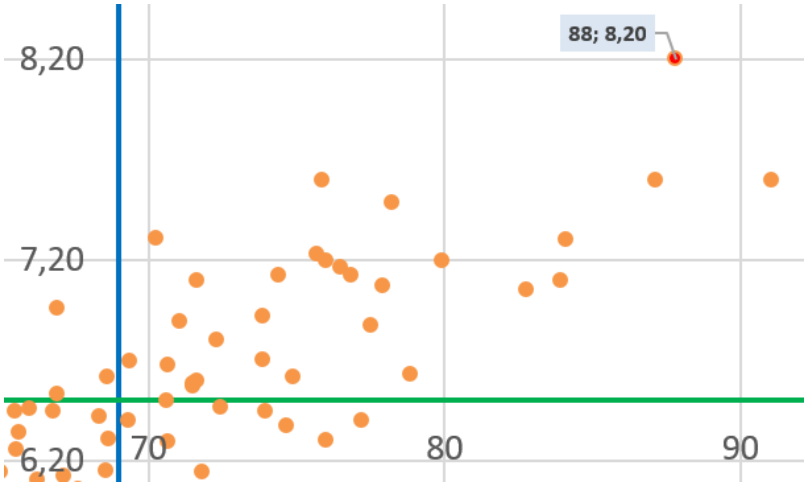
Firms will invest in powerful capture platforms (i.e. based on supercomputing technologies) that will collect and collate real-time data from a wide range of internal and external sources (customer feedback, product RFID tags, machinery, sensors, robots, etc.) and make it available, in a targeted manner, to all areas of the production chain.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **1st**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
88	15	8,20	0,92	719,96

FACTOR: 2.2.2 Secure and Resilient ICT Infrastructure

FACT SHEET ID 39 // Working Group: DIGITIZATION

Factor:

2 – Infrastructure

2.2 - ICT Infrastructure

2.2.2 Secure and Resilient ICT Infrastructure

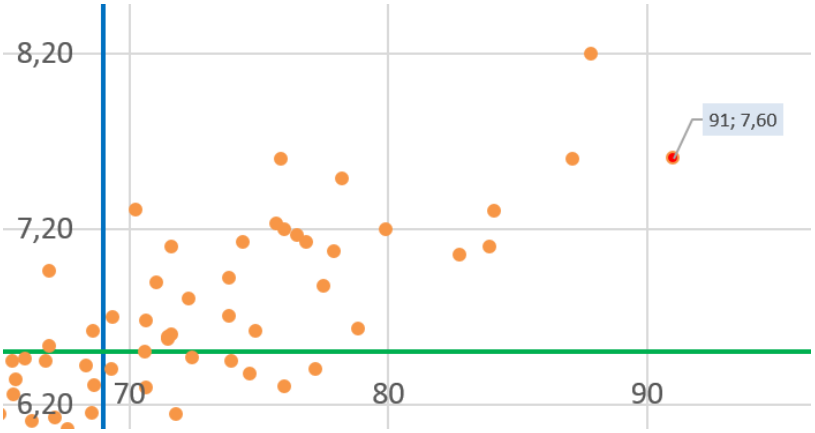
As ICT infrastructure becomes more and more critical for the manufacturing daily operations and the manufacturing network at large, firms will require more secure and resilient ICT infrastructure with a high level of data protection, a stable broadband and no service disruption.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **2nd**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
91	11	7,60	2,37	691,60

FACTOR: 4.1.2 Data Visualisation

FACT SHEET ID 55 // Working Group: DIGITIZATION

Factor:

4 - Knowledge Management

4.1 - Data Capture

4.1.2 Data Visualisation

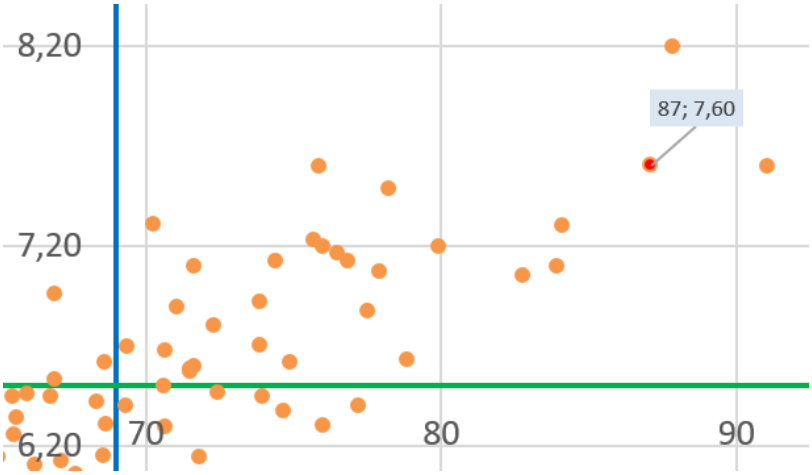
To better use and understand the large quantities of data that will be collected, firms will use a variety of visualisation tools. These tools will be developed to address all levels of expertise found in the value chain from the Big Data experts to the factory floor workers, including managers and executives. The data visualisation tools will be implemented to facilitate the constant improvement of companies' value chains as businesses continually strive to become more efficient, and to produce products required by an ever increasingly competitive global market.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **3rd**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
87	14	7,60	2,17	661,96

FACTOR: 4.1.4 Data Process for Knowledge Acquisition

FACT SHEET ID 57 // Working Group: DIGITIZATION

Factor:

4 - Knowledge Management

4.1 - Data Capture

4.1.4 Data Process for Knowledge Acquisition

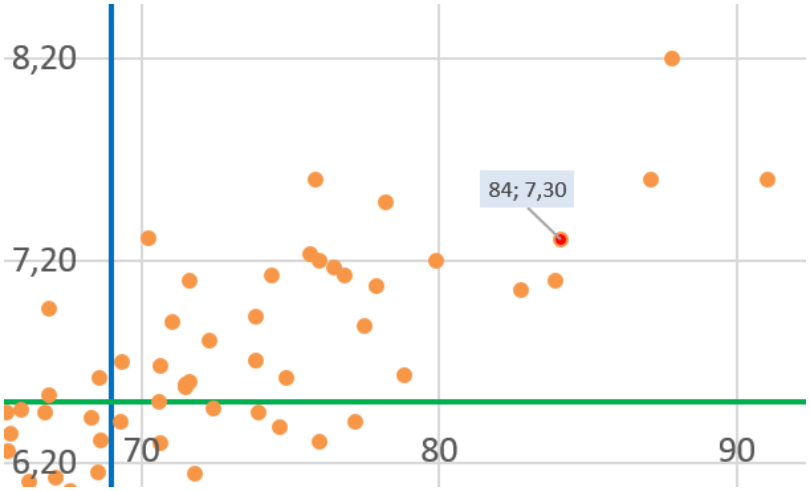
Investment will be made in developing analytical techniques to manage the "big data" collected, permitting manufacturing firms to better understand and optimize all stages of their value chains, and to better understand their markets.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **4th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
84	19	7,30	2,21	613,93

FACTOR: 2.2.1 Upgraded ICT Networks

FACT SHEET ID 38 // Working Group: DIGITIZATION

Factor:

2 – Infrastructure

2.2 - ICT Infrastructure

2.2.1 Upgraded ICT Networks

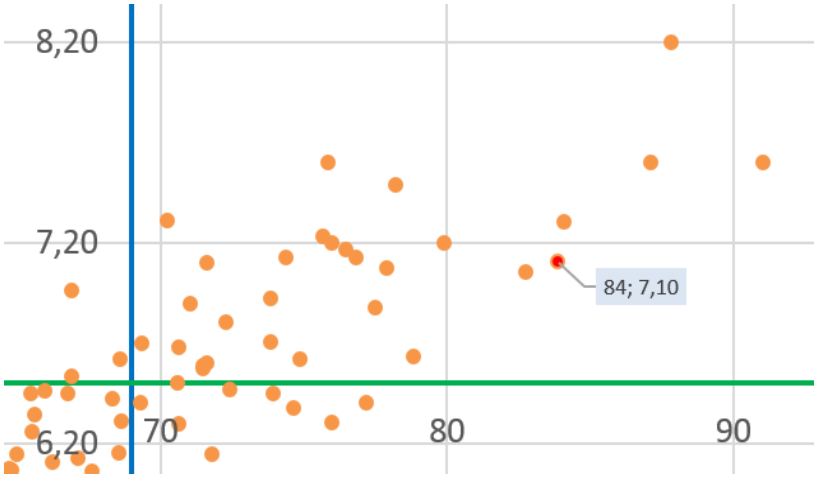
Firms will seek connection to the highest-capacity ICT networks (e.g. Next Generation Networks for convergence of voice, data and video) to answer the increased demand from customers for fast delivery of large broadband services and applications, and to take all the benefits from cloud computing and supercomputing technologies (e.g. grid computing, cluster computing, etc.).

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **5th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
84	15	7,10	2,47	595,69

FACTOR: 1.7.4 Customer-Oriented Design

FACT SHEET ID 33 // Working Group: FURNITURE

Factor:

1 - Business Environment

1.7 - Customer Involvement

1.7.4 Customer-Oriented Design

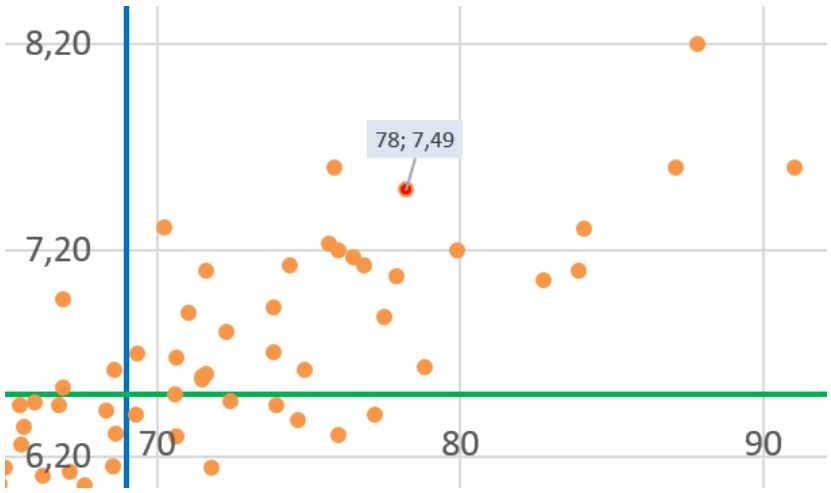
To enrich personalization and customization, companies will work more closely with customers in the design, development and testing of their products in order to closely capture new requirements, including regional and national differences, and to fine-tune new features and services. They will use virtual design environments to facilitate this collaboration.

Summary of statistics:

Number of respondents: **47**

Field of expertise respondents groups:
DIGITIZATION
VET
ECONOMY
FURNITURE

Ranking of importance (PROB. x IMP.): **6th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
78	21	7,49	1,88	585,76

FACTOR: 2.3.3 Sustainable Knowledge Infrastructure

FACT SHEET ID 42 // Working Group: VET

Factor:

2 – Infrastructure

2.3 - Knowledge Infrastructure

2.3.3 Sustainable Knowledge Infrastructure

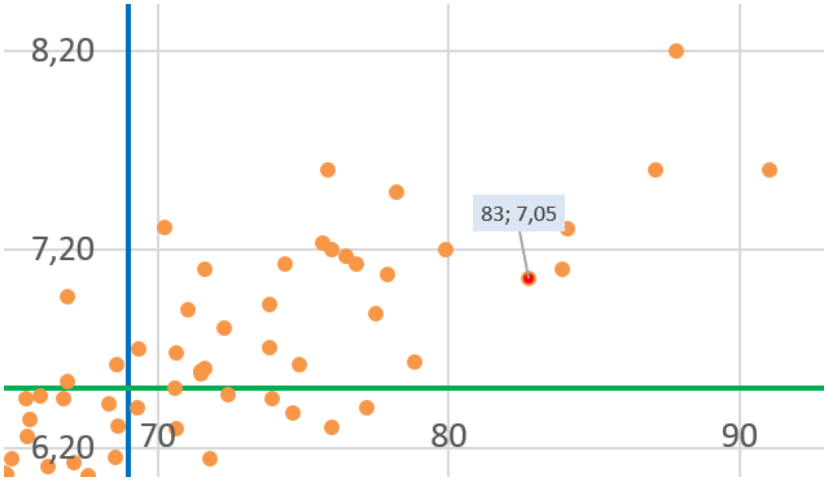
With the Big Data explosion, the sustainability of the knowledge infrastructure - and mainly the issue of collecting, collating and archiving valuable information in secure digital storage media - will be increasingly important to companies. This includes for SMEs that will rely increasingly on cloud computing and third-party archival services. To assure the sustainability of information collection, analysis and storage, the issue of data protection and privacy becomes a major issue to be resolved.

Summary of statistics:

Number of respondents: **20**

Field of expertise respondents groups:
DIGITIZATION
VET

Ranking of importance
(PROB. x IMP.): **7th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
83	13	7,05	2,01	583,39

FACTOR: 1.6.1 Competition for Skills and Talent

FACT SHEET ID 25 // Working Group: VET

Factor:

1 - Business Environment

1.6 - Skills and Talents

1.6.1 Competition for Skills and Talent

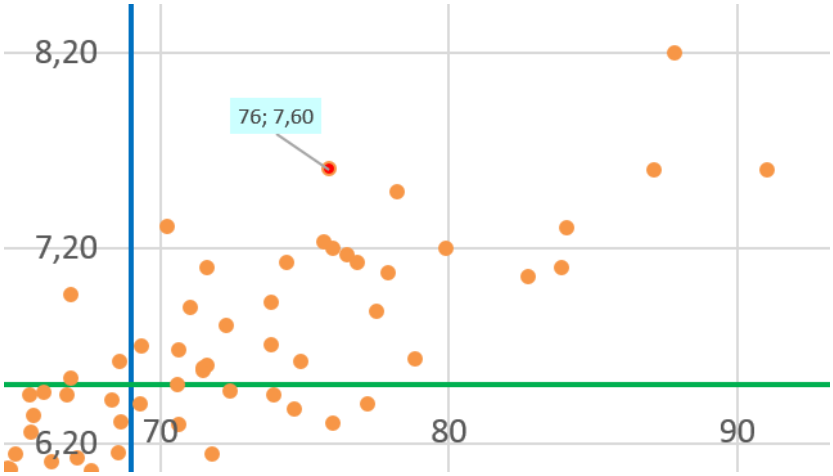
Firms will aggressively compete for high-skilled workers worldwide as local supply will not match the demand. Advanced manufacturing systems and technologies, required to remain competitive in a global market demanding personalized products and services, will need a wide range of highly skilled staff ranging from engineers to creative staff able to understand the ever-changing consumer requirements and the specificities of markets. General engineers and tech-oriented managers will also be essential to achieve business/ICT alignment and convert data into strategic insights.

Summary of statistics:

Number of respondents: **20**

Field of expertise respondents groups:
DIGITIZATION
VET

Ranking of importance (PROB. x IMP.): **8th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
76	20	7,60	1,93	576,46

FACTOR: 2.1.1 Upgraded, Integrated Infrastructure Networks

FACT SHEET ID 35 // Working Group: DIGITIZATION

Factor:

2 – Infrastructure

2.1 - Smart and Interoperable Physical Infrastructure

2.1.1 Upgraded, Integrated Infrastructure Networks

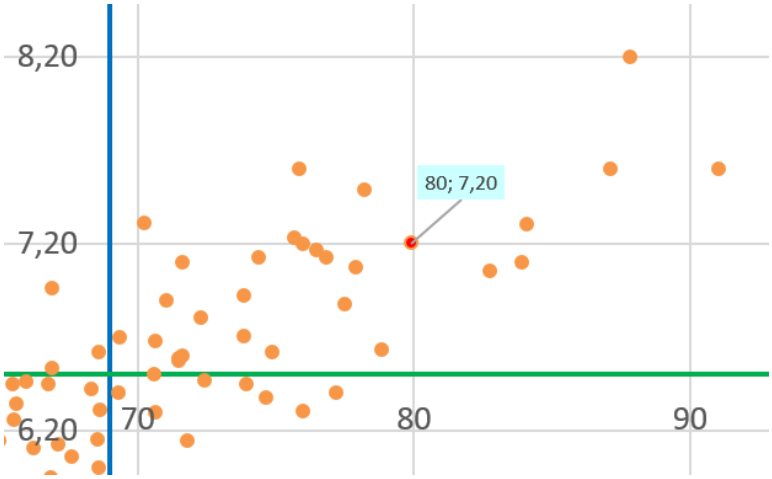
To optimise their global, fragmented supply chains and ensure safe and fast delivery, manufacturing industries will increasingly require upgraded physical infrastructure networks that are more intelligent, resilient and secure. These networks will be more and more integrated.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **9th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
80	13	7,20	1,81	575,28

FACTOR: 1.7.3 Personalisation

FACT SHEET ID 32 // Working Group: FURNITURE

Factor:

1 - Business Environment

1.7 - Customer Involvement

1.7.3 Personalisation

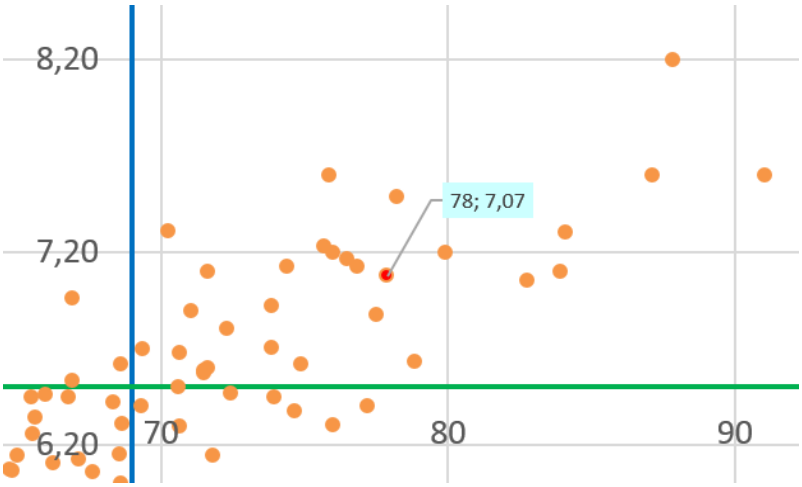
Firms will increasingly focus on the personalisation of their integrated products and services, allowing their dynamic modification according to the user's preferences and behaviours.

Summary of statistics:

Number of respondents: 27

Field of expertise respondents groups:
ECONOMY
FURNITURE

Ranking of importance
(PROB. x IMP.): **10th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
78	16	7,07	2,18	550,99

FACTOR: 1.7.2 Mass Customisation

FACT SHEET ID 31 // Working Group: ECONOMY

Factor:

1 - Business Environment

1.7 - Customer Involvement

1.7.2 Mass Customisation

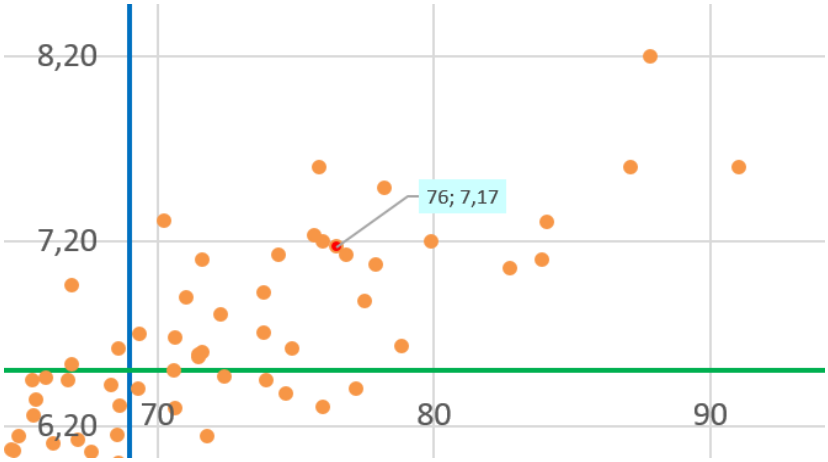
To answer increasing customers' requirements, firms will still seek to maintain the cost-efficiency of mass production by integrating the highest degree of flexibility in individual customisation and differentiating the product/service at the latest possible point in the supply chain.

Summary of statistics:

Number of respondents: **37**

Field of expertise respondents groups:
DIGITIZATION
ECONOMY
FURNITURE

Ranking of importance (PROB. x IMP.): **11th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
76	18	7,17	2,04	548,05

FACTOR: 6.2.1 Advanced Robotics

FACT SHEET ID 80 // Working Group: H&S

Factor:

6 - Technologies and Production Processes

6.2 - Flexible, Smart and Customer-Oriented Technologies

6.2.1 Advanced Robotics

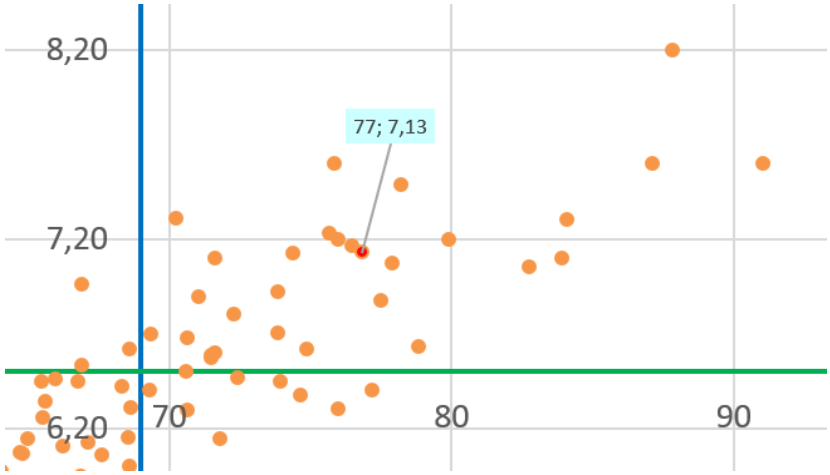
Robots with increased dexterity and intelligence, as well as a capability to work safely with human work forces, will enable an even higher level of automation and for factories to reduce variability, to increase flexibility and speed of their production processes, allowing the delivery of more complex, personalised and higher quality products with lower labour work cost.

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **12th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
77	21	7,13	2,02	547,62

FACTOR: 1.4.2 Consumer Innovation

FACT SHEET ID 17 // Working Group: VET

Factor:

1 - Business Environment

1.4 - New Innovation Schemes

1.4.2 Consumer Innovation

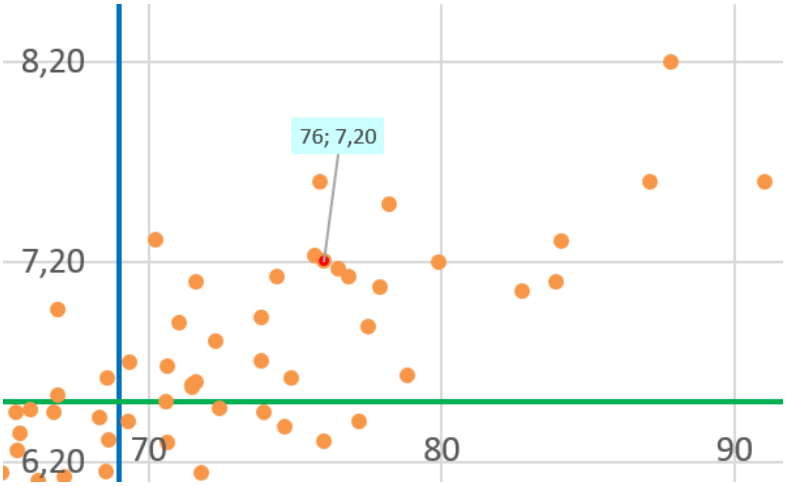
Consumers will increasingly be engaged in the development of innovative solutions that build on their experience of current products and services. Web-based forums (i.e. "virtual customer environment") and other ICT solutions will help firms to consult their customers at all stages of development.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **VET**

Ranking of importance (PROB. x IMP.): **13th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
76	13	7,20	1,62	547,20

FACTOR: 6.5.1 Smart Logistic Tools

FACT SHEET ID 99 // Working Group: H&S

Factor:

6 - Technologies and Production Processes

6.5 - Logistics and Supply Chain

6.5.1 Smart Logistic Tools

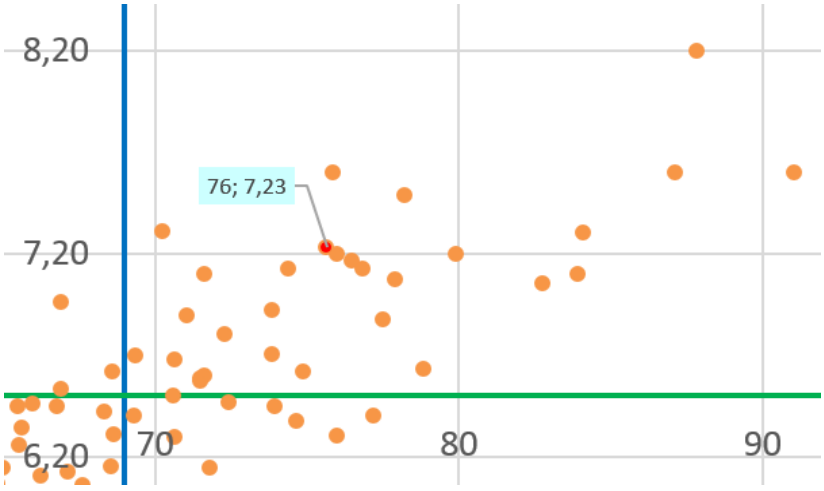
In their attempt to integrate more and more complex value chains and to deliver highly personalised products and services with high frequency renewal, companies encounter bottlenecks in establishing, optimising and managing the internal and external logistics within the supply chain. Consequently, they will increasingly rely on intelligent, automated and integrated logistic tools and solutions to manage a random mix production of different products and services, to improve the overall performance and to meet increased customer expectations of quality and faster delivery.

Summary of statistics:

Number of respondents: **39**

Field of expertise respondents groups:
DIGITIZATION
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **14th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
76	22	7,23	2,14	546,96

FACTOR: 6.1.1 Sustainable Manufacturing

FACT SHEET ID 74 // Working Group: H&S

Factor:

6 - Technologies and Production Processes

6.1 - Resource-Efficient and Clean Production Processes

6.1.1 Sustainable Manufacturing

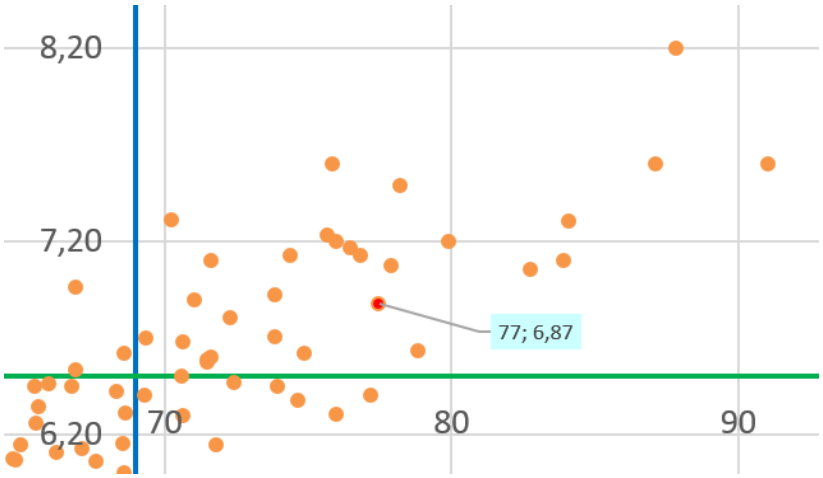
Environmental, regulatory and societal pressures will force manufacturing firms to adopt greener production processes so as to improve resource and energy-efficiency (e.g. maximum productivity of materials, optimisation of energy flows) and reach minimal environmental impact (e.g. near-to-zero CO2 emissions, use of biodegradable and renewable materials, etc.).

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **15th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
77	18	6,87	1,96	532,46

FACTOR: 6.2.4 Agile Manufacturing

FACT SHEET ID 83 // Working Group: H&S

Factor:

6 - Technologies and Production Processes

6.2 - Flexible, Smart and Customer-Oriented Technologies

6.2.4 Agile Manufacturing

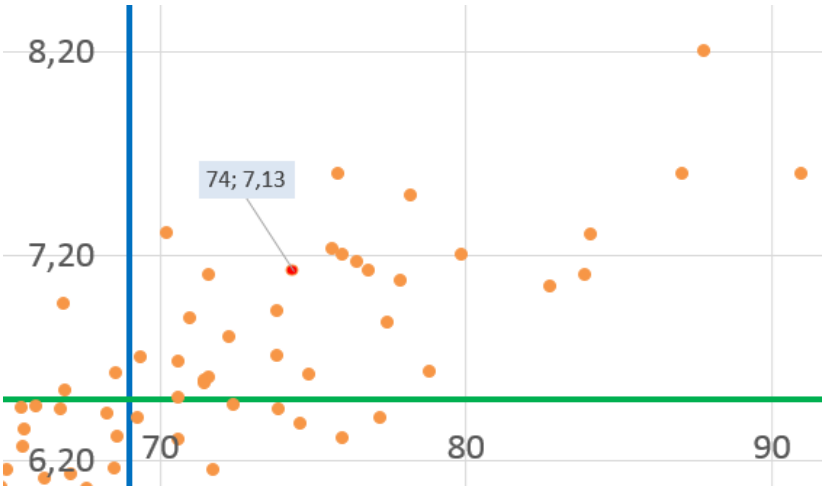
To maintain their competitive advantage, companies will become more sensitive to changes in the demand and will consequently ensure the flexibility of their supply chain and the fast re-configurability of their production lines (e.g. through self-adaptive and modular machine tools and robots).

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **16th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
74	19	7,13	1,76	530,18

FACTOR:1.2.3 Niche Industries

FACT SHEET ID 8 // Working Group: ECONOMY

Factor:

1 - Business Environment

1.2 - Value Chain Optimisation

1.2.3 Niche Industries

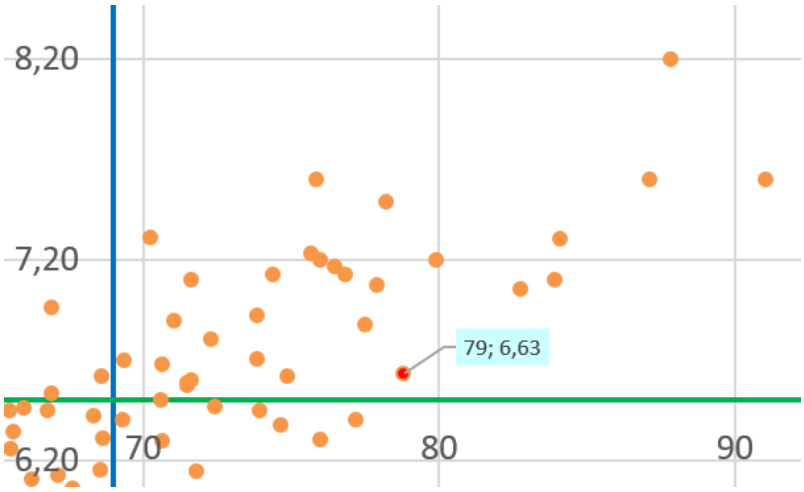
An increased number of niche industries will develop, often in very technical and specialised areas. These niche industries will work in loose alliances with other companies to produce the personalised products and services that consumers will increasingly require.

Summary of statistics:

Number of respondents: **27**

Field of expertise respondents groups:
ECONOMY
FURNITURE

Ranking of importance (PROB. x IMP.): **17th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
79	19	6,63	2,31	522,51

FACTOR: 1.2.5 Virtual Enterprise Environments

FACT SHEET ID 10 // Working Group: ECONOMY

Factor:

1 - Business Environment

1.2 - Value Chain Optimisation

1.2.5 Virtual Enterprise Environments

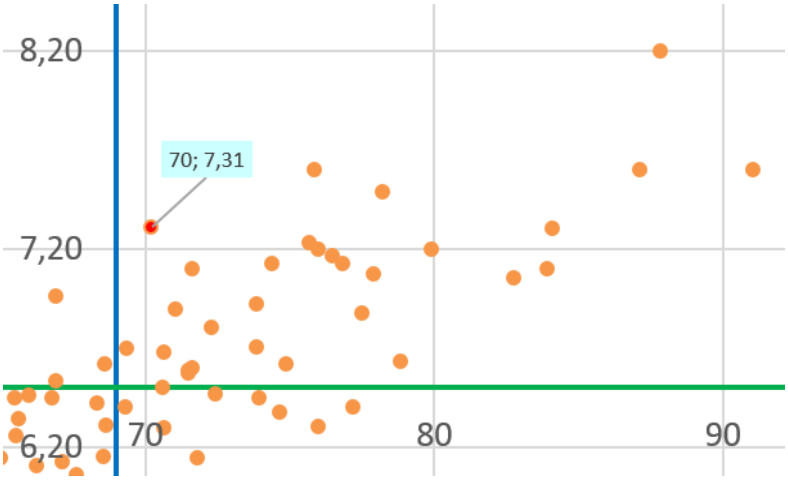
ICT-based virtual environments, allowing the real-time monitoring and visualisation of inter-organisational flows and the sharing of skills and knowledge, will add value to the product-service value chain by enhancing supply chain management of globally dispersed production processes and complex firm operations.

Summary of statistics:

Number of respondents: **27**

Field of expertise respondents groups:
ECONOMY
FURNITURE

Ranking of importance
(PROB. x IMP.): **18th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
70	21	7,31	1,59	513,22

FACTOR: 5.3.2 Eco-Industry Services

FACT SHEET ID 73 // Working Group: ECONOMY

Factor:

5 – Services

5.3 - Services for Business

5.3.2 Eco-Industry Services

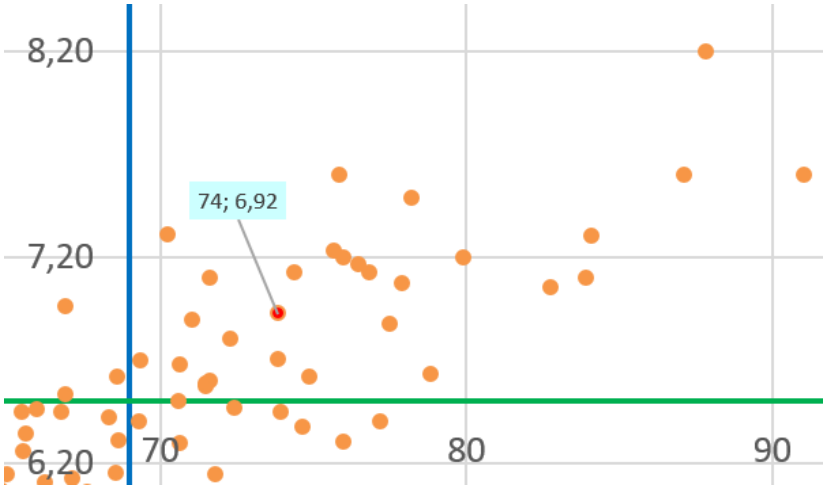
As the need to mitigate and adapt to climate change becomes more acute, and as pressure from society to address global environmental and natural resources issues becomes greater, companies will increasingly move to become "greener", seeking to become energy and waste neutral.

Summary of statistics:

Number of respondents: **27**

Field of expertise respondents groups:
ECONOMY
FURNITURE

Ranking of importance (PROB. x IMP.): **19th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
74	19	6,92	2,13	511,24

FACTOR:1.6.3 Developing Talents

FACT SHEET ID 27// Working Group: VET

Factor:

1 - Business Environment

1.6 - Skills and Talents

1.6.3 Developing Talents

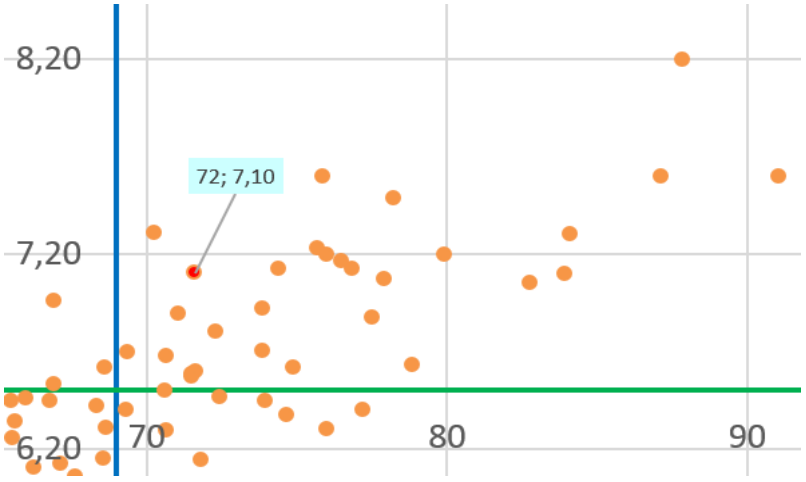
Companies will develop internal training schemes or apprenticeship programmes to fill their specific workforce needs. They will increasingly collaborate with universities, research centres and other partners to offer work study programmes with recognised degrees to younger talented recruits.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **VET**

Ranking of importance (PROB. x IMP.): **20th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
72	20	7,10	2,18	508,36

FACTOR: 6.2.2 Additive Manufacturing

FACT SHEET ID 81 // Working Group: FURNITURE

Factor:

6 - Technologies and Production Processes

6.2 - Flexible, Smart and Customer-Oriented Technologies

6.2.2 Additive Manufacturing

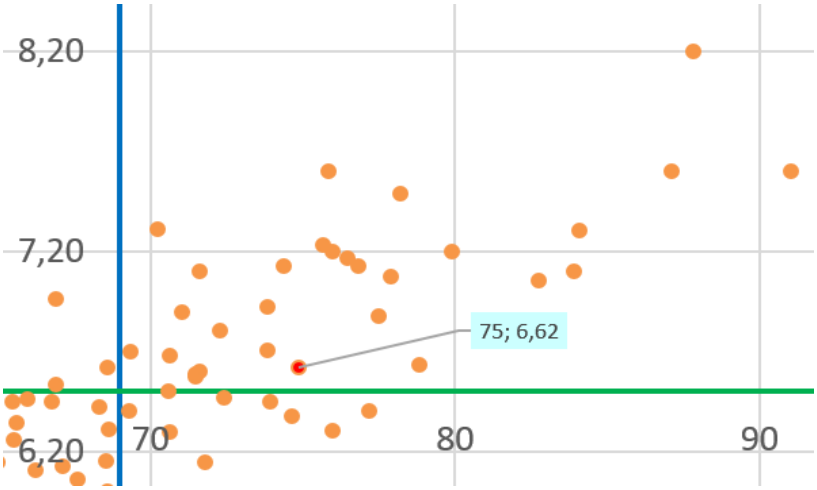
With the development of larger and faster printers and the enhanced characterisation of materials, additive manufacturing technologies (e.g. 3D printing, selective laser sintering, fused deposition modelling, stereo-lithography, laminated object manufacturing, etc.) will be increasingly used by both SMEs and larger manufacturing firms to realise prototypes, to produce light and complex parts for low-volume high-tech applications, and to make customised products.

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance
(PROB. x IMP.): **21st**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
75	21	6,62	2,04	495,43

FACTOR: 1.2.1 Complex Value Chain

FACT SHEET ID 6 // Working Group: ECONOMY

Factor:

1 - Business Environment

1.2 - Value Chain Optimisation

1.2.1 Complex Value Chain

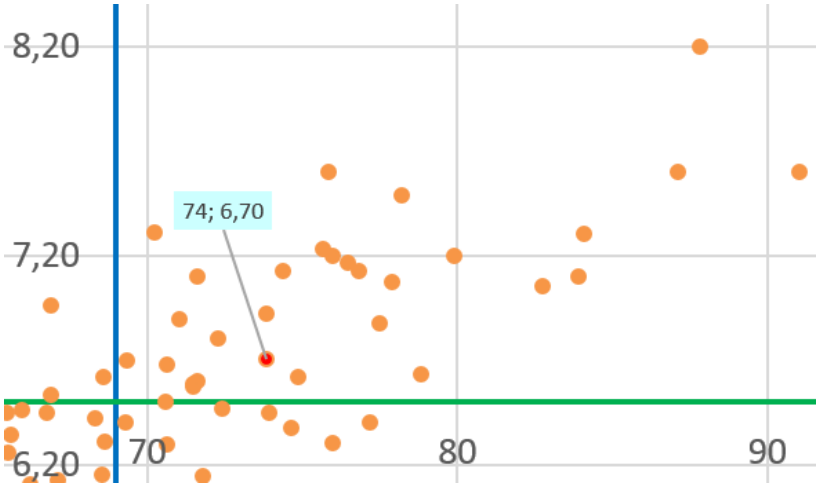
Enhanced competition for local and global markets will result in increasingly complex and diverse value chains. Driven by an increasingly globalised market, and based upon new technologies firms will seek to minimise the supply chain risks, minimise environmental impact and maximise savings through various strategies according to the geo-political situation, sectors and market segments.

Summary of statistics:

Number of respondents: **27**

Field of expertise respondents groups:
ECONOMY
FURNITURE

Ranking of importance
(PROB. x IMP.): **22nd**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
74	12	6,70	1,61	495,08

FACTOR: 1.4.1 Open Innovation

FACT SHEET ID 16 // Working Group: VET

Factor:

1 - Business Environment

1.4 - New Innovation Schemes

1.4.1 Open Innovation

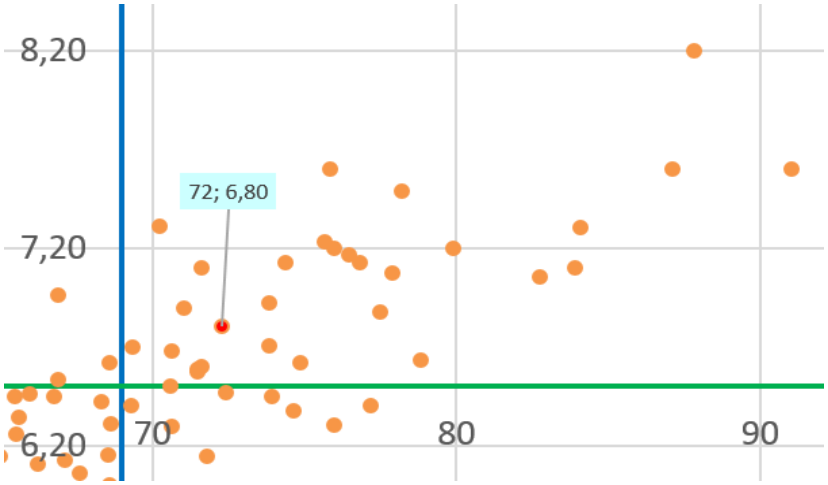
Pressured to capture diverse and geographically distributed human talent, and enabled by ICT technologies, firms will use and combine internal and external innovative ideas to take advantage of a wider distribution of knowledge across the globe. They will rely on a more diverse range of sources (customers, social networks, competitors, academics, etc.) and apply new techniques to extract innovative ideas (e.g. collaborative games, idea competitions, etc.).

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **VET**

Ranking of importance (PROB. x IMP.): **24th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
72	13	6,80	1,48	491,64

FACTOR: 1.7.1 Social Manufacturing

FACT SHEET ID 30 // Working Group: FURNITURE

Factor:

1 - Business Environment

1.7 - Customer Involvement

1.7.1 Social Manufacturing

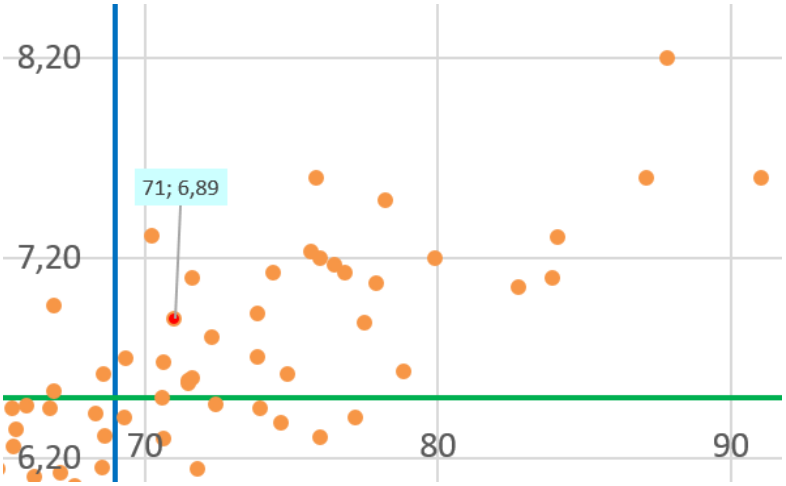
The widespread use of online social tools (e.g. collaborative platforms) and solutions (e.g. crowdfunding) together with digital fabrication software (i.e. CAD) and ready-to-use manufacturing hardware (e.g. 3D printing) will result in new forms of product design, development and testing, directly involving customers and a new innovative type of entrepreneur.

Summary of statistics:

Number of respondents: **47**

Field of expertise respondents groups:
DIGITIZATION
VET
ECONOMY
FURNITURE

Ranking of importance
(PROB. x IMP.): **25th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
71	21	6,89	2,19	489,59

FACTOR: 2.1.3 Intelligent and Intermodal Transport Infrastructure

FACT SHEET ID 37 // Working Group: DIGITIZATION

Factor:

2 – Infrastructure

2.1 - Smart and Interoperable Physical Infrastructure

2.1.3 Intelligent and Intermodal Transport Infrastructure

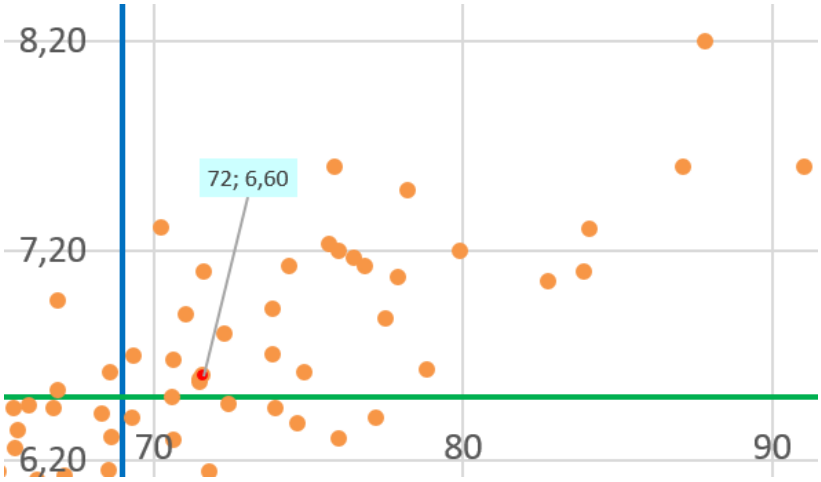
The development of intelligent transport systems - allowing real-time traffic and mobility management - will enable manufacturing firms to have quicker logistic chains thanks to a more reliable, more secure and faster movement of goods across different but fully intermodal infrastructures (road, rail, air, water).

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **29th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
72	28	6,60	2,76	472,56

FACTOR: 3.1.2 Circulation of Materials and Parts

FACT SHEET ID 49 // Working Group: H&S

Factor:

3 - Materials

3.1 - Materials and Reusable Parts for Sustainability

3.1.2 Circulation of Materials and Parts

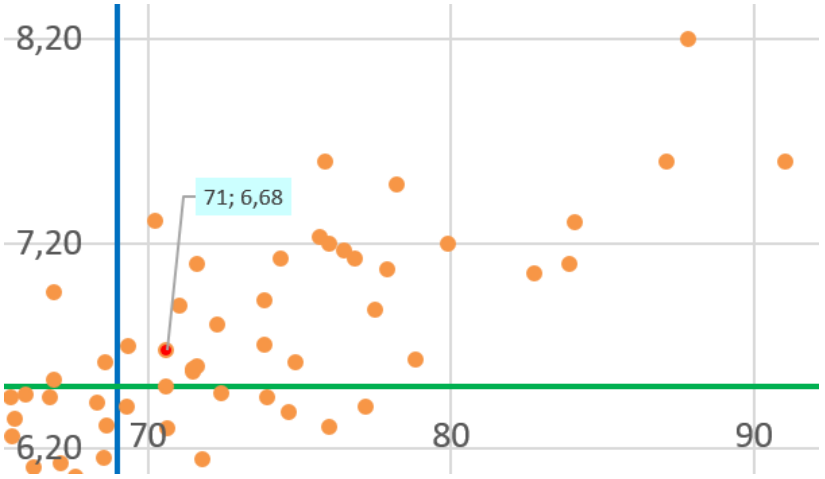
As 'life cycle' and the 'sustainability by design' approaches increasingly impact the industrials value chains, materials will circulate among different industries and value chains. This circulation will be enabled by a range of advanced technologies including the reuse, remanufacturing and recycling of secondary materials, parts and products.

Summary of statistics:

Number of respondents: **39**

Field of expertise respondents groups:
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **30th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
71	23	6,68	2,03	471,51

FACTOR: 6.1.3 Waste Minimisation

FACT SHEET ID 76 // Working Group: H&S

Factor:

6 - Technologies and Production Processes

6.1 - Resource-Efficient and Clean Production Processes

6.1.3 Waste Minimisation

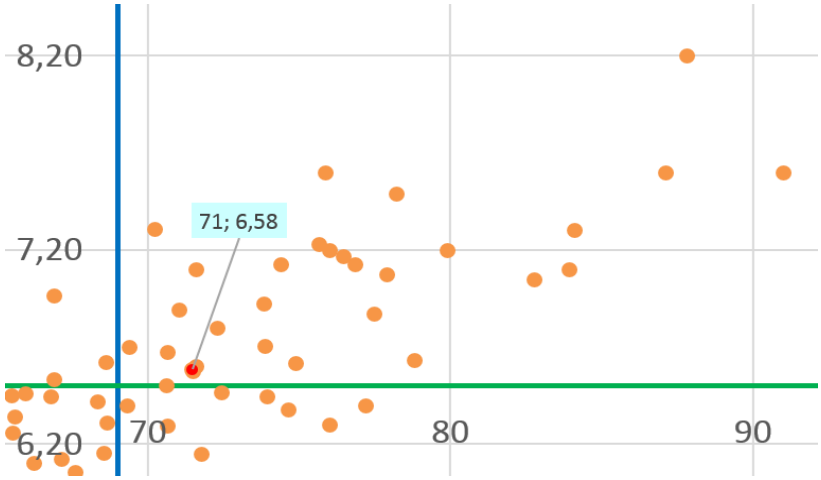
Enhanced automation and production processes (e.g. near net shape), as well as new advanced manufacturing techniques such as additive manufacturing, will enable factories to use a smaller quantity of materials to make a product with almost no waste.

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **31st**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
71	21	6,58	2,05	470,57

FACTOR: 6.2.5 Personalised Production Lines

FACT SHEET ID 84 // Working Group: VET

Factor:

6 - Technologies and Production Processes

6.2 - Flexible, Smart and Customer-Oriented Technologies

6.2.5 Personalised Production Lines

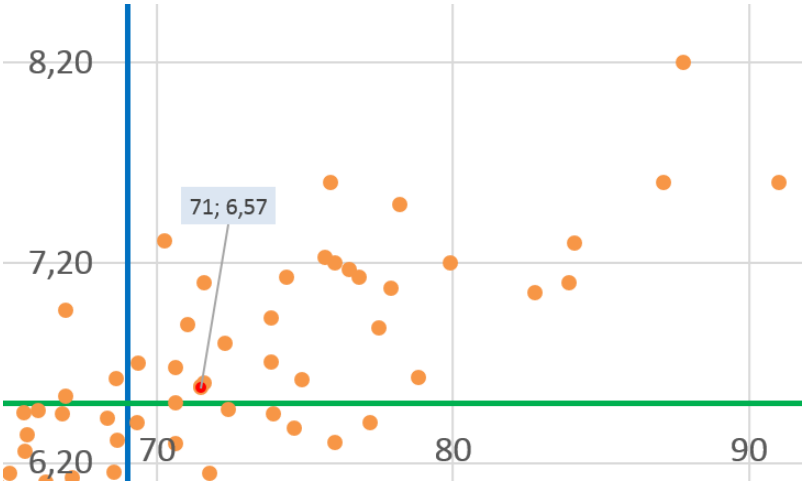
New production approaches will be implemented to enable mass customisation and personalisation, such as a two-step production approach for (1) producing blank elements, and (2) assembling products from the blank elements according to customer preferences.

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **32nd**



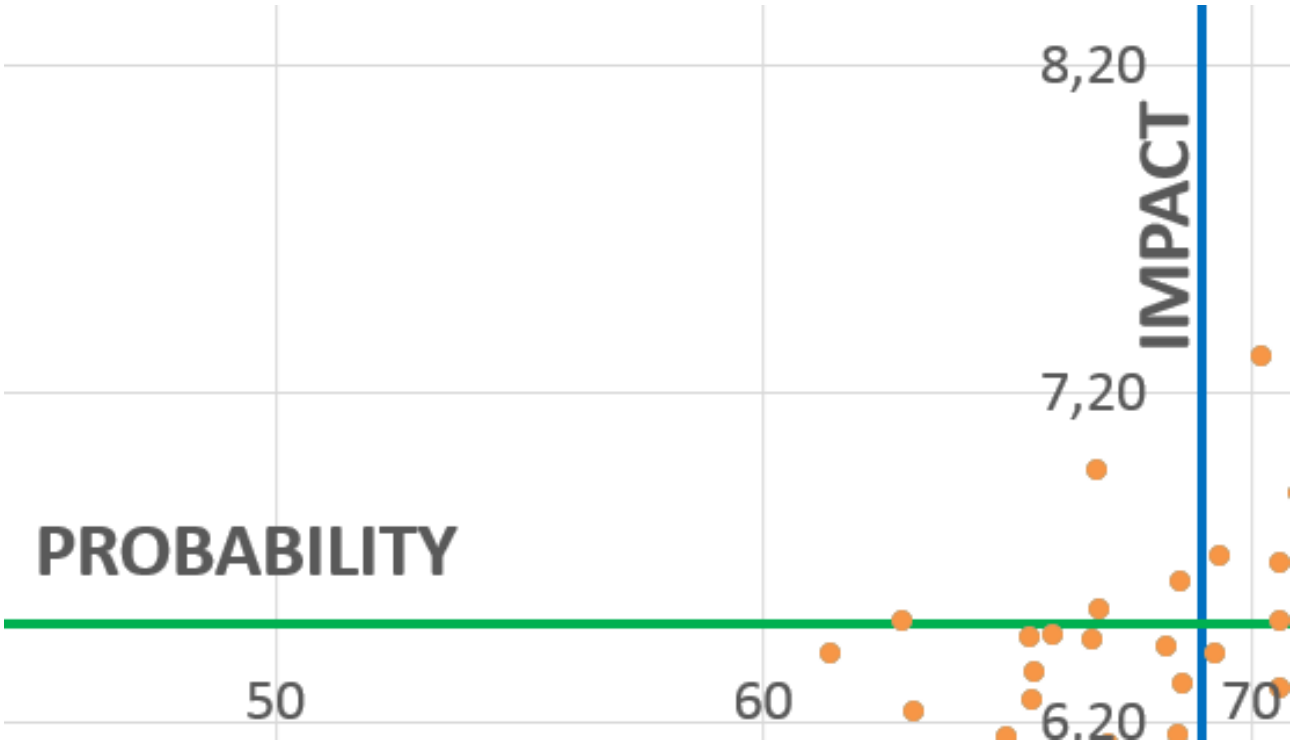
PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
71	20	6,57	2,17	470,00

5.2 Factors in the 3rd quadrant

In this third quadrant we find the **4 factors** with an impact higher than 6,5 and a probability lower than 70.

QUADRANTS	Ranking	ID	FACTORS	IMPORTANCE (PROB. x IMP.)	PROBABILITY (Mean Value)	PROBABILITY (Standard Deviation)	IMPACT (Mean Value)	IMPACT (Standard Deviation)
3	34	12	1.3.2 'Circular Economy' Business Models	465,74	67	25	6,96	2,19
3	35	96	6.4.2 Digital Engineering Tools	464,58	69	21	6,70	1,97
3	37	15	1.3.5 'Craftsmanship' Approach	454,21	69	26	6,62	2,33
3	42	103	6.6.3 Design for Sustainability	437,19	67	17	6,54	1,79

3rd quadrant graphic



FACTOR: 1.3.2 'Circular Economy' Business Models

FACT SHEET ID 12 // Working Group: ECONOMY

Factor:

1 - Business Environment

1.3 - Dynamic and Sustainable Business Models

1.3.2 'Circular Economy' Business Models

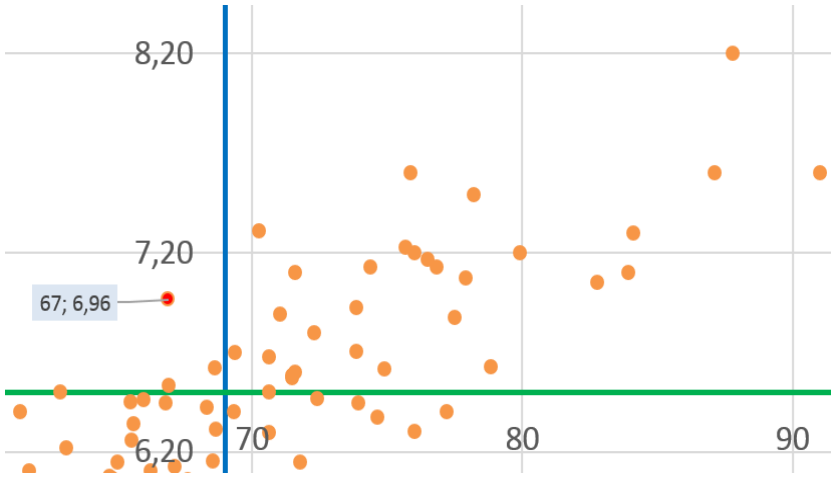
Energy- and resource-efficient business models will be needed for factories to achieve the 'triple-zero' objectives: zero waste, zero net energy cost and zero environmental impact. This circular economy business model will be driven by market costs, society demands, and hence the consumer for more environmentally friendly business solutions. Companies will make their business models "environmental-friendly" as a marketing strategy to seek commercial advantage (e.g. re-manufacturing).

Summary of statistics:

Number of respondents: **27**

Field of expertise respondents groups:
ECONOMY
FURNITURE

Ranking of importance
(PROB. x IMP.): **34th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
67	25	6,96	2,19	465,74

FACTOR: 6.4.2 Digital Engineering Tools

FACT SHEET ID 96 // Working Group: FURNITURE

Factor:

6 - Technologies and Production Processes

6.4 - Digital Factories

6.4.2 Digital Engineering Tools

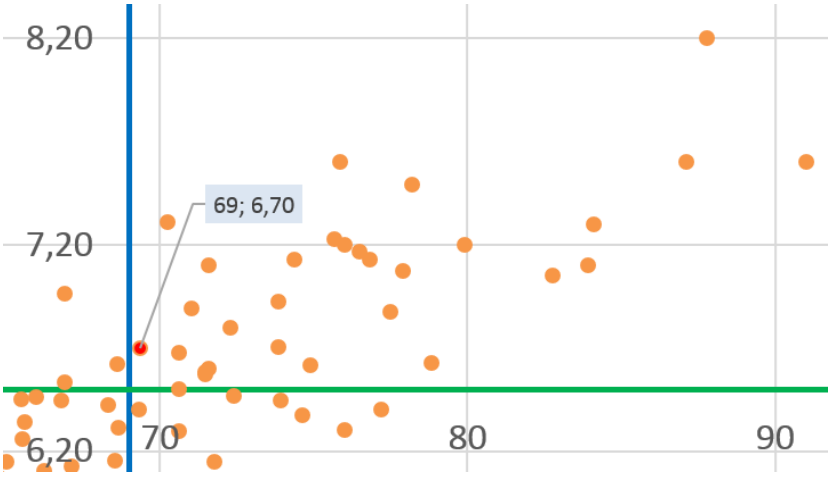
Digital tools will increasingly support the management and the optimisation of integrated product-process-production systems allowing the collaborative interaction of multiple stakeholders on a real-time basis.

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance
(PROB. x IMP.): **35th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
69	21	6,70	1,97	464,58

FACTOR: 1.3.5 'Craftsmanship' Approach

FACT SHEET ID 15 // Working Group: FURNITURE

Factor:

1 - Business Environment

1.3 - Dynamic and Sustainable Business Models

1.3.5 'Craftsmanship' Approach

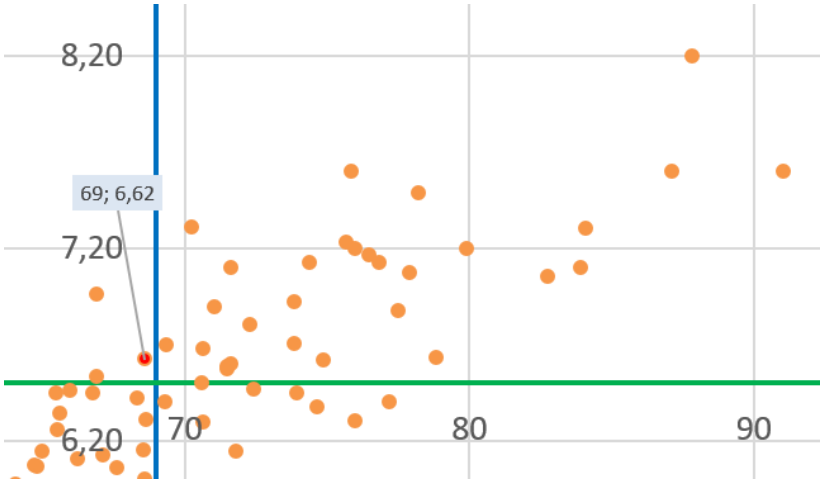
As technology develops, particularly in software development and ICT services, there will be an increasing number of highly skilled "software craftsmen" whose unique skills and creativity will be available on a freelance basis. The work of these developers will accelerate the innovation and will be in demand by all major businesses. The rise of the maker and fixer movement (e.g. Fab Labs, makerspaces, etc.) will also be integrated by firms in their business models.

Summary of statistics:

Number of respondents: **37**

Field of expertise respondents groups:
DIGITIZATION
ECONOMY
FURNITURE

Ranking of importance
(PROB. x IMP.): **37th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
69	26	6,62	2,33	454,21

FACTOR: 6.6.3 Design for Sustainability

FACT SHEET ID 103 // Working Group: VET

Factor:

6 - Technologies and Production Processes

6.6 - Holistic Design

6.6.3 Design for Sustainability

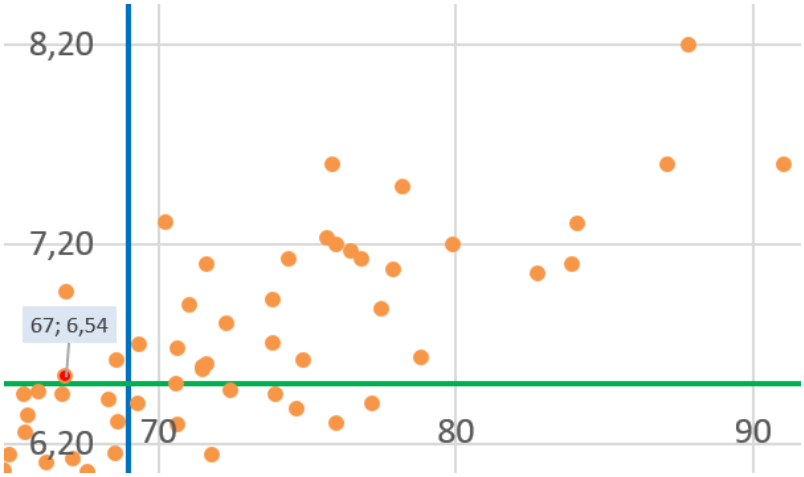
Firms will design products with their entire life cycle in mind in order to optimise their durability and to reduce the costs of recycling, recovery of materials, reuse and remanufacturing of spare parts, and waste disposal. 'Circular design' will focus on material selection and modularity among standardised components to facilitate disassembly. Design for sustainability will support an holistic approach aiming to reducing also the negative social and economic impacts of products and services.

Summary of statistics:

Number of respondents: **29**

Field of expertise respondents groups:
VET
FURNITURE

Ranking of importance
(PROB. x IMP.): **42nd**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
67	17	6,54	1,79	437,19

5.3 Factors with high standard deviation and medium-high impact

Apart of the previous 32 factors with data showing an high impact on the sector in 2025, we decided to analyse during the project workshop as well 5 other factors with high standard deviation and medium-high impact in order to better understand and forecast their impact on the sector.

QUADRANTS	Ranking	ID	FACTORS	IMPORTANCE (PROB. x IMP.)	PROBABILITY (Mean Value)	PROBABILITY (Standard Deviation)	IMPACT (Mean Value)	IMPACT (Standard Deviation)
2	23	56	4.1.3 Data Storage	494,08	77	23	6,40	2,88
2	26	58	4.1.5 Cybersecurity	478,80	76	30	6,30	3,23
4	72	19	1.4.4 Frugal Innovation	372,68	63	29	5,89	2,90
4	91	87	6.3.2 Human-Robot Symbiosis	301,56	55	29	5,51	2,59
4	95	4	1.1.4 Production Near To Skills and Talents	284,81	54	29	5,25	2,38

FACTOR: 4.1.3 Data Storage

FACT SHEET ID 56 // Working Group: DIGITIZATION

Factor:

4 - Knowledge Management

4.1 - Data Capture

4.1.3 Data Storage

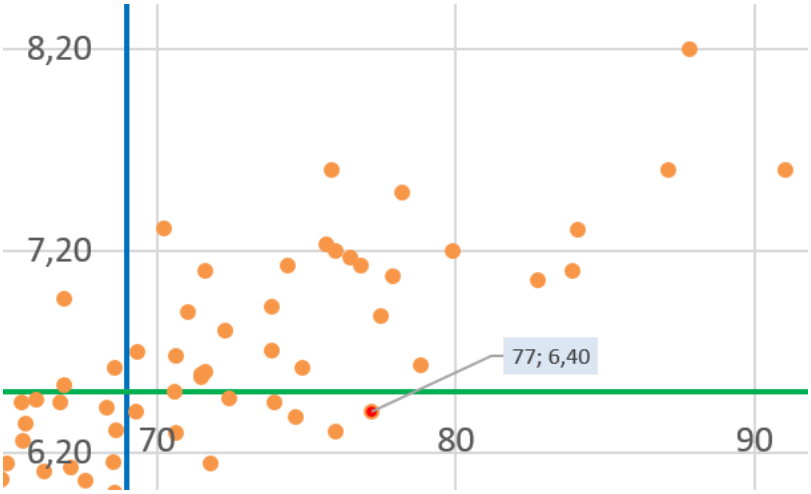
The arrival of "big data" on the industrial landscape will force companies to consider innovative, cheap and efficient mechanisms to store the data collected in a safe and secure manner. Internal high-capacity servers or outsourced storage services will be needed to store exabytes of valued data useful for ex-post analysis and evaluation.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **23rd**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
77	23	6,40	2,88	494,08

FACTOR: 4.1.5 Cybersecurity

FACT SHEET ID 58 // Working Group: DIGITIZATION

Factor:

4 - Knowledge Management

4.1.3 Data Storage

4.1.5 Cybersecurity

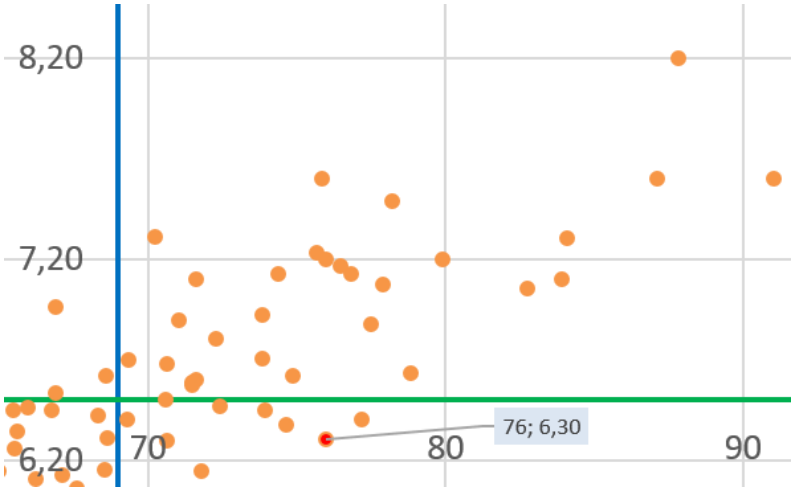
Firms will need to invest and implement strong, adaptive and resilient security systems and techniques to protect their data from cyber-attacks from competitors, foreign intelligence services or hacktivists. They will also need to define and communicate on a transparent privacy charter to manage customers' data with the right balance between privacy rights and expectations of protection by customers, and in compliance with the law.

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

Ranking of importance (PROB. x IMP.): **26th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
76	30	6,30	3,23	478,80

FACTOR: 1.4.4 Frugal Innovation

FACT SHEET ID 19 // Working Group: FURNITURE

Factor:

1 - Business Environment

1.4 - New Innovation Schemes

1.4.4 Frugal Innovation

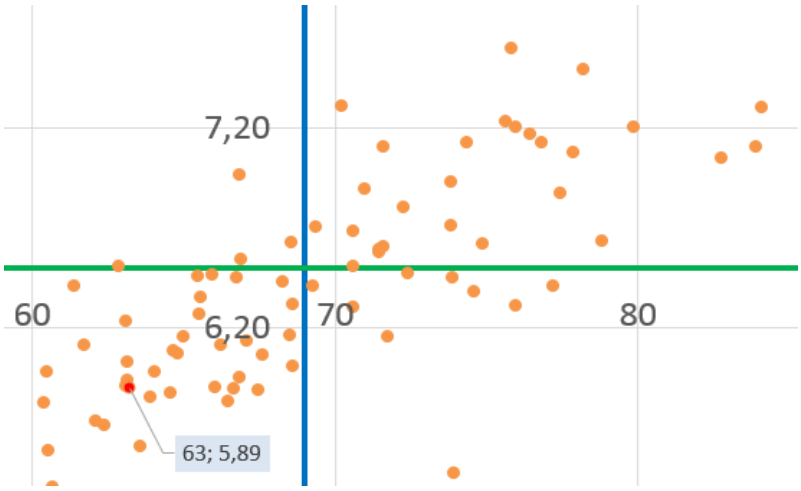
Developing more frugal and cheap products and services will be a focus of attention for firms in their attempt to conquer vast market segments of developing countries.

Summary of statistics:

Number of respondents: **19**

Field of expertise respondents groups: **FURNITURE**

Ranking of importance (PROB. x IMP.): **72th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
63	29	5,89	2,90	372,68

FACTOR: 6.3.2 Human-Robot Symbiosis

FACT SHEET ID 87 // Working Group: H&S

Factor:

6 - Technologies and Production Processes

6.3 - Human-Centred Factories

6.3.2 Human-Robot Symbiosis

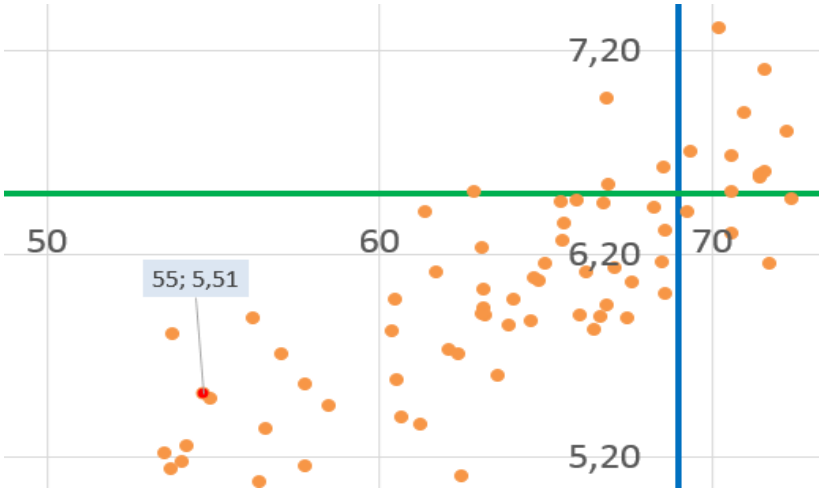
Humans and collaborative robots (cobots) will work in harmony on the plant floor thanks to personalised machine-to-user interfaces and human-like robot behaviour and features (e.g. humanoid design, voice recognition, natural language, gesture understanding, etc.). Human-machine interactions will be designed to capitalise on the outstanding capabilities of humans in terms of flexible process operation.

Summary of statistics:

Number of respondents: **49**

Field of expertise respondents groups:
DIGITIZATION
VET
H&S
FURNITURE

Ranking of importance (PROB. x IMP.): **91th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
55	29	5,51	2,59	301,56

FACTOR: 1.1.4 Production Near To Skills and Talents

FACT SHEET ID 4 // Working Group: ECONOMY

Factor:

1 - Business Environment

1.1.1 New Global Markets

1.1.4 Production Near To Skills and Talents

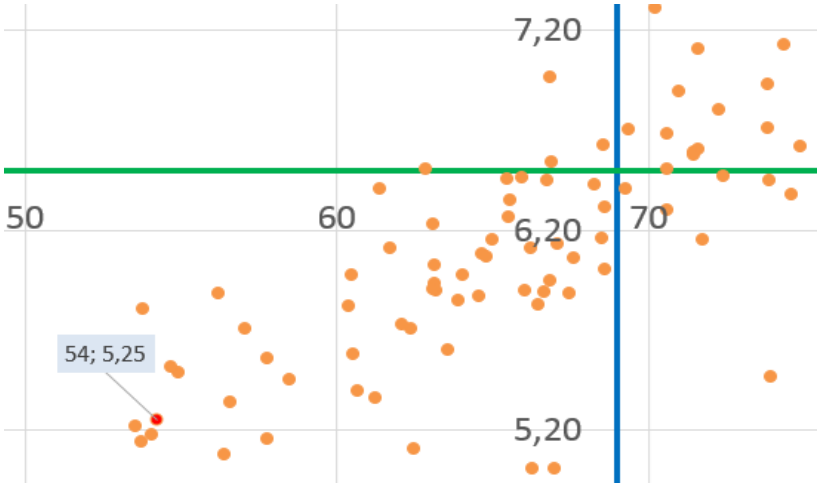
Firms will consider human resources globally and factories will move where skills and talents are located. Continuing geographic differences in skills will result in a divergence of value chains across the world, and will result in the "hybridisation" of the global value chain with specialist parts of the value chain geographically located in the part of the world where the correct skills exist at the best cost.

Summary of statistics:

Number of respondents: **8**

Field of expertise respondents groups: **ECONOMY**

Ranking of importance (PROB. x IMP.): **95th**



PROBABILITY (mean value)	PROBABILITY (standard deviation)	IMPACT (mean value)	IMPACT (standard deviation)	IMPORTANCE (PROB. x IMP.)
54	29	5,25	2,38	284,81

In the following paragraphs, we will enlist all the factors positioned in the second and fourth quadrants. Some of them are included and detailed earlier in this same paragraph.

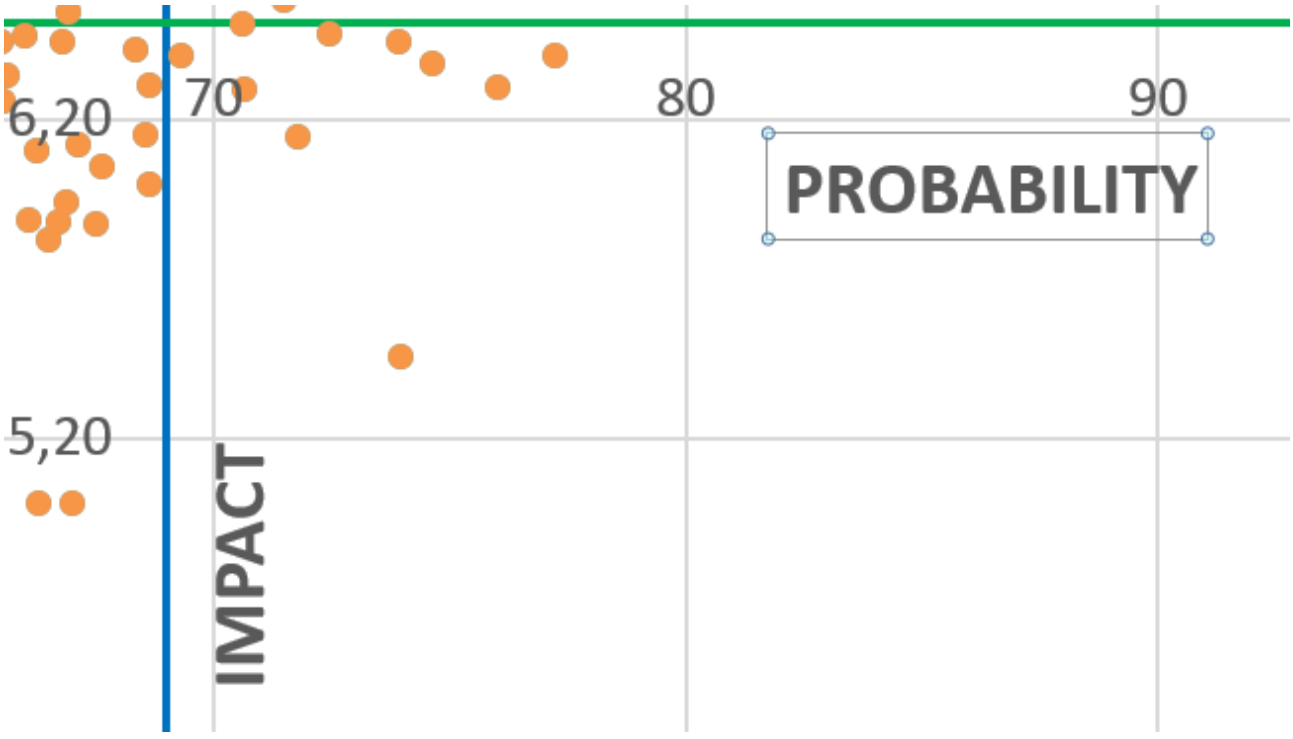
6. The remaining survey factors

6.1 Factors in the 2nd quadrant

We enlist here those 10 factors positioned in the 2nd quadrant and having average values of high probability bigger than 70 and impact lower or equal to 6,5.

QUADRANTS	Ranking	ID	FACTORS	IMPORTANCE (PROB. x IMP.)	PROBABILITY (Mean Value)	PROBABILITY (Standard Deviation)	IMPACT (Mean Value)	IMPACT (Standard Deviation)
2	23	56	4.1.3 Data Storage	494,08	77	23	6,40	2,88
2	26	58	4.1.5 Cybersecurity	478,80	76	30	6,30	3,23
2	27	65	5.1.1 Integrated Products and Services	476,35	74	18	6,44	2,20
2	28	44	2.4.2 Innovative Systems of Payment	475,73	75	17	6,38	2,00
2	33	78	6.1.5 Traceability	468,40	72	20	6,47	1,87
2	36	36	2.1.2 On-Site Energy Generation	458,90	71	25	6,50	2,32
2	38	106	6.6.6 Design for Performance	444,71	71	20	6,30	1,94
2	39	18	1.4.3 Service Innovation	443,52	69	17	6,40	1,58
2	40	107	6.6.7 Safety and Security by Design	441,30	72	22	6,15	2,46
2	55	72	5.3.1 Enhancement of Traditional Services	403,94	74	20	5,46	2,47

2nd quadrant graphic



6.2 Factors in the 4th quadrant

We enlist here the remaining 66 factors positioned in the fourth quadrant and having average values of high probability lower than 70 and impact lower to 6,5.

1st part of Factors in the 4th quadrant

QUADRANTS	Ranking	ID	FACTORS	IMPORTANCE (PROB. x IMP.)	PROBABILITY (Mean Value)	PROBABILITY (Standard Deviation)	IMPACT (Mean Value)	IMPACT (Standard Deviation)
4	41	21	1.4.6 Eco-innovation	438,66	68	22	6,42	2,22
4	43	89	6.3.4 Safe Workplace	433,18	69	22	6,31	2,28
4	44	2	1.1.2 Global Production System	430,35	67	23	6,44	2,18
4	45	101	6.6.1 Design for User Well-Being	426,22	66	21	6,46	2,02
4	46	51	3.2.1 Material Science	422,25	65	23	6,45	1,90
4	47	22	1.5.1 Strategic and Loose Alliances	421,78	69	24	6,15	2,13
4	48	50	3.1.3 Replacement Materials	416,08	66	24	6,34	1,99
4	49	66	5.1.2 Service as a Key Source of Profit	411,67	69	18	6,00	2,04
4	50	43	2.4.1 Efficient Financial Infrastructure	411,14	67	12	6,13	1,13
4	51	9	1.2.4 Value Chain Ecosystems	410,10	66	26	6,26	2,33
4	52	70	5.2.1 Enhancement of Traditional Services	409,53	68	21	6,06	2,11
4	53	60	4.2.2 Knowledge Sharing / Harvesting	408,85	63	18	6,50	2,07
4	54	77	6.1.4 Smart and Agile Maintenance Approaches	404,27	66	23	6,10	2,08
4	56	11	1.3.1 Dynamic and Agile Business Models	399,63	65	23	6,15	2,21
4	57	67	5.1.3 Service-Oriented Design	397,45	67	20	5,94	1,97
4	58	1	1.1.1 New Global Markets	396,56	68	19	5,88	1,46
4	59	14	1.3.4 Ethical Business Practices	393,02	65	23	6,07	1,90
4	60	75	6.1.2 Disassembly, De-Manufacturing and Recovery	393,01	65	24	6,06	2,25
4	61	26	1.6.2 Effective Use of Talent	392,96	61	22	6,40	2,07
4	62	104	6.6.4 Full Eco-Design	392,69	63	22	6,22	2,03
4	63	100	6.5.2 Asset Management	392,21	67	21	5,88	1,72
4	64	68	5.1.4 Experience Economy	389,16	66	26	5,89	2,44
4	65	71	5.2.2 Virtual Service	387,26	67	19	5,82	1,83
4	66	102	6.6.2 Smart Products Design	382,59	64	25	5,97	2,19
4	67	95	6.4.1 Digital Modelisation, Simulation and Visualisation	380,42	63	26	6,02	2,40
4	68	85	6.2.6 Zero Defect Manufacturing	379,04	65	23	5,87	2,11
4	69	86	6.3.1 Socially Responsible Manufacturing	377,04	62	24	6,11	2,22
4	70	7	1.2.2 Vertical Integration	374,43	63	23	5,93	2,16
4	71	98	6.4.4 Factory Data Management	373,66	64	22	5,84	1,99
4	72	19	1.4.4 Frugal Innovation	372,68	63	29	5,89	2,90
4	73	59	4.2.1 Knowledge Management	372,29	63	15	5,90	1,29
4	74	48	3.1.1 Secure Material Supply	361,57	61	23	5,97	2,06
4	75	108	6.6.8 UX Design (User Experience Design)	355,77	64	22	5,59	1,72
4	76	28	1.6.4 New Human Management Models	355,68	62	18	5,70	1,70

2nd part of Factors in the 4th quadrant

QUADRANTS	Ranking	ID	FACTORS	IMPORTANCE (PROB. x IMP.)	PROBABILITY (Mean Value)	PROBABILITY (Standard Deviation)	IMPACT (Mean Value)	IMPACT (Standard Deviation)
4	77	20	1.4.5 Integrated Innovation	355,41	62	20	5,72	2,08
4	78	105	6.6.5 Cradle-to-Cradle Design	351,26	60	23	5,81	1,94
4	79	82	6.2.3 Technological Adaptation	337,43	61	20	5,57	1,95
4	80	46	2.4.4 New Providers of Financial Services	335,00	67	18	5,00	2,08
4	81	45	2.4.3 Digital Security in Financial Infrastructure	331,43	66	24	5,00	1,91
4	82	3	1.1.3 Distributed Production Near To Consumption	330,47	56	25	5,88	2,42
4	83	13	1.3.3 New Business Models for Integrated Products and	327,73	61	26	5,35	2,32
4	84	53	3.2.3 Nanomaterials	327,42	61	25	5,39	2,17
4	85	41	2.3.2 Collaborative Knowledge Networks	325,47	57	22	5,70	1,95
4	86	90	6.3.5 Inclusive Workplace	321,04	58	25	5,55	2,37
4	87	29	1.6.5 Technological Human Enhancement	318,75	63	18	5,10	1,37
4	88	61	4.2.3 Standards	318,50	59	19	5,44	1,94
4	89	40	2.3.1 Knowledge-Based Environment	312,04	54	21	5,80	2,10
4	90	64	4.3.3 Digital Rights Management	301,83	57	25	5,33	2,29
4	91	87	6.3.2 Human-Robot Symbiosis	301,56	55	29	5,51	2,59
4	92	52	3.2.2 Smart Materials	301,36	55	23	5,48	2,28
4	93	24	1.5.3 Collaborative Regulatory Science	297,64	58	21	5,15	1,92
4	94	23	1.5.2 Corporate Social Responsibility	286,22	56	23	5,07	1,92
4	95	4	1.1.4 Production Near To Skills and Talents	284,81	54	29	5,25	2,38
4	96	88	6.3.3 Enhanced Human Performance	279,63	54	27	5,17	2,23
4	97	91	6.3.6 Attractive Workplace	279,38	54	27	5,21	2,45
4	98	97	6.4.3 Factory Life Cycle Management	275,95	54	24	5,13	2,22
4	99	34	1.7.5 Collaborative Consumption	246,65	51	24	4,81	2,18
4	100	62	4.3.1 Collaborative IP Management	237,02	48	29	4,89	2,49
4	101	93	6.3.8 Community Production Sites	224,60	49	29	4,60	2,46
4	102	5	1.1.5 Production Near To Raw Materials	211,59	46	25	4,57	1,72
4	103	79	6.1.6 Circular Economy	210,71	43	26	4,91	2,16
4	104	69	5.1.5 Servitization	197,54	44	28	4,52	2,41
4	105	63	4.3.2 IP Trade Market	172,01	44	20	3,92	1,72
4	106	94	6.3.9 Demanding Workplace	136,57	35	27	3,85	2,84
4	107	47	2.4.5 International Payments	126,86	32	29	4,00	2,45
4	108	92	6.3.7 Factory as a Good Neighbour	125,32	36	26	3,49	2,32

4th quadrant graphic