DIGIT-FUR

IMPACTS OF THE DIGITAL TRANSFORMATION IN THE WOOD FURNITURE INDUSTRY

FACTORS FACT SHEETS FOR:

ALL EXPERTS GROUPS – DIG, VET, H&S, ECON, FURN

- DIGIT-FUR WORKSHOP, 25th Oct. 2017 - Forecasting the Furniture Sector Scenario in 2025

LEAD PARTNER:

cenfim Home & Contract Furnishings

Furnishing Cluster and Innovation Hub

ASSOCIATED ORGANIZATIONS:

European Federation of Building and Woodworkers

European Furniture Manufacturers Federation

European Furniture Manufacturers Federation

With financial support from the European Union

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1. Factors with HIGH IMPACT (> 6,5) and HIGH PROBABILITY (> 69)

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

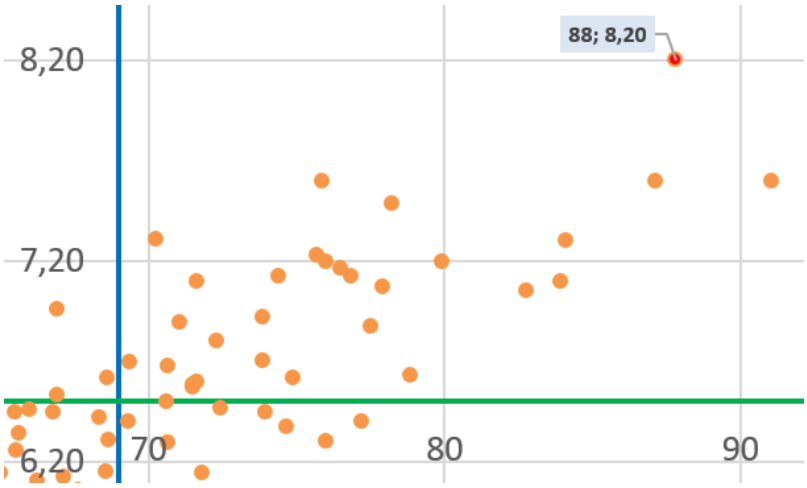
Firms will invest in powerful capture platforms (i.e. based on supercomputing technologies) that will collect and collate real-time data from a wide range of internal and external sources (customer feedback, product RFID tags, machinery, sensors, robots, etc.) and make it available, in a targeted manner,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

Survey respondents comments:

- We can already see such systems increasingly emerging. However, what I expect to happen by 2025 is that not only capturing of such data will increase, but also new analytics methods for the the more efficient analysis and utilization of such data will also emerge.
- Robotics, sensory, etc. will enable good pricing policy products + quality. So good solutions here are necessity for successful companies.
- Both large and small firms. Today cloud systems services go from almost zero to almost infinite monthly cost. The scalability is continuously getting better.
- This will be an enabler for both productivity optimization on the production lines, but also enable fast almost on-line market monitoring to forecast demand changes (sales and production planning) and capture trends for new designs.
- It will generate key information to accelerate and optimize the accuracy of predictions and forecast. To anticipate to costumers needs, and even generate suggestions before the costumers start to ask.

- This will mostly affect large companies and some small niche product SMEs. However, 2025 is probably too close for this trend to fully develop and establish itself.
- Manufacturers use advanced analytics to increase yields and reduce costs. Big data and advanced analytics streamline manufacture value chains for finding parameters for process performance and taking actions to improve them. Big data is used for optimizing production schedule based on suppliers, customers, machine availability and cost constraints. The furniture sector production will not miss out on these advantages.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

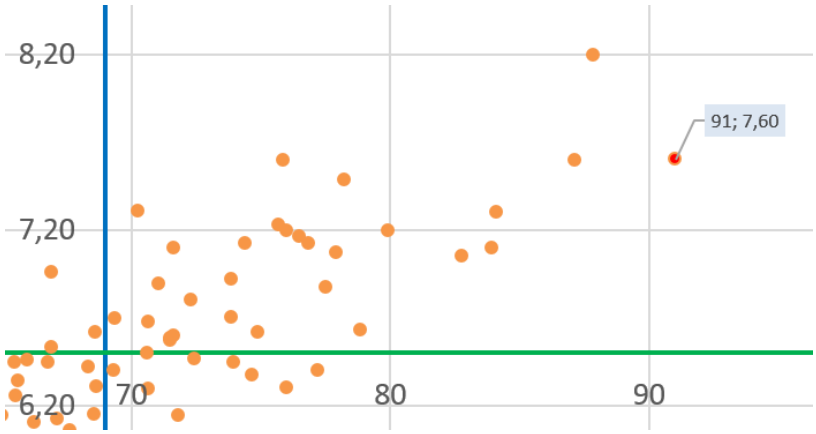
As ICT infrastructure becomes more and more critical for the manufacturing daily operations and the manufacturing network at large, firms will require more secure and resilient ICT infrastructure with a high level of data protection, a stable broadband and no service disruption.

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

Survey respondents comments:

- Although I believe that this will impact the furniture sector, I do not think that this sector will be critical regarding security and reliability requirements of ICT infrastructure.
- Again...this is more a necessity/requirement than "choice".
- Security is a must in the ICT offer, as transparent as possible to the end user. Data Diodes are examples of this.
- This is true for large companies that are going to make the most out of online data communication, ubiquitous computing etc. Smaller companies are not affected as much.
- In an always-connected world, business critical application failures can be very costly for a company in the form of unplanned downtime and data loss. Inadequate data protection and insufficient recovery models can have big consequences. Therefore, the furniture sector production requires secure and resilient ICT infrastructure.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

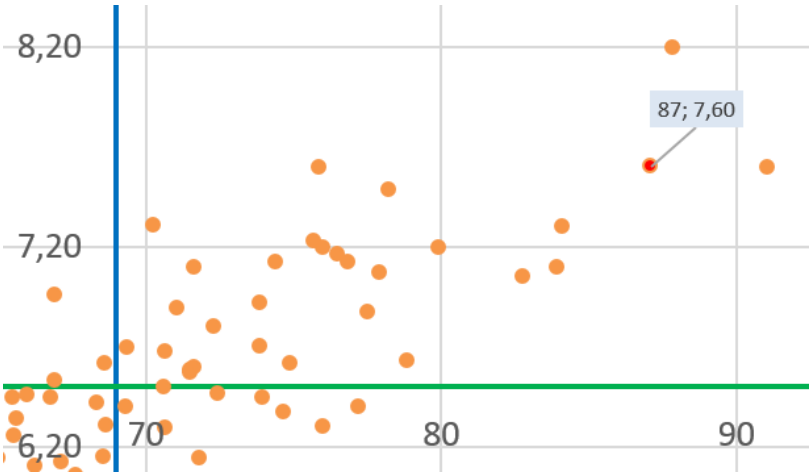
To better use and understand the large quantities of data that will be collected, firms will use a variety of visualisation tools. These tools will be developed to address all levels of expertise found in the value chain from the Big Data experts to the factory floor workers, including managers and executives. 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

Survey respondents comments:

- High-Tech is/used to be very complex field limited to the "few" experts. This is changing rapidly with simple graphical user interfaces, simple gesture and voice commands, etc. So in the future much more people will be able to be involved in the whole process of business - from design, manufacturing to customer. So instead of complex command structures and "linux" like systems for experts it will go more into the "windows click" based solutions for wider audience.
- In practice the use and development of big data is very difficult. However huge investments and developments in this area are being made so it will impact all industries at some point.
- CAD/CAM/CAE systems and cloud with power data visualization is a trend. A example is Autodesk Fusion 360 platform.
- Visualization is key to transform data into value. Some will be sector specific (requires domain knowledge) whereas other areas will be standard off-the-shelf tools from e.g. data hosting companies
- Communication will be in general more visual.
- This will mostly affect large companies and some small niche product SMEs.

- With growing digital data, visuals is more important than ever, because it is getting harder to sift through data to understand what's valuable. Visualizations are the only way to filter out the noise and see the signals in your data. Data visualization tools make it easy to create insightful reports and dashboards, simplifies data analysis and helps people make informed critical business decisions faster. Visualization will be also indispensable to furniture manufacturing.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

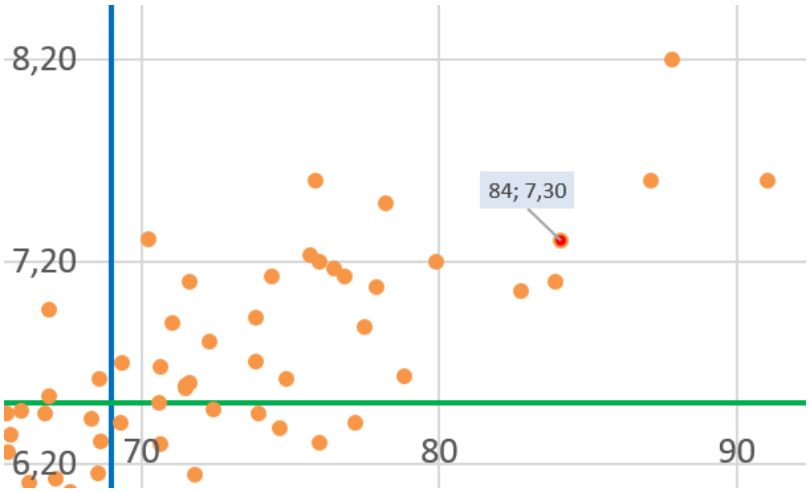
Investment will be made in developing analytical techniques to manage the "big data" collected, permitting manufacturing firms to better understand and optimize all stages of their value chains, and to better understand their markets.

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

Survey respondents comments:

- As stated before, I believe that the emphasis will sooner or later shift form collecting large amount of data to the better processing and analysis of such data. Therefore, advanced and improved analytical techniques will have increased importance by 2025.
- While it is important - for the furniture sector it will be easier to outsource this to the companies dealing with it then rather investing big amounts of money and knowledge into this.
- If the furnature sector continues to lag in automation and digitalization the impact will be very negative.
- Most will buy "analytics as a service"
- Again, mostly large companies are affected. Small companies will come into the picture after it has become mature through the experience of large companies.
- Big data analytics helps organizations to harness their data and use it to identify new opportunities. This results in more efficient operations, higher profits and happier customers. The companies can get value in the ways of cost reduction, faster and better decision making, new products and services with the ability to gauge customer needs and give customers what they want..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

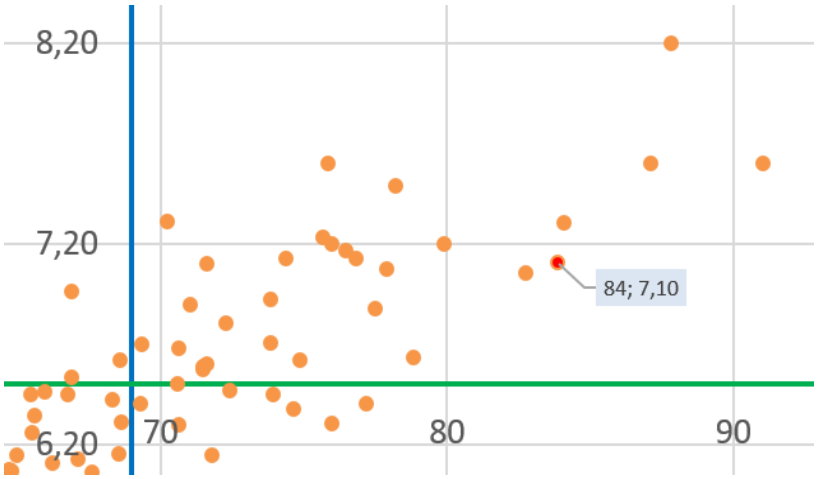
Firms will seek connection to the highest-capacity ICT networks (e.g. Next Generation Networks for convergence of voice, data and video) to answer the increased demand from customers for fast delivery of large broadband services and applications, and to take all the benefits from cloud computing and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

Survey respondents comments:

- I believe that the impact of highest capacity ICT networks and high performance computing technologies on the furniture industry will be still relatively modest by 2025. I expect other more obviously computationally demanding areas (such as fluid dynamics or optimization) to reach their full potential when using HPC by 2025. However, the utilization in the funiture industry could still be relatively modest.
- This is becoming rather necessity in the world we are living then "option" to follow. Good ICT solutions/networks means reliability, speed process up, and makes it more convenient for customers.
- There is no sector specific difference
- Digital value chains from Model Based Systems Engineering to Digital Manufacturing require full fledged communications
- For large companies impact will be more pronounced, but for smaller companies there is more to deploying ICT than strengthening of communication networks and augmentation of speed, i.e. process re-engineering for digitized processes.
- For the manufacturing industry wireless networks ad internet are important for connectivity among machines, with processes, partners and customers. The storage and processing of data gathered

during production and customer data can benefit from the cloud technology, and so can IT task, service automation and business service automation.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

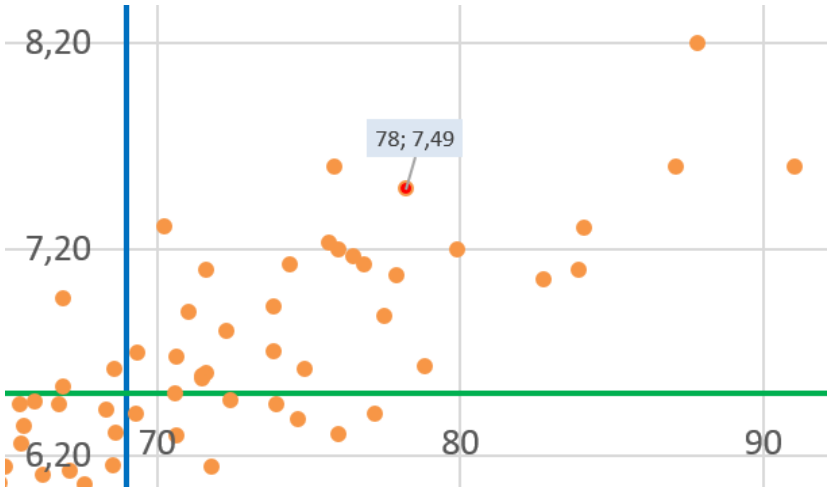
To enrich personalization and customization, companies will work more closely with customers in the design, development and testing of their products in order to closely capture new requirements, including regional and national differences, and to fine-tune new features and services. They will use virtual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

Survey respondents comments:

- Involvement of customers via virtual design environments is very likely to happen in the furniture industry. I expect the technological basis for such environments to be completely stable and widely available by 2025 with widespread utilization of such technologies. As stated before, in areas where the need for individualized product design and customer participation is naturally high (such as the furniture industry), I expect such technologies to be used in the first wave of adoption.
- Thousand people - thousand tastes :) in contrary with previous - customization direction.
- This is already occurring in other sectors such as building design and has started to appear in kitchen design
- Technologies like Augmented Reality and Virtual Reality will be used even more.
- Marketplaces like www.opendesk.com with parametric and open digital models let extreme customization
- The impact will mainly be in the innovation/design phase where virtual prototyping and co-design will ease customer/market validation and reduce development time. This will probably also push manufacturing to shorten time from proven concept/design to market release.
- Technologies in order to develop the standard and portfolio of companies.

- Large companies will use this as a means to mass customization. smaller companies will do so to a lower extent.
- Customers who are not interior designers will need tools to create a virtual designs including the furniture. Virtual reality for simulation and augmented reality for adding elements to real images will be instrumental for such tools and mobile apps will be connected with them.
- It could be an interesting challenge to involve the customer in design, within certain limits. the designer's role will not be completely replaced by customers, but definitely in the details of the product.
- Companies to be competitive have to make these solutions.
- Lead users, open innovation and lower barriers to entry (through crow-funding, decoupling design-manufacturing, etc.) are very general trends, widely used in many sectors. Furniture won't be an exception here. And, as long as design and fashion play a more important role, even more pronounced. I do not know the sector well enough, but I guess that large companies are already taking advantage of this trend. Virtual design environments are but one of the multiple possible approached to increase customer oriented design.
- The companies have to organize themselves because actually customer oriented design is done by the architects and designers.
- I think it is difficult to implement all customers ideas and needs to the final product. However it is happening at the moment and will increase in the future.
- Thanks to internet, the communication through firms and customers is not just in 1 direction (from firms to customers). Nowadays, this communication is bidirectional and let the Company hear and take insights from their own customers. In this line, it's probably that some companies use even more this communication and try to take profit of hear and work directly with their own customers.
- It already happens and it is helping a lot to shorten the designing process and to reduce expenses, In 2025 it will be widely used
- More use of internet and information technology in this process, in some respects less client contact but with more client participation.
- A company who doesn't consider the customer-oriented design in this industry won't survive. The society have other consumption preferences. As previous said, furniture in today is a necessary tool to live at home and not so much as an investment (lifetime furniture). Comfortability, ergonomy and other convenience related attributes (ease to mount, availability, for example) will have to be considered by furniture manufacturers. Big companies in this industry have been doing this homework. But, unfortunately, an high number of small companies, today are still designing their products without a previous research on the trends or market needs.
- User Experience and Customer-Centered Solutions will be the origin of the major of the process in the future.
- VR is kind of antinatural
- Companies will work more closely with customers in the design, development and testing of their products as "need" for new "customer orientation" models and adapted to regional and national differences to ensure future success.
- It is practice today. It will grow
- Yes because the technique give this opportunity.
- This is an important trend, but difficult to implement.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

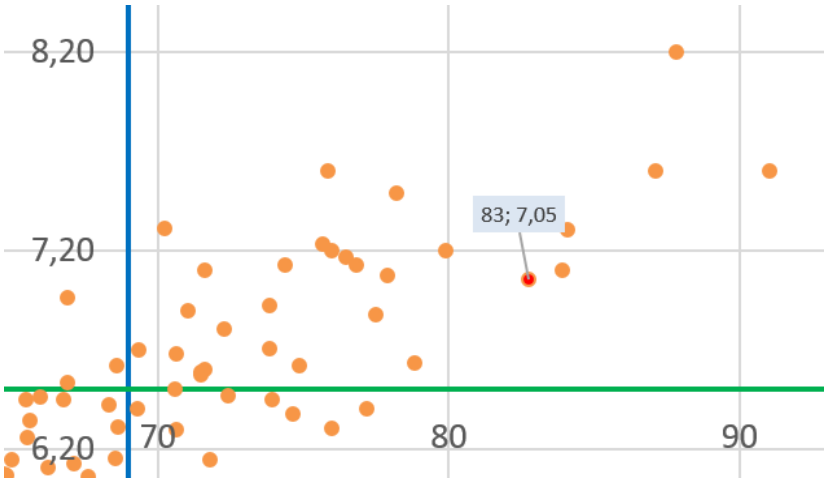
With the Big Data explosion, the sustainability of the knowledge infrastructure - and mainly the issue of collecting, collating and archiving valuable information in secure digital storage media - will be increasingly important to companies. This includes for SMEs that will rely increasingly on cloud 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

Survey respondents comments:

- Although knowledge infrastructure and big data is likely to play an important role in the furniture industry by 2025, especially when related to mass customization, I do not expect data protection and privacy to play a leading role within this particular industry. +EF7:EF59
- It is a general direction presently and by 2025 this will still be an topic but hopefully much more improved one that today. On one side there is more and more data, more computer/computational power on the other side there are more and more companies dealing with this (and also threat of safety and security of data). But this is ongoing and most of the businesses must go along with it. So it has impact...but it is understandable so.
- Again this is not sector specific
- Cloud computing providers offer now a high level security levels. Confidentiality contracts are needed as it have been happening with classical services in areas as healthcare or consultancy services.
- This is THE problem to solve in other sectors, such as metal-working, aerospace, automotive etc., too.

- Significant achievements in software and technology allow companies to collect and analyze data, yet the companies struggle with the challenge that the increased access to data presents. Data protection and privacy becomes very important for all industries including furniture sector. Data analysis enhance the value of the data being collected increase the potential for better and real-time decision making.
- Closer customer relationships in furniture will require more personal information about clients.
- Issues around data protectionism are one of the key aspects with accelerated growth in any company, having each time more and more information stored about production processes, opinions of customers and other valuable information that need to be secured.
- All companies will need professionals in cybersecurity, independently of their size because each one will get a lot of data which need to be protected.
- Also to deal with the legislation on privacy
- There will be already some difficulties concerning cloud storage, data protection etc... with the new EU privacy rules (amy 2018 !!!). There is a whole new challenge for gathering information and big data, and complying to these new EU rules.
- The trend is certainly relevant in general terms and for large enterprises at the end of the value chain, but most SMEs will probably not become clients of data services and continue to rely, as long as possible, on their knowledge of the specific/traditional market.
- it will be really impacting for large companies but less for small one which are not ready for that at the moment and i cannot see it happen in 7 years time..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

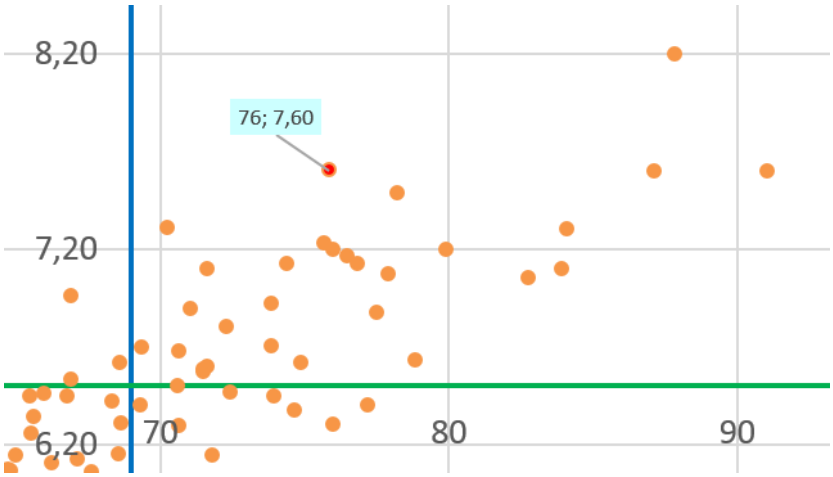
Firms will aggressively compete for high-skilled workers worldwide as local supply will not match the demand. Advanced manufacturing systems and technologies, required to remain competitive in a global market demanding personalized products and services, will need a wide range of highly skilled staff 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

Survey respondents comments:

- High level of customization and personalized design will see the demand for highly skilled personnel to increase dramatically. This will not only be evident when supporting the design and the manufacturing process, but also when analysing the large amount of data collected from various systems along the value chain. Big data analytics and its influence on the planning and manufacturing process, distribution and marketing will further increase, raising the demand for such highly skilled individuals.
- It is already a case in some developed countries (e.g. Germany) - lack of skilled people - and on the other hand from other countries people are leaving to better paying countries leaving those countries without good labour.
- This is happening today in Denmark
- In some countries there are sparse resources, but in many countries where we outsourcing the availability of qualified competence is not that big an issue. The digitalization makes it possible to utilize these resources globally. The production and design can shift to countries having available resources

- Advanced manufacturing systems will be shared by product designers, so talent is needed to design, build and run manufacturing facilities and talent is needed to build, design and sell final products. Those can be at independent geographical locations.
- The buying situation will shift towards e.g. using augmented reality to preview setting, select models and maybe customize the furniture. The sustainability trend will favour those being able to tell the good story and live up to it in reality through e.g. materials traceability. These are just examples of trends requiring the mentioned skills and talents.
- Educational institutions will most probably have catered for any shortage of high skills by 2025, but also globalisation of economies will compensate for shortages in one country by surplus in others.
- By deploying latest technologies and creating value for society, the sector needs to attract young people. The teams will need to be multidisciplinary and include staff from all relevant technology areas. Companies need to work with educational organizations to assure that the knowledge and skills of the graduates matches their sector's needs. The professionals from companies can give lectures at the educational institutes or training can be offered in house to develop the right skills
- A few months ago I wrote an email to responsable head of furniture professional association, which was later published in its association bulletin, in which he urgently demanded policies to encourage training in the sector of wood and furniture Because, I thought, companies would suffer from a much more serious crisis than the one we had just passed because there would be work but there would be no technicians to carry it out. In fact, it's already happening.
- The trend is likely to happen, but it seems questionable if the effect on employees in furniture manufacturing is significant, as the bulk is not high-tech jobs. Still it might be relevant for specific employment categories and markets.
- Data is and will be the most powerful tool to companies. However, data collection can't be a tremendous " Cemetery" of useless information as, currently, sometimes, happens. It will be necessary to collect the right information, to focus and add value to business. For this propose high skilled workers, with a strategic approach and very strong digital skills will be crucial to the sector.
- This is what's already happening
- Demanded skills and talents for 'Industry 4.0' will be more 'abstract'. Nevertheless, there still will be 'some' markershare for more handicraft skilled workers. In general, there will be a stronger 'split' between operators (lower skills demanded) and technicians/engineers (higher skills demanded)
- I believe it will happen only in the larger firms and in a few innovative smaller enterprises, so the impact will be relevant on the whole working on the industry, but will contribute to concentration.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

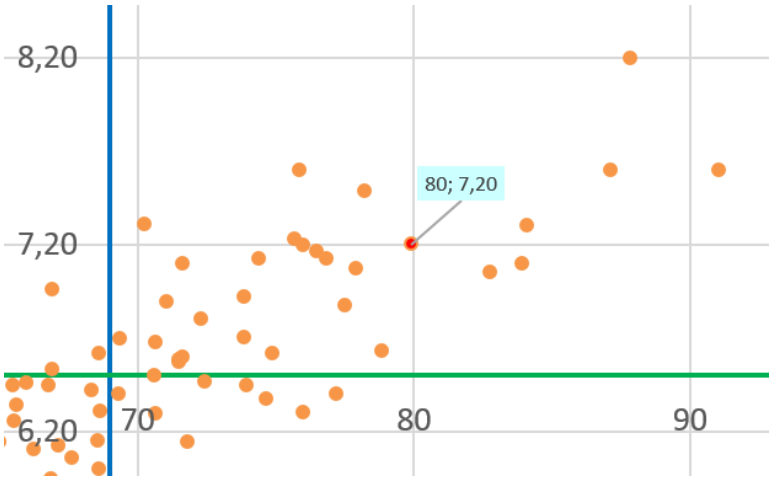
To optimise their global, fragmented supply chains and ensure safe and fast delivery, manufacturing industries will increasingly require upgraded physical infrastructure networks that are more intelligent, resilient and secure. These networks will be more and more integrated.

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

Survey respondents comments:

- This is (again) not need just for the furniture business but it is a necessity for practically most of the (manufacturing) businesses. The cost is of utmost importance and to achieve good prices one has to optimize and upgrade all aspects of the infrastructure.
- If you are to survive as an industry it is necessary to automate, and digitalize. This requires the modern infrastructure and energy effective factories
- A global SOA architectures let interoperability and unlimited orchestration combinations.
- Transparency and sustainability in the whole supply chain - including your suppliers - is becoming an integrated part of doing business
- Efficiency through optimization in supply chain and logistics will be for almost all sectors applicable.
- This strongly varies with location even with production systems solely located in Europe let alone in globalised production systems. Infrastructures are not easy to develop within 8 years...
- Although the operations of a company is rooted In the specifics of the furniture industry, network structures should not be narrowed to this industry, but looked from the perspective of the industrial network structures. IoT and ICT technologies and managements software enable to optimize and integrate infrastructure networks. The furniture sector needs to participate and

benefit of these developments to increase the quality and reliability of their operations and services.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

1.7.3 Personalisation

FACT SHEET ID 32 // Working Group: FURNITURE

Factor:

1 - Business Environment

1.7 - Customer Involvement

1.7.3 Personalisation

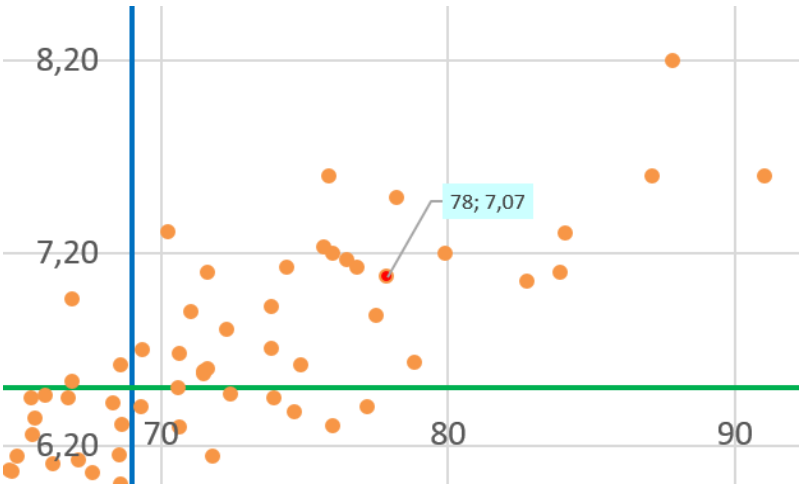
Firms will increasingly focus on the personalisation of their integrated products and services, allowing their dynamic modification according to the user's preferences and behaviours.

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

Survey respondents comments:

- the activation of services in addition to product customization is the future of the furniture sector. Personalized products with complementary services that make the product even more unique is the future challenge. Hybridization of products with services is difficult to implement in this area, but will have to find solutions to make products more and more distinctive.
- The need for a customization of the product is one of the most relevant trends in the furniture markets, so it is expectable that more and more companies will compete on this aspect, upgrading their production processes in order to offer this service to the consumer.
- Companies to be competitive have to make these solutions.
- Some easy forms of customisation are already being used and will be more used (personalization through printing, colouring, etc.) More coming tied to increased digitization of the offer (integration of digital goods and services into furniture) For the mass market, I would bet more on a faster turnover of designs and offering, so as to create a feeling of exclusivity, an urgency to buy and a sort of "programmed obsolescence" of designs (i.e. the zara model in furniture)
- All the furniture sector is doing steps on it and it is very important to be efficient on customisation the final step. It is happening now and it is where the sector should go to compete with large and globalised companies with low scale economies.

- this is not going to happen for all the companies (low-cost companies will be in the market also for 2025) but, in general, i totally agree with this point. The future is going to be polarized between the value for money optimization and the personalisation of the products.
- This will be a must. It happens already in the car industry. In the furniture industry the indidual customisation already exists but we need to get it cost efficient
- Specially SMEs (+90%) that will produce personalised furniture in order to survive in an competitive environment where big corporations will dominate the distribution channels.
- It will always depend on the market and the perceived value by the final customer (and willingness to pay for it)
- After the all-chinese will come the all-unique
- Companies will allow customers to personalize their products directly.
- This is not the future as it is the present.
- The tecnique give the companies the opportunity to fast se what people "google" and meet that with new products and design e.g.
- I think that furnitures and living systems will become adaptive to different phases of life or to progressive user's modifications.
- I would not say this is a concept for niches but it already exist and becomes easier feasible but will not penetrate the sector as a whole.
- The end consumer wants personalized products..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

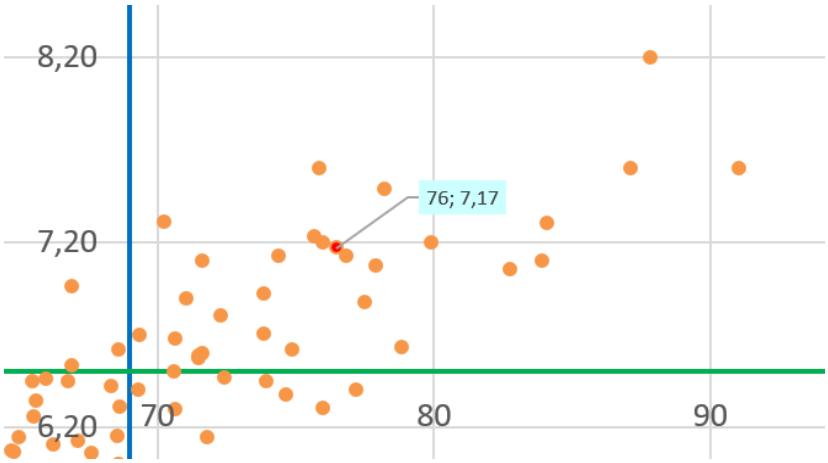
To answer increasing customers' requirements, firms will still seek to maintain the cost-efficiency of mass production by integrating the highest degree of flexibility in individual customisation and differentiating the product/service at the latest possible point in the supply chain.

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

Survey respondents comments:

- As I expect individualized production costs to decrease (e.g. via technologies such as 3D printing), I expect that customization will be put to earlier stages in the supply chain.
- This is one area where furniture business could find new business models - as a comparison - pharmaceutical business in close cooperation with genetics research advanced will most probably start producing customized medicines for each individual based on the genetics. Same could be expected here since people value their furniture and also many times needs special dimensions, styles, etc. - so making space for this kind of innovation & business potential.
- This is happening today in Denmark
- Modularization is already considered carefully and this becomes even more important to keep tailoring cost down.
- Carpenters 4.0 as a integrators and local solutions providers
- Trend of configurator automated tools as car industry, to apply certain limited standards on customizing the final product.
- This applied mainly to large companies, whose market share is going to increase further. Modularity in product design and manufacture is also probably an answer to shifting product customisation further down the chain.

- Digital tools can unlock the opportunities of mass-customization for consumers. An online tool can enable to customize a furniture piece. For example with a palette of modular parts, customers can design their furniture. The parts for the particular design get added to the production schedule only after the customer place your order. That manufacturing-on-demand model helps control costs and decrease stock. Based on the design the logistics chain can puts the parts together for shipping.
- Companies to be competitive have to make these solutions
- Some easy forms of customisation are already being used and will be more used (personalization through printing, colouring, etc.) More coming tied to increased digitization of the offer (integration of digital goods and services into furniture) For the mass market, I would bet more on a faster turnover of designs and offering, so as to create a feeling of exclusivity, an urgency to buy and a sort of "programmed obsolescence" of designs (i.e. the zara model in furniture)
- All the furniture sector is doing steps on it and it is very important to be efficient on customisation the final step. It is happening now and it is where the sector should go to compete with large and globalised companies with low scale economies.
- firms will be struggle between the maximum cost-efficiency possible (which means mass production) and the customisation required for the customers. For this reason, the only way to adapt to this trade-off is to move to the latest possible point in the supply chain all this customisation.
- This will be a must. It happens already in the car industry. In the furniture industry the individual customisation already exists but we need to get it cost efficient
- More competitive pricing, more demand on lower costs.
- We already have to do something similar, customizing pieces of furniture once the process is almost finished, but, taking into account that we have to offer a wide range of products, the cost efficiency of mass production disappears. I don't think this is very feasible in our sector (especially if you offer high end furniture in different woods and lacquers)
- In fact, whether or not with the use of ICT, the furniture industry, mainly when we consider SMEs, follow mass customisation procedures. They offer a wide range of possibilities for combining finishes, sizes and even customise furniture, through the traditional distribution channel. By using ICT (product configuration tools, home planners and so on) mass customisation practices will increasingly be developed in the furniture industry, specially in SMEs.
- I do not think that this is a generalizable approach, there will be companies that will explore this line, but others will remain linked to distribution networks and, as a result, mediated by them.
- There will be long-tail companies taking care of the specialisation / customisation of the products. Individual customisation and at the same time mass production can not live together.
- After the all-Chinese will come the all-unique
- Individual customization and differentiation of the product / service at affordable costs will be the key to future success.
- This is not the future as it is the present.
- To mix effectiveness with personal touch.
- I agree. It's the same model of the fashion system. We will see a large number of finishing and variations on the same mother model.
- What we will see could be more the trend to have mass production with a very high and growing flexibility.
- Make-to-order is more interesting for the furniture industry than mass customisation.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

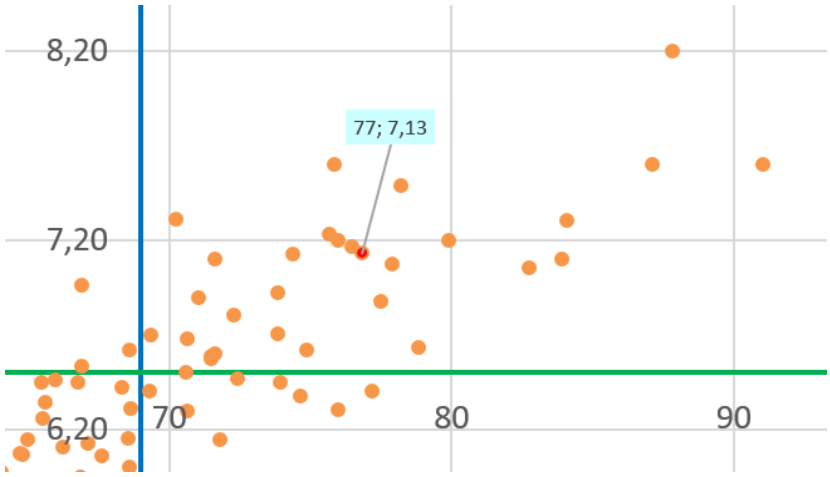
Robots with increased dexterity and intelligence, as well as a capability to work safely with human work forces, will enable an even higher level of automation and for factories to reduce variability, to increase flexibility and speed of their production processes, allowing the delivery of more complex,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

Survey respondents comments:

- This is coming and it will have a huge effect on how business is done. Effective and safe implementation of robots in industry will allow: - less waste; - more efficient production; - customized solution (within product range of course);
- Same with all industries
- Classical and expensive robots only if necessary. Cyber-physical systems can include partial robotics functions
- Main driver is optimization of the production processes. Especially in a labour intensive sector like wood furniture with recruitment challenges.
- It is something already happened in other sectors
- Both large and small companies are expected to benefit from new generation robots becoming available as helpers of human workforce (cobots etc) or stand-alone automation. However, 2025 may be a little too close for this trend to fully develop.
- New wave of manufacturing rely on technologies leveraging artificial intelligence, autonomy, 3-D printing and other emerging technologies to make industrial robotics more affordable for businesses of all sizes and adaptable for many uses. Advanced robotics will be widely used in

production but also in warehouses to ease logistics. Furniture sector will need invest in these technologies like other industries to be competitive.

- To have competitive prices, we will have to reduce our workforce, so, thanks to highly automated factories we will be price competitive.
- Sure, furniture companies (as the KIT furniture producers) run almost without human work or interaction at the manufacturing lines. On the other hand, software or maintenance workers are highly required.
- for big factories only
- Robot will substitute skilled workers as they will not be available..
- This is a major tendency for the evolution of industry in the years to come. I have nevertheless some doubts about the fact that it will translate in "working safely with human work forces". Increasing of Muskoskeletal disorders and Psychosocial risks could be a result of the use of these new techniques if, as it is possible or even likely, not enough care is taken in health and safety.
- The investment in such technology is too high for most of the firms in the sector, by 2015. To big companies this will mean a great impact in productivity quality and safety.
- Robots will take over the dangerous and heavy work and thus minimise problems such as musculoskeletal diseases or exposure to dangerous substances (dust, solvents, coatings etc.). With an increased use of robots, the number of "human" workers will be reduced. Remaining workers will feel isolated as personal relations are replaced by virtual contacts.
- As this scenario appears like the perfect trade-off between efficiency and production costs for companies, I consider it very likely that robots will be used more frequently especially if they allow to lower labour work costs. Robots will not get tired during the working day and will produce the same quality results throughout the entire day and night without being exposed to the same safety risks like humans are.
- Automation of manufacturing processes is rapidly increasing in all sectors. The question is the capacity of SME to invest in automated processes or if they should aim towards other strategies.
- The furniture industry is 30 or 40 years behind in the car industry. It is clear that the paths are parallel but three further steps.
- Large efficiency gains are possible in furniture manufacturing
- Robots will change the industry perspective. The growth of automation threatens many highly qualify people, as software designers. (Martin Ford - Rise of the Robots Technology and the Threat of a Jobless Future (2015) and not only workers with repetitive tasks.
- Due to the development of these kind of robots, this is inevitable, just like other technical developments in recent years with high impact on the production
- INDUSTRY 4.0 !!! all machines communicate with each other. Humans will be controlling the processes (double checks, as the control also will be done by robots, computers etc...). Humans will not be processing themselves anymore. Only in a small 'niche' there will still be the need for handicraftsmen.
- As in the Polany's paradox the Robot won't entirely substitute us, but the mix human and robot it will efficiently coexist..
- Innovators are very optimistic and pushing for incorporating more industrial robotics with additional industrial applications. Although there is fear that robotics take away jobs..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

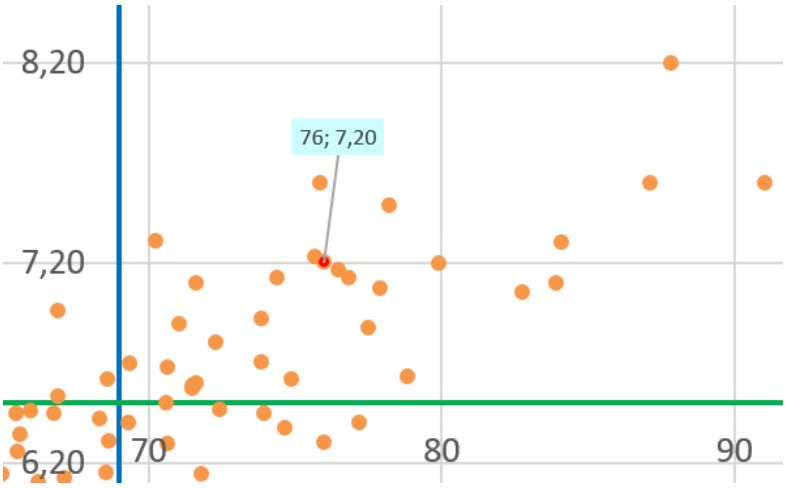
Consumers will increasingly be engaged in the development of innovative solutions that build on their experience of current products and services. Web-based forums (i.e. “virtual customer environment”) and other ICT solutions will help firms to consult their customers at all stages of development.

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

Survey respondents comments:

- Consumers will appreciate and benefit from much higher possibilities to customize and even co-design their own furniture. This can be a real opportunity for furniture industries, although the implementation is surely challenging.
- Customers are more and more involved along the supply - value chain. In 2025 they will one of the parties on the process.
- consumers will no longer accept the fact that when they buy something, the message is: you hear from us in 8-10 weeks
- See also Kick Starter projects, where ideas are in search of financing and production means. If furniture industry does not take these kick starter projects up, they will loose market share and others will take in these places.
- Today Ikea and Apple (with Iphone X) has already provides the first beta test of VR and AR. Google has already experimented it with the Tango project. Our sons are already using "propioceptores" more then us. The future is ready!!
- again, we already have some experiences in France on the subject you also have IKEA already engaged in this way.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

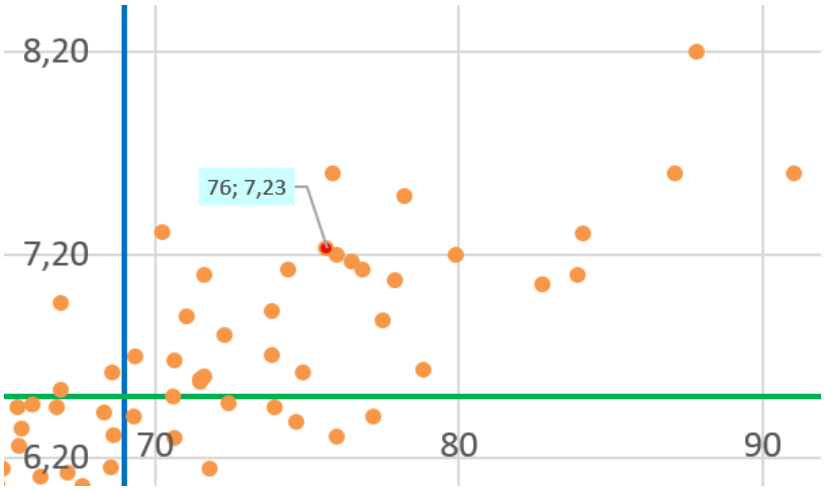
In their attempt to integrate more and more complex value chains and to deliver highly personalised products and services with high frequency renewal, companies encounter bottlenecks in establishing, optimising and managing the internal and external logistics within the supply chain. Consequently, they 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

Survey respondents comments:

- I expects smart logistics tools to have an increasing importance at all areas of manufacturing, including the furniture sector.
- Probably one of the most important topic after price in furniture business. Again...everybody who bought a "bed" and waited 7-10 weeks...knows the issue very well. Effective solutions will have huge impact.
- Cost of these tools will be reduced drastically within the next years.
- This is happening in large companies and is expected to expand further.
- Technologies such as mobile robotics systems, modular flexible and scalable automated logistics equipment, IoT technologies enabling real-time data transfer and big data analytics, automated agent based via cloud will allow the creation of the smart connected logistic systems with significant efficiency gains and cost savings. The whole logistics concept will change to belong to the factories of the future and the furniture industry logistics will adapt to take a part in it.
- This matter is a problem at the current times and will become a higher problem in the future with problems with means of transport. How to locate products difficult to be transportated will be key.

- This scenario is going to change the management of the Factory making it much more complex. In this transformation, new profiles are going to be needed in order to understand and manage correctly the tools that are going to optimize the complex supply chain in the companies who focus in personalization.
- We have tools for that and it is already used in many business It is a need
- Better logistics always means better service and happy clients
- Route Optimization Tools or Convenience Solutions (Same Hour Deliveries) will be the future in logisitics. New arising companies and technology will help to implement it, improving service and reducing cost. An example of collaborative solution is UBER, that has become an exceptional service reducing the final price to customer. The question is if technology will help to improve the life balance of the logistic companies and will only help to reduce costs to final customers.
- Because of the volume in the furniture, its difficulty in composing them and volume is one of the most significant challenges in the Sector.
- Cost advances ratio will call for securing info on the status of goods.
- The new systems esp. RFID systems become cheap and more and more inexpensive so they help enterprises to improve cost effectiveness.
- I do not really believe in the production of highly personalised products by the big firms and factories of the furniture sector (and I have the same point of view for many other industrial sectors). But I agree with the will of the industry to be able to deliver faster.
- Not so much available by 2025; with great impact if applied in bigger companies where is mostly needed. Some aspects of creativity may be impaired other will be stimulated; it might generate stress and inappropriate estimation of workload of using such solution which is not effortless and needs perpetual updating.
- Thanks to the possibilities interconnected logistics tools offer the overall performance becomes easily enhanceable and will thus be improved.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

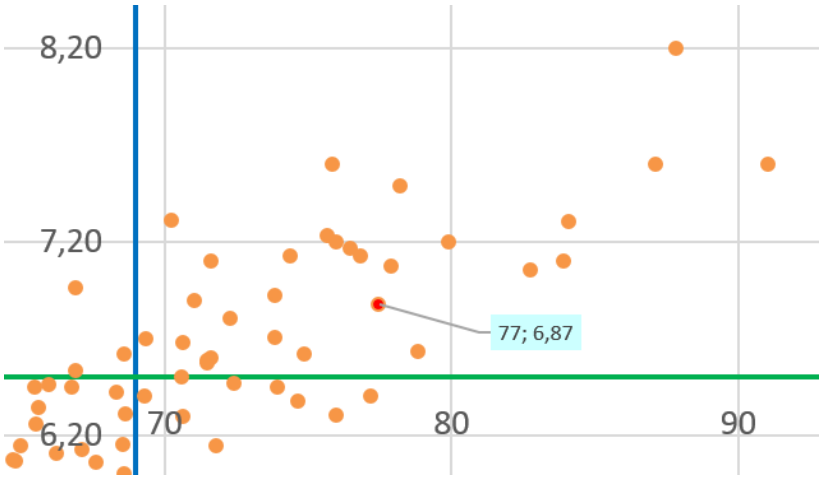
Environmental, regulatory and societal pressures will force manufacturing firms to adopt greener production processes so as to improve resource and energy-efficiency (e.g. maximum productivity of materials, optimisation of energy flows) and reach minimal environmental impact (e.g. near-to-zero CO2 emissions,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

Survey respondents comments:

- Although these factors will be important and dominant by 2025, their impact on the furniture sector will not be greater that on other manufacturing sectors in general.
- Companies will do it "minimum with compliance" as long as it effects revenue stream and in turn effects pricing and margins. Motivation is financial and not environmental.
- This trend is strong - both from consumers, but also from B2B customers who want full transparency from their suppliers
- Current industrial processes are absolutely far of target, therefore the impact should be strong if regulations are fixed.
- This is already happening in other sectors, but will strongly depend on sector-specific directions and legislation coming into play before 2025.
- Sustainable manufacturing minimize negative environmental impacts while conserving energy and natural resources, and also enhances employee, community and product safety. A growing number of manufacturers are realizing substantial financial and environmental benefits from sustainable business practices. Furniture industry will also use economically sound processed to produce.
- Hopefully this will be forced by global agreements that will force through hard regulations to move industries and manufacturing to near-0 CO2 emissions.

- It will be of importance in finishing processes based on varnishes and lacquers
- To survive on the market the companies need to go this way. The regulation will be tougher and demanding to follow the regulations.
- I see an increasing pressure in this direction coming from the civil society and the political field. For high market segments there will be nevertheless enough space to provide products based on a high energy and material consumption.
- Because of customers´ demands and societal pressure preferring green products combined with legal obligations for low emission production and mandatory recycling of products (i.e. furniture) by the manufacturer.
- These changes will translate in growing costs of production. The industry will have to cope with that.
- By 2025 such changes would apply to a limited number of companies. The impact on those that will could be high, for reasons of renewed technology and supply chain.
- Manufacturing new materials will need knowledge about the properties and workability of the material. Workers will be exposure to new substances with new/unknown risks. Workers will have to be trained in managing new machines and new technologies.
- Greener Production is a main driver already for current but especially for upcoming economies. As the numbers and varieties of allergies and allergens has constantly increased over the last couple of years so will the demand for greener and healthier products that will be used in offices as well as in private households.
- Increasing consumer demand for greener and healthier products will pressure manufacturers to adopt greener production processes but most importantly the pressure will come from increasing energy prices that will impact on production and transportation costs
- The furniture industry (and wood) would have to have, in these environmental strategies, its own barn stick and it should be the mirror for other more environmental impact industrial sectors.
- Very important, and it is already happening in many countries.
- Because energy as well as commodities will be less available
- legislation and EU-rules will force the furniture sector to be more 'green'
- It's a virtuous circle : Recycling means to collect materials, to create "new " composites through the use of "new" technologies, and for the designer and companies the opportunity to have a good and "new" story to tell to the customers (..we will have also "new" customers)
- It is already on going, but the driver is more often the cost !.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

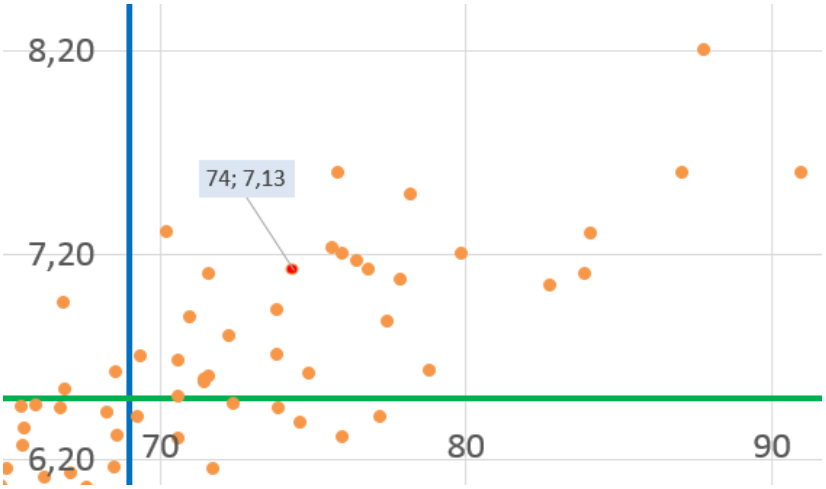
To maintain their competitive advantage, companies will become more sensitive to changes in the demand and will consequently ensure the flexibility of their supply chain and the fast re-configurability of their production lines (e.g. through self-adaptive and modular machine tools and robots).

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

Survey respondents comments:

- It will also happen and it will be desired - but implementation is hard and not all will be able to do it. But upon successful implementation it will bring very good results to the companies.
- Same with all industries
- Production Lead Time will and should be shorter as the supply chain is optimized.
- Flexibility and customisation depends on this. However, reconfigurability may be achieved in different ways. Large differences will exist between large and small companies, both pursuing the agile manufacturing model.
- Agile manufacturing permits rapid response to customers by turning speed and agility into a key competitive advantage. Consumers value instant gratification and they are often willing to pay for it. Manufacturers can achieve a significant advantage over global competitors by leveraging proximity to local markets to deliver highly personalized products with high speed. Agile is of particular interest for manufacturers in countries with developed local markets and high labor costs.
- Exactly the same way the products will be more customized and adapted to the customer requests, the supply-chain, the lay-out and the configuration of the production lines should be flexible in order to adapt to this changeable environment.
- We are already working on it.

- Modularity in the manufacturing is a trend that companies will have to follow to adapt theri processes fast and flexible to new changes and volatility of the markets.
- The flexibility of the supply chain and the rapid reconfigurability of the production lines will ensure that small and medium-sized enterprises remain on the market.
- Other industries have already developed further in this area.
- Because of the demands of the big furniture shops and chains to innovate and change permanently their collections!
- The same way as for some previous questions, it is difficult to give a unique answer to that question. If there is only one "Furniture sector", there is and there will be different kind of firms in that industry. Some will need to use sophisticated (and expensive) techniques, others will not be able to afford them (and they will not need them).
- The investment in such technology is too high for most of the firms in the sector, by 2015. To big companies this will mean a great impact in productivity quality and safety.
- This may apply for large companies. It will require a very flexible production, workers who are able to react on new tasks and who are able to programme the machines and intelligent tools. This may put workers at stress and increase psychosocial risks. They may feel overburdened.
- It is important but might be less relevant in furniture than in other sectors, because furniture products have a long life.
- The changes in demand, the changes in the customers and their needs, changes of physical areas, the circulation of information , the increased availability of information to customers and the increased competition between producer demands adaption, personalization of products.
- Just on time will be a driving force and for that goal industry need to be very flexible.
- This will be essential to survive
- Fast adaptation to new customers, new demands, etc... will become more important. This could be in the advantage of the smaller companies (SME's)
- That it's something that it's already in the "nature" of the Italian furniture companies. Anyway these companies need to be receptive to the new techniques in order to not loose competitiveness.
- True for large companies. SME are far away.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

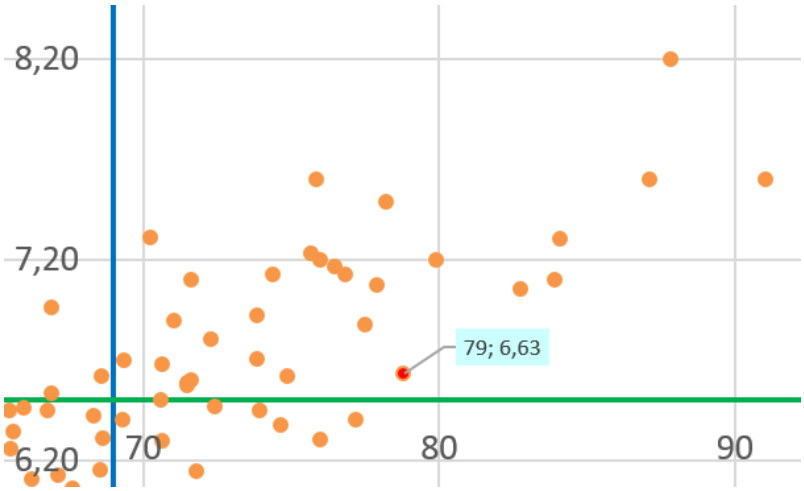
An increased number of niche industries will develop, often in very technical and specialised areas. These niche industries will work in loose alliances with other companies to produce the personalised products and services that consumers will increasingly require.

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

Survey respondents comments:

- Furniture industry firms will have to specialize in very specific products, then join with other companies to form a complete product system made up of so many highly customized and refinement parts
- The customization and diversification of the product is a trend that already affects the European furniture industry. This requires European companies to rely on artisanal skills and/or very specific technical expertise (e.g. in the processing of the different materials: wood, plastics, glass..)and will lead more and more to the development of niche industries.
- Companies to be competitive in the global market must develop products, articles, and custom services. For this reason, there will be agreements with small and specialized companies.
- I believe that these niche industries may become very important for established companies. Niche companies will drive the change in processes and hence become potential M&A targets, from which the forms may benefit in processes and effectivity improvement. I believe that niche companies will me main driving force of Industry 4.0 revolution.
- I think this is a no-brainer. It will always happen as long as it is easier to manufacture "custom designs". Therefore, I think the likelihood of this happening in the furniture sector is very high. Furthermore when, also likely, specific customs needs may come from specialised demand. A different question is whether the impact is going to be "significant" in term of total

value/production/etc. I do not see this "niche" play strong enough to have a high impact. In other words, likely more qualitative than quantitative impact

- This is it, specialization will be the only way to compete with large globalised companies. As information is reached easily by everybody, specific knowledge will be crucial to compete and to offer extra value.
- As in many other sectors, my possible scenario of this sector in the next year is a polarized sector. There is going to be bigger companies more vertical integrated but also there is going to appear very specialized companies which are going to take advantage of their flexibility and adaptation to the market. This specialized companies will Search for the biggest insights of some customers and focusing as a Company just in solve this insights better than no other Company. The rest of the value chain will be externalized to loose alliances.
- This scenario is the most probable, but with poor impact because the size of market share will be small. We have to take into account we are talking about market niches and not segments.
- Same response as before. Furniture sector will follow the same trend as the High-Tec sector nowadays. Niche specialised companies will arise that will help the final customer to personalise their furniture.
- Niche industry = small overall turnover within the sector. But yes, for personalized / tailor-made products, such alliances make all sense
- They will be the niches that can save small and medium industries.
- Tailor made manufacturing in bulk has a great future. Only modern developed technologies may bring necessary productivity.
- Diversification of styles and tastes will grow
- I agree. In a sense, It's already true for the Italian market, where a large number of craftsman industries helps big firm in any specialised phases, for example tissues embroideries, cabinetry, etc. I can imagine a shift of the same phenomenon from the handicraft to the new technologies.
- I scored here relatively low because of the simple fact that the sector already has a very high level of personalized products. Digitalisation will however allow to become more flexible in various aspects of a more personalised production.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

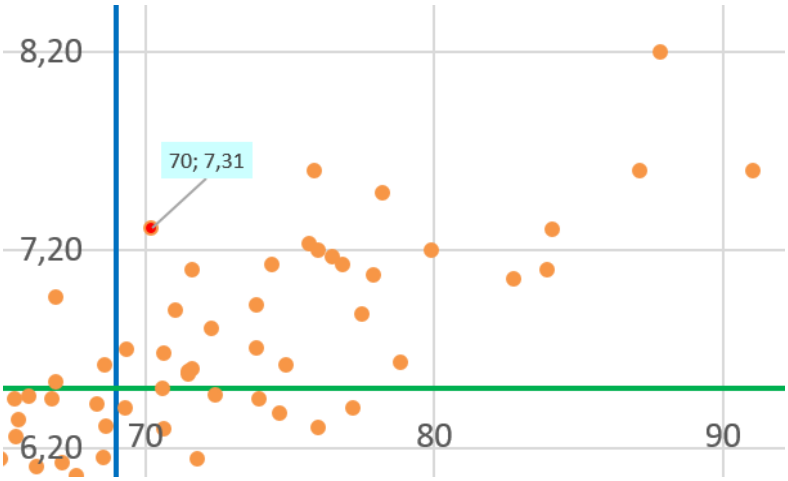
ICT-based virtual environments, allowing the real-time monitoring and visualisation of inter-organisational flows and the sharing of skills and knowledge, will add value to the product-service value chain by enhancing supply chain management of globally dispersed production processes and complex firm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

Survey respondents comments:

- Companies will be able to control the supply of raw materials, but above all they can be more incisive in customizing the product. To be very customizable products, businesses need to be equipped to meet more and more niches, creating unique products for each customer. Already today the direction is this and technology can surely accelerate this process.
- Companies to be competitive in the global market need to develop interactive systems.
- Better monitoring will lead to better spotting of wasting processes and actions and hence to improvement in effectivity of processes.
- This will be significant only in large companies, vertically integrated value chains.
- I really think that supply and client will become connected on different basis such as EDI, etc so it will mean that the lower value chain part will know about all the information about their supplier, and will do their suppppliers too etc. Interconection for data (better comunication sistems) will be crucial.
- As i wrote before, i believe more in the vertical integration than in this inter-organisational cooperation. However, both scenarios are possible and it's clear the big advantages of understand and monitoring the skills and knowledges of all the value chain. For this reason, no matter in which scenario will be for the future, it's going to be a big impact in the furniture sector through the

opening the scope of the value chain and sharing the skills and knowledge between the different steps and players of the market.

- It would be relevant in order to optimize time and cost but it can be only possible in big production units
- Although this scenario is the most probable for technological industries (knowledge industries), this new kind of organizational model of companies (network company), characteristic of the new economy, due to economical and social transformations, in general, won't be applicable to the furniture industry, unless in big companies. This assumption is stated due poor technological impact in the furniture industry (at the end of the queue of the knowledge economy), sector composed by more than 90% of SMEs under 20 employees. Moreover, the use of this model to control the supply chain by big companies will be high impact in the sector because that will improve the efficiency of logistics an so the competitiveness of big corporations. In this scenario SMEs (majority of companies) will suffer a great loss of competitiveness. SMEs operating in market niche probably resist better in this scenario.
- It already happens in my company. Our customers can continuously monitor our processes and production. We are also in terms of IT vertical integrated to optimise operations flow (DESADV Systems)
- Yes. It is a trend and a positive one, but the impact at local level is average. You have more information, can take better decisions, but it doesn't help with strategy; it is just a tool.
- It is not easy to apply extensively for the entire furniture sector
- Reducing risks of stock . Reducing time to market.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

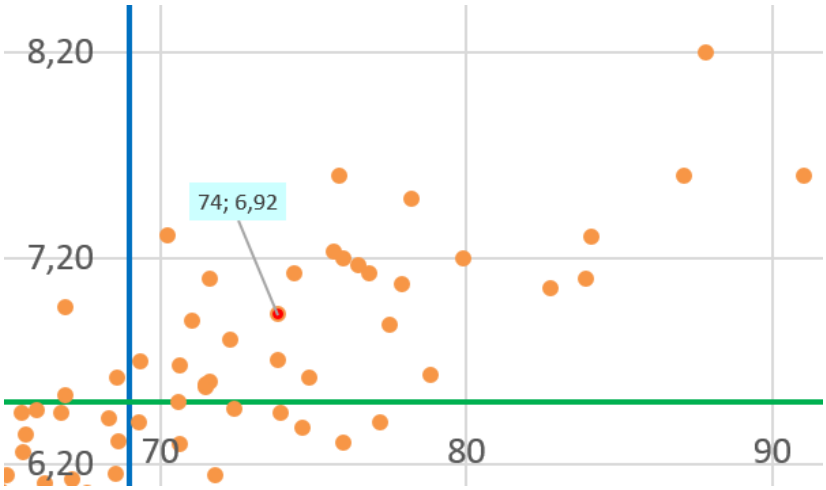
As the need to mitigate and adapt to climate change becomes more acute, and as pressure from society to address global environmental and natural resources issues becomes greater, companies will increasingly move to become "greener", seeking to become energy and waste neutral.

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

Survey respondents comments:

- The furniture companies are already ahead in this field. They will have to continue to improve more and more to meet the customer sensibility
- The effort to improve the production process from an environmental point of view will become more and more substantial. This transition is however conditional to a simple and efficient regulatory framework in order to offer a competitive advantage to companies and to avoid unnecessary costs and burdens.
- It should be the normal evolution of the environmental approach of companies that have business culture and transfer that culture to the market.
- This trend will be as stronger as social / regulatory pressure is. The development of new materials will also be key. But I see here a key long term trend, with likely slow progress to 2025.
- block chain to be considered to demonstrate provenance of materials and processes
- Many companies will do investment in order to make plants much green.
- As I said before, the lack of natural resources will oblige companies to think in green, in part obliged by their clients requirements. On the other hand it will be necessary because raw products will be little and expensive too.

- In general, the firms move to become "greener" just if the customers ask for it. For this reason, in general, this impact on the furniture sector is going to happen as much as the customers requested and not if the firms really believe in this change.
- Higher demand for ecologic materials creates higher demand of good materials, increases prices.
- Some companies will, but most of them will need political pressure, as going greener is expensive nowadays.
- The society is getting year by year, driven by gobal disasters, more sensitive and conscious about the climate change forcing companies to encourage and implement greener policies.
- Wood as material are one of the solutions to a better enviroment. Wood is a big raw material in furniture production.
- As said the trend of this scenario is obvious but, I suspect that those elements will be integrated into existing approaches.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

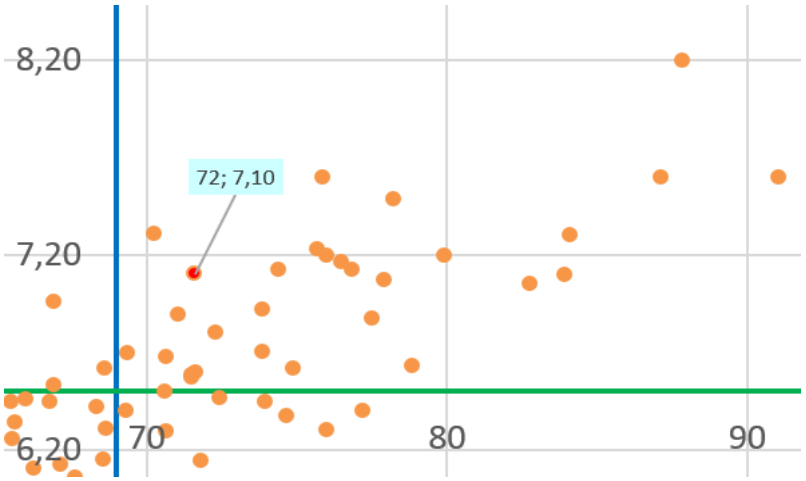
Companies will develop internal training schemes or apprenticeship programmes to fill their specific workforce needs. They will increasingly collaborate with universities, research centres and other partners to offer work study programmes with recognised degrees to younger talented recruits.

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

Survey respondents comments:

- This is a major general trend and a big opportunity for furniture industries.
- Collaborative platforms and better link between companies, research and education is the pathway. Without a collaborative and open way among the sector stakeholders it will be more hard to be competitive. Apprenticeship programmes are the best way to attract young people to the sector and to recruit the right talent to companies.
- We see this at the moment, but its still strongly related to the state of the economy. During the economic crisis there was less urgency then at the moment
- I believe companies will develop internal training schemes or apprenticeship programmes to fill their specific workforce needs. Collaboration with educational partners IN GENERAL will increase. But recognition of acquired skills and knowledge will become more important than official degrees. Example: there is a big demand for hackers to employ them in the firms, but there is (still) no master degree in this particular domain (in BE). This situation is probably also coming to the more traditional furniture sector.
- There will certainly be an evolution in existing training practice, sometimes in collaboration with universities and research centres, but I believe that, again, this will be limited to a minority of large and innovative enterprises, while most SMEs will probably continue to train as little as immediately necessary to cover immediate operational needs.

- it is already like this in large company as schmidt groupe, Mobalpa.... .

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

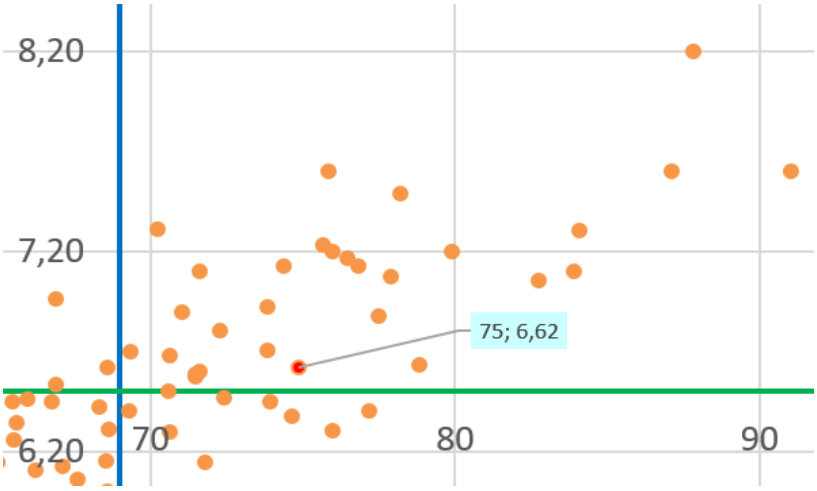
With the development of larger and faster printers and the enhanced characterisation of materials, additive manufacturing technologies (e.g. 3D printing, selective laser sintering, fused deposition modelling, stereo-lithography, laminated object manufacturing, etc.) will be increasingly used by both 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

Survey respondents comments:

- As stated before, such techniques are likely to drive mass customization in the furniture sector and will lead to lower production costs allowing higher level of customization. I do expect the furniture sector to be one of the leading manufacturing sectors in this area due to high potential demand for customization.
- It will importantly change the market, allowing more SME's involvement and more customized furniture solutions.
- Same with all industries
- At all levels
- For low volume parts and prototypes this will become dominant for metal and composite components. Not sure if impact will be significant for wooden parts (substitute materials)
- It is something already happened in other sectors
- This may be true for other sectors, but not for wooden products.
- Additive manufacturing transformed the way designers create, produce and manufacture furniture. It gives consumer more control over customizing thire furniture. Advancements in technology allow designers to manufacture products like lighting units, tables and chairs. 3D

printing reduces limitations on material thicknesses, tool paths and enable realize an unconventional shape would have been possible with regular tools.

- There are some nowadays who used 3D printing for prototyping, so I suppose it will have reached almost every factory by 2025.
- For Prototyping and small batches it´s already a reality used in different segments of the industry. The question that I can not answer is when additive manufacturing technologies will be used for higher lot sizes.
- to reduce prototyping costs
- Less used materials lighter weight.
- The tendency is clear and we will see until 2025 some changes but not dramatic changes. The general penetration of these production elements are maybe much stronger in the second half of the 20ies.
- The impact will be strong, but probably not on all the firms. If it is likely that all the firms will use these techniques, or at least a part of them, that use will be different in volume, in fucntion of the nature of the production (more or less sophisticated).
- The investment in such technology is too high for most of the firms in the sector, by 2015. To big companies this will mean a great impact in productivity quality and safety.
- Use of additive manufacturing technologies in furniture production will change the requirements for workers skills and working methods. The workers will have to operate computers/3D printers instead of woodworking machines. Companies will have to invest in new technologies.
- Additive manufacturing technologies offer the chance to produce varying products that suit individual customer needs without raising the bars for the development and design departments.
- The impact of these technologies will be brutal and it will force many business mindsets and policies to change.
- Especially needed to respond to growing customisation markets
- The impact will be strong as additive manufacturing is a very important tool to the customisation in the sector.
- Under the condition that it will be cost effective
- I think this will only apply for some custom made parts (hinges etc..); not for the main part of the furniture
- As already mentioned, we will be witness of an improvement and use of the additive manufacturing technologies. What is now just a fablab and small prototypes use, in the next future will be part of the production line. Woodworking equipment manufacturing are now working for filling this technological gap (in terms of hardware and software)
- The technology is mature, and quite cheap
- There is still a gap between what additive manufacturing can do and what it will end up being used for. The process is challenging and require sophisticated skills and training.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

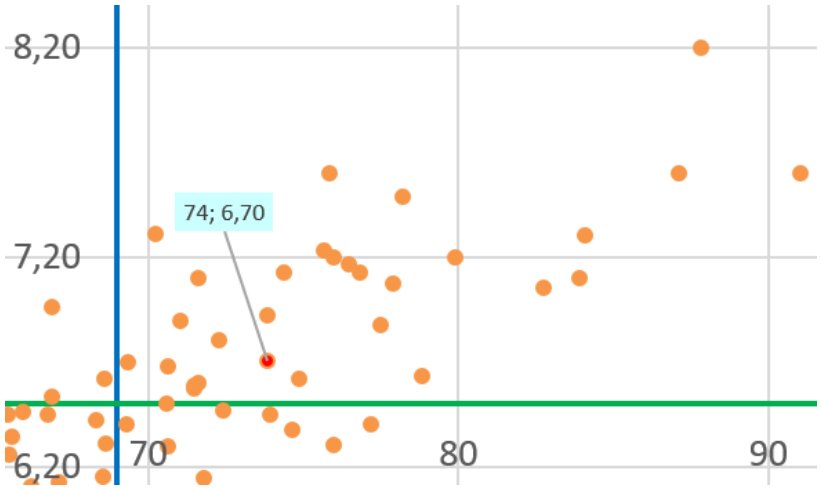
Enhanced competition for local and global markets will result in increasingly complex and diverse value chains. Driven by an increasingly globalised market, and based upon new technologies firms will seek to minimise the supply chain risks, minimise environmental impact and maximise savings through various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

Survey respondents comments:

- The optimization of the production process (including the use of less resources, less energy etc.) is vital for European companies that want to compete at the global level, given the impossibility to compete on labour cost.
- Companies to be competitive in the global market are forced to act in this way.
- Many companies didn't invest on the organization as a key factor for their business development because they focused all the energies on products. But now it's not enough, you can produce a good product requested by the market and don't be able to turn a profit because your organization in the value chain is not efficient.
- The sector is still very old fashioned and uses strategies from the 90s. There is a big gap between new generations and old generations and the first ones will have the their future in their hands but only when old generations are out of the market. It will be necessary to compete, if not other globalised companies will come and kick them out the market. So specialization and online and computerised companies will be the future for an old sector.
- In my opinion, there is not going to be big changes in the value chain of this sector. The changes will become inside each step of the value chain and it's going to be more about how to manage and adapt to this transformation in each step than the value chain itself.

- In a globalised market companies will not survive unless they take care of the value of chain. It happens already in other business sectors such as clothes and other hardware. In the furniture industry it will be also relevant
- I think we have to differentiate between unique or tailor-made products and products for the general public. First ones will not be much affected for supply chain risks or environmental impact. It's almost km 0 product. In the other hand I think this products are much affected for global markets and complex value chain
- Companies in this industry are mainly SME. Until I know, in Spain more than 90% have less of 20 employees. These small companies, in general, lack of skilled workers in order to adapt to these huge changes are coming. The furniture industry are going to include high value characteristics to their products: smart, sustainable from environmental view, accessible, etc. to do so it is not enough the actual qualification of workers in these small companies. Furniture industry needs to add ICT professionals, design engineers, environmental engineers and also other profiles like strategists that read the global changes could affect the sector and act in consequence, establishing strategies to play in these new rivalry scenarios.
- Furniture producers will have to take into account environmental policies from its providers due to the sensibilisation of the future potential customers (actual millenials). Moreover, to ensure service and quality, geo-political situation will be a milestone in the decision making of big furniture producers about their suppliers. Globalisation will lead to standardisation of the parameters and policies in the supply chain for the global furniture production.
- 1. Internet-based buys are a game changer 2. Increasing demand for tailored products
- The approach of the products by personalization to the client will also make the environmental awareness of this be transmitted through the entire value chain
- This just depend on the market segment. How large the sector will be in 2025? Just to know this answer, we can say what business strategy predominate.
- Integration among players is called by the higher product diversification and continuous need to reduce the risk of stock with no value and by the need of reducing time to customer.
- The future for the material wood is good because of the environment impact. The GDP growth has also a impact.
- - The value chain of furniture sector lives in a globalised world: the creativity (designers, architects) comes - by now - from all over the world, customer belong to different cultures, nations and social environments, workers are often foreign people, competitors from emerging markets aim to achieve traditional markets with a low price offer. - In this context, every firm has to play its own market strategy according low restrictions (for example environmental / health duties)and a globalised competition to join a customer even more vague, sophisticated, ready to use different market channels.
- Potentially, the sector is tailored for sustainable production concepts, products and partly value chains. However, because of the diversification in terms of costumers (needs, income, fondness and trends) and companies (orientation towards high market segments or lower) we will face various orientations within the sector.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

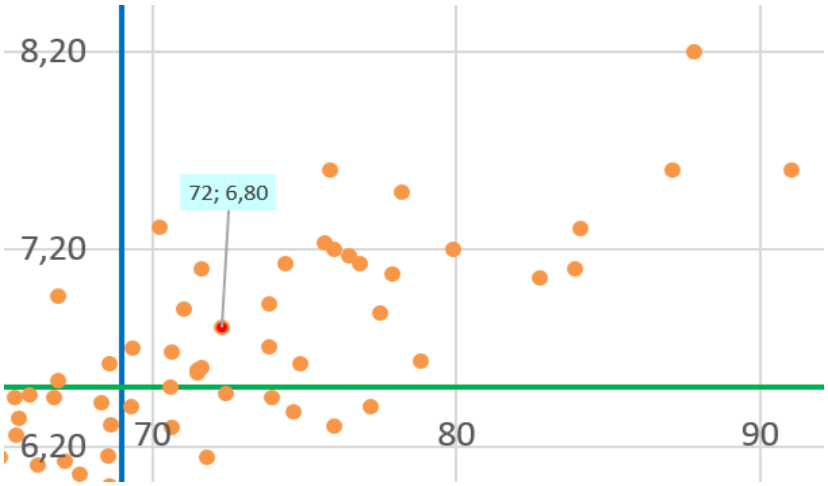
Pressured to capture diverse and geographically distributed human talent, and enabled by ICT technologies, firms will use and combine internal and external innovative ideas to take advantage of a wider distribution of knowledge across the globe. They will rely on a more diverse range of sources (customers, 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.): **23rd**



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

Survey respondents comments:

- At first, everything will go very slow. The furniture industry is not too inclined to change and its adaptation to ICTs will be cumbersome but when an important part of the competence will has been integrated, they will must have innovative ideas to be at the forefront.
- impacts of globalization will increase even more, fashionable trends will spread faster, and customers will want to participate in such innovations and expect them in the products they buy. regional cultures e.g. in housing or furniture will remain dominant, but the exchange and cross-fertilization will increase.
- The work in network in all fields of economic activity, but also in the furniture sector, pushed by the increasing importance of exportations, will need the design in a global logic, but also forced by the demands of the diversity of markets, by increasing domain of the ICT by the customers and the need to search of new customers, to work from/with digital platforms and social networks. Everything that to deal with these platforms is increasing, as well as the trust of the consumers in this kind of business. There is the need to study and collect information from all the market's singularities.

- Creating services to be more competitive in the perspective of sharing economy and to better profit from innovation practices examples that can be extended and recommended to a diversity of SMEs along the supply chain. However the sector is getting more and more big companies, SMEs are the majority of European companies.Currently, Open innovation is a trend. In 2025 it will be a reality!
- Because the whole society will be a network , the role of institutions (companies etc) will decrease and innovations will no longer come from within a sector but mostly from sector.
- Furniture industry will probably be more 'individualised'. The demand for big series and high numbers of the same product will decrease. Furniture pieces will be customized, on demand, maybe even through assembly of (sub)products of different suppliers/factories.
- Co-working and codesign are already used in the fablabs. In the next future with implementation of the actual prototyping technologies (3D printers, laser cut,..) to production line technologies, the open innovation will be strongly encourage from the large to the small companies in order to avoid structural costs.
- we already experienced this in France in the furniture industry.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

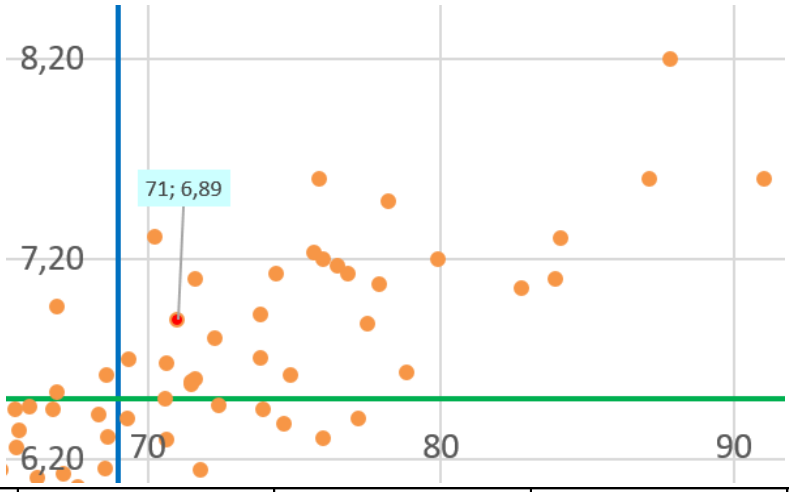
The widespread use of online social tools (e.g. collaborative platforms) and solutions (e.g. crowdfunding) together with digital fabrication software (i.e. CAD) and ready-to-use manufacturing hardware (e.g. 3D printing) will result in new forms of product design, development and testing, directly involving 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.): **24th**



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

Survey respondents comments:

- I believe customer influence via social channels will affect the furniture sector very strongly, probably more strongly than the majority of other sectors. Furniture is a very personal thing and people in general have a high demand to achieve high level of customization. Once such customization becomes feasible and easily accessible for customers, then it is likely to become widely available throughout the industry. I believe that early pioneers of such technologies will have excellent opportunities to gain significant share on the market and to transform this area completely.
- This is happening today in Denmark
- This is a trend that has been seen in the past years and will increase even further with the possibilities provided by digitalization.
- Just consider the potential combination of platforms like www.opendesk.com and production systems like companies as Nobilia
- The customers would like to have online tools to design their furniture or flexibility to combine design options. 3D printing might be needed for plastic and metal parts of the furniture. New startups might come up with new furniture products/services and raise crowd funding and disrupt the market and challenge the incumbents.

- Customers want 100% customized products, especially for high level products. the furniture sector must increasingly involve its customers in product design. The basis and the trends will be the same, but the details need to change and adapt to the needs of the customers. The niche concept will grow exponentially, leading companies to create customized products for each customer.
- The culture of modern society is evolving over these orbits.
- Lead users, open innovation and lower barriers to entry (through crow-funding, decoupling design-manufacturing, etc.) are very general trends, widely used in many sectors. Furniture won't be an exception here. And, as long as design and fashion play a more important role, even more pronounced. I do not know the sector well enough, but I guess that large companies are already taking advantage of this trend.
- I do not think that 3D printing will be the unique source of production but it will be able to adapt final products to specific demand. We must see at which cost. An end user policy will be a requirement to become the leader in the market.
- Some people want personalized products and this is becoming an important trend. At this point, it is easy to think in a future where some furniture companies should adapt their way of product design even letting to their own customers to make the design they want/need for their furniture.
- this will happen in the b to b business and it will have great impact but less probably in the c to b.
- Production will be more customer orientated , tailor made production to suit indivudual customer needs.
- Customers are alredy 100% involved in other sectors while developing new products (software, Fi Tech, etc.). Furniture will not be an exception
- those are very technical tools, not directly available/usable by the general public
- Design of new products should be user centered.
- The impact will be so strong that in jest, I tell to my students: Ikea, as we know it today, has the days counted.
- This is a major innovation opportunity for furniture where companies can gain competitive advantage.
- The strong customer's involvement may lead to the externalization of the design area. It's not necessary to have design talent inside the company. What is necessary is to have skilled people to connect and facilitate the relation customer/company.
- I think this will happen but we don t know yet or the costs of the products manufactured this way will be competetive with the costs of standarized products
- The furniture setor will have to cope with these new tools (crowdfunding, 3D-printing, collaborative design through social networks, ...) and will have to adopt these new forms of (net)work(ing). The customers will also be more involved already from the design phase (bèta-users/testgroups).
- Most important footwear brands have already began to use the "democratic" design tools. Some MD selling furniture are now starting to experiment it . Now it's seems a way to make play the customers and the young designers, in the future it will be the common way to design, produce and to purchase Your furniture.
- there already are some new business models in which the Customer designed its own furniture in France. at the moment it is not very well spread but it might developp in few years in a larger scale but not for all companies.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

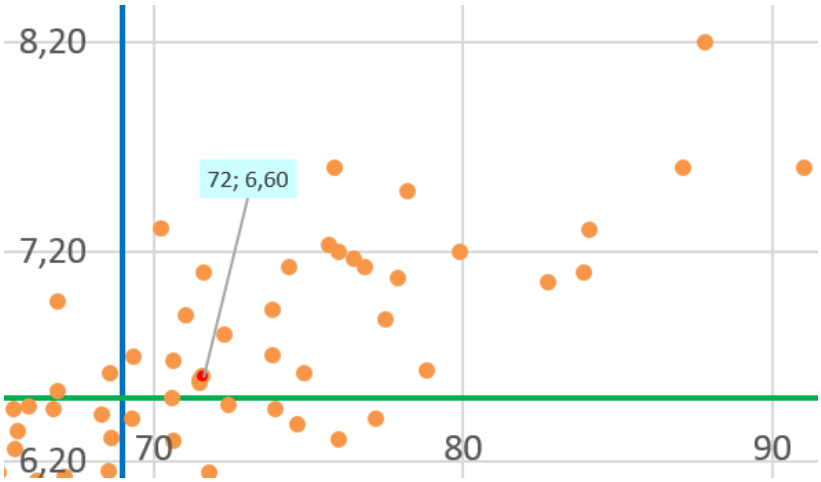
The development of intelligent transport systems - allowing real-time traffic and mobility management - will enable manufacturing firms to have quicker logistic chains thanks to a more reliable, more secure and faster movement of goods across different but fully intermodal infrastructures (road, rail,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

Summary of statistics:

Number of respondents: **10**

Field of expertise respondents groups: **DIGITIZATION**

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



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

Survey respondents comments:

- I believe that such intelligent intermodal transport infrastructure in general will play a significant role by 2025 in all industries that rely on transportation of goods. Therefore, I expect the furniture industry to be influenced by such advances. However, I do not think that this influence on the industry will be higher than average, or whether this industry will play a leading role in such changes.
- All industries will have to adapt to the developments in logistics which is a generic service
- This is always a huge consideration to day. I dont think transportation and will be much affected by digitalization besides unmanned transportation and drone delivery of smaller items
- Intelligent transport systems and intermodal infrastructures are crucial for the secure and fast movements of goods, in particular for companies who are involved in international trade. The furniture sector needs to participate into and benefit of these developments for reliable and faster movements of goods.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

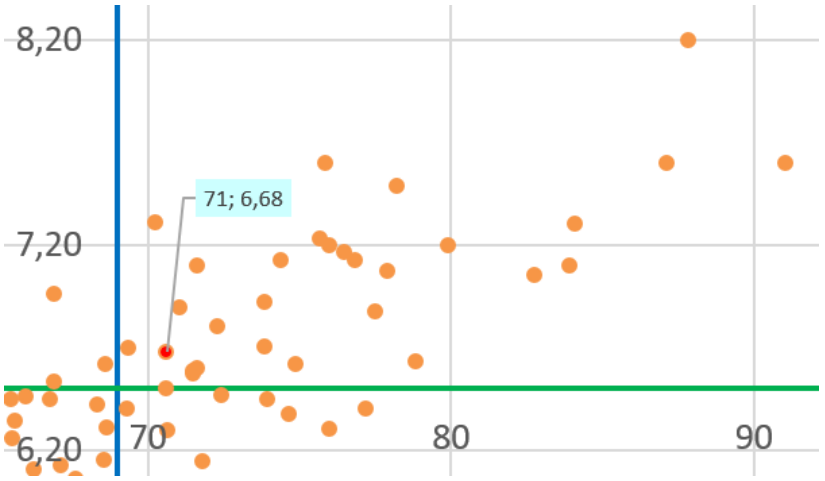
As 'life cycle' and the 'sustainability by design' approaches increasingly impact the industrials value chains, materials will circulate among different industries and value chains. This circulation will be enabled by a range of advanced technologies including the reuse, remanufacturing and recycling 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.): **26th**



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

Survey respondents comments:

- I think that furniture sector will need to meditate about new uses for a manufactured product and there will born companies specialised on that in order to reduce environmental costs. Reparation will be then a new sector in the future and people will demand these products. The producers may have new sections to recuperate old products and refurbish or reciclate then.
- This new approach is going to create new ways of make the things and change the value chain of the companies. Also, this approach of reuse and remanufacture the materials could let the companies to think about new uses and new products on the market.
- We are too consumerists to will have changed it by 2025. I think it will happen in a longer term... (hope to be wrong)
- Recycling in most cases is a legal matter. Reuse in most cases is given by recycling of materials or components, for example: wooden shavings in order to produce wooden particle boards or MDF boards. The culture of remanufacturing is increasingly be expanding in the society, but is not exactly affecting the furniture production, beyond reducing the purchases of new products by consumers that prefer remanufacture their furniture in order to redecorate their homes (change finishing with other colour for example).

- Chipboard plants (as EGGER) from big groups already have sustainalbe plans to re-use materials as well as remanufacturing process (FSC - Controlled Wood origins, etc.)
- As described above panels are the cheapest base to make furniture. Recycled furniture fits with circular economy directives....
- In the wood sector the furniture is the first use then it will become energy. The production of the furniture needs to be prepared with as low ingredients of chemicals as possible to make it good for the energy sector.
- Circular economy is the future.
- I expect that here will be probably new legal obligations in preparation dealing with reuse and recycling of materials and parts especially in industrialized countries in Europe and also in emerging economies.
- As the reuse of materials might be more expensive than the use of new raw materials, I do not think the industry will be very "reuse motivated" enough. But this lack of conviction could lead to a big increase in the cost of raw materials and the situation could become hard to deal with.
- Sustainability by design will impact companies that will adopt it,. Small/poor enterprises might not have the resources to apply such measures by 2025. Recycling could become more important e.g. by the increase use of materials like plywood at large scale (for cheap and expensive furniture).
- Today, materials are already marked electronically. This possibility creates the prerequisite for efficient recycling and use in production. Specialized companies specialize in these processes and offer their services. This trend will continue to intensify in the future. Products can thus be produced extremely sustainably.
- The demand of new green and sustainable material will also be requested for furniture. The new material will influence the processing as well as the design. New material may be a challenge for the durability and strength of the material and products. New material may expose workers to substances with unknown risks.
- Even sooner that 2025 the furniture sector will need to close its material cycles and take responsibility of its products during the whole life-cycle. The sector should be prepared and already develop take-back schemes, repair services and enhance the reuse and recycling of furniture materials. The sector should also be looking at the chemicals used in its materials and products in order to avoid toxic substances (for example heave metals, or halogenated substances used as flame retardants). It should also be prepared to answer to the growing demands on disclosure of information on chemicals in products by other actors in the supply chain, consumers and regulators.
- The furniture industry will have to make a titanic effort in order to reach recycling, remanufacturing and reuse levels that allow the costs to be below the limit that would make it socially unfeasible to continue to buy home furniture.
- It is a very relevant topic for furniture because of the complexity of products, materials and components involved, and it might be an important market opportunity.
- I THINK THE USE of raw material and commodities will be minimized, instead raw materials will come from recycling and circular production. Manufacturers have to take in account that they will have to take the products back when no longer needed and use them for the manufacturing of new products
- I think this will only apply to some specific wood species. But for the furniture in general, there will be an renewed use of other materials, re-used materials etc...
- In Italy a lot has been done for the production of particleboards. In the next future technologies and processes will be ready to support the design of ecoproducts using other recycling materials
- with ecomobilier and valdelia in France, the challenge is already on going

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

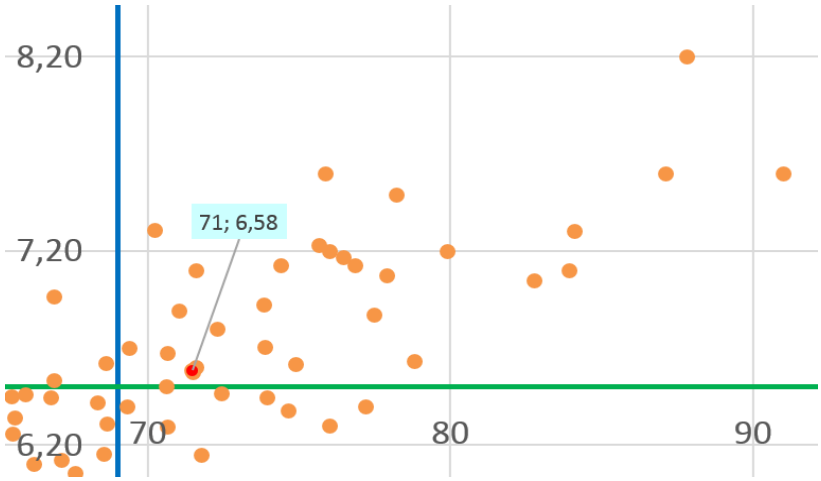
Enhanced automation and production processes (e.g. near net shape), as well as new advanced manufacturing techniques such as additive manufacturing, will enable factories to use a smaller quantity of materials to make a product with almost no waste.

Summary of statistics:

Number of respondents: **49**

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

Ranking of importance (PROB. x IMP.): **27th**



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

Survey respondents comments:

- I believe that optimization/minimization of waste is an area where huge gains can be achieved in the furniture sector with smart manufacturing and optimization solutions within a very short time-frame. Simulation based analysis and optimization techniques are likely to play a significant role in this.
- Again, to be frank - this will make sense when it is financially rewarding - and this could be also aligned with environmental laws/regulations and with optimized production this could have concrete effect and probably companies will follow it.
- This is a strong technological driver to enable more cost-efficient manufacturing. Needed to stay competitive.
- Cost of WASTE will increase compare to current situation. Current industrial processes are absolutely far of target, therefore the impact should be strong if regulations are fixed.
- Near net-shape is already under way, but additive manufacturing is not particularly relevant to day-to-day production of furniture.
- Additive manufacturing is suitable for metal and plastic furniture parts. With decreasing cost of additive manufacturing it will also be deployed in the furniture sector and can contribute to minimizing waste.
- But only if in 2025 these materials have reached good prices.

- Best Practices (as IkEA in the packaging area) consider this are oriented to no-waste processes.
- The perception of semplifiyng the recycling process will call for a carefull design of the components single material based.
- We have growing regulation in this area as well s pressure from the civil society. We also have already today players in the sector who design intelligent production cycles with the integration of recycling processes and strategies to minimize material use. This will become an overall trend, without excluding what I commented under 6.1.1.
- Waste minimisation in production is a normal industrial process, but the influence depends on the size of the enterprise. SMEs in traditional wood furniture production won´t undergo such dramatic changes like the bigger firms.
- That will change the way the products are designed and manufactured.
- Not so likely to be a mass change but it would help save on wastes and rise efficiency.
- new technologies and intelligent tools will help to minimise waste production. This will reqiuire employees who are able to use the technologie. New tasks are required, less handycraft workers will be necessary.
- Due to economic and environmental pressures, manufacturers will be obliged to save resources (reduce waste production) by all means.
- The only solution to minimize waste is to change the substractive technologies (CNC) by additive technologies (3D Print). I'm not a visionary but some time ago, I have told me to my students that in few years the dimensions of CNC machines and 3D printers will have exchanged their dimensions.
- A real opportunity for furniture mass production
- The increased automation of the productive processes leads to the reduction of material wastes. Also the reduction of raw materials available to the industry reinforces the issue to the reduction of wastes and optimization of processes.
- It's important to think on the automation of the production with robots (currently as car industry). No waste!
- legislation and EU-rules will force the furniture sector to comply to these new rules, where disassembly and de-manufacturing of materials, parts and products, and reuse, remanufacturing and recycling will be compulsory
- The Moore's law has been impressive for the microcircuits, now it seems the new production processes are making every year big steps. In particular learning machines will improve their performance, decreasing their errors and making products with almost no waste

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

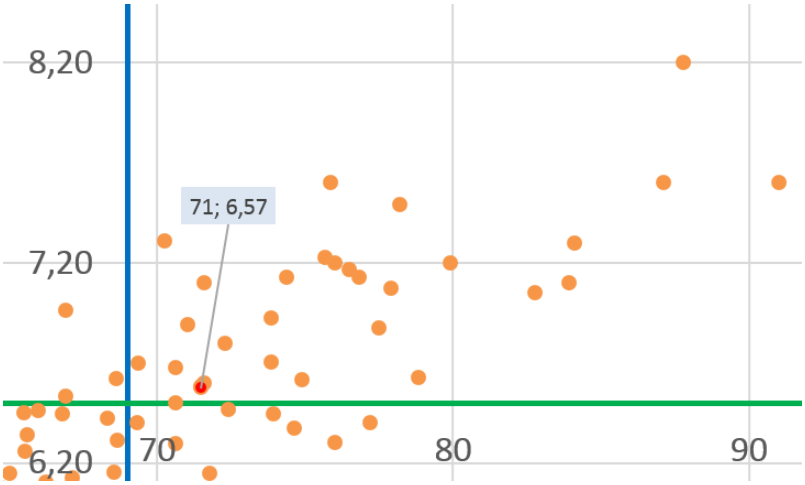
New production approaches will be implemented to enable mass customisation and personalisation, such as a two-step production approach for (1) producing blank elements, and (2) assembling products from the blank elements according to customer preferences.

Summary of statistics:

Number of respondents: **49**

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

Ranking of importance (PROB. x IMP.): **28th**



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

Survey respondents comments:

- Due to high potential need for customization, such approaches are very likely to play significant role in the furniture industry by 2025.
- It is a question of implementation (again) and not wishes ("everybody" would want it). It would involve heavy investment and business model changes. So again...who can do it successfully will have important competitive advantages.
- Same with all industries
- And also produce a different digital model based product each time
- Isn't that already reality in the sector today...
- It is something already happened in other sectors
- This is, as previously stated, a reasonable way to pursue mass customisation without affecting too much the manufacturing part of the system, but shifting most combinatorial explosion to the assembly part of the system.
- Personalized production lines can vary depending on the strategy of the company and choice for technologies. Two step production can be effective in the furniture industry.
- I really think it is a common solution for personalization. However we need to be able to do so and to be efficient in personalization which does not makes it expensive at the final stage.

- The impact on the value chain of the furniture sector is going to be high. It means to have big warehouses for the blank elements produced, two different lay outs on the factories and so on in order to adapt to this demand of the market.
- Small and medium-sized businesses have always been characterized for this, the adaptability to demand, however, customization based on blank elements, distances the final product from the root of natural material. This will affect a segment of consumers, which is difficult to generalize across the spectrum.
- There are already working on this orientation in some end customer oriented companies.
- As a general tendency I see this trend and, we already have production concepts as described above, say in the kitchen production.
- This is already the case.
- This change is not specific to this sector. It concerns all the industries.
- It will help adjust to the growing customization trend.
- Maybe large companies will take this approach, I do not think this will be an option for small companies. They will focus more on adhoc production, to meet customers needs.
- This scenario appears as a reasonable answer to the progressing individualization of customers' wishes and needs.
- Major innovation possibilities for furniture
- The special needs of certain society's forms of organization, whether it is on-parent families or single persons and also considering other factors as the diminishment of the habitational spaces, are factors that need to be taken into account as for the personalization of products.
- Customisation.
- depending on the production costs
- see IKEA-strategy and automobile sector
- This is already a good practice in furniture sector. It's a business pillar rather than a differentiator..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

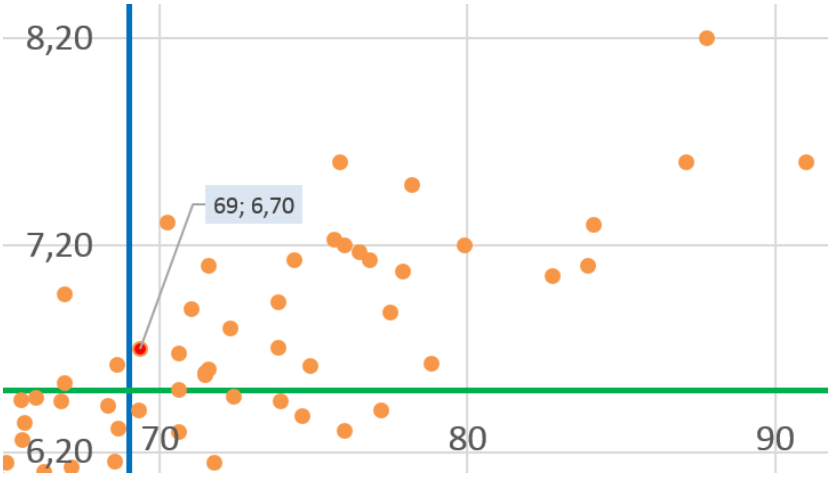
Digital tools will increasingly support the management and the optimisation of integrated product-process-production systems allowing the collaborative interaction of multiple stakeholders on a real-time basis.

Summary of statistics:

Number of respondents: **49**

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

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



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

Survey respondents comments:

- it really depends on the implementation - so it comes down to companies. It is important to notice though - tools (whatever they are - from hammer, to most complex IT ones) are only tools - its the people (from management on) how they are utilized. Tools it self do not solve the problems (on contrary...with improper implementation and/or use can add them).
- This could enable a major productivity gain from idea/design to market
- Optimizing work with suppliers and costumers. Processes. Already on going in other sectors.
- This is already on track (e.g. PLM, integrated CAD-CAM) and will be accelerated even for small companies, let alone for large ones.
- In digital factories, as first step vertical digitalization is used to integrate processes and information flows within a factory. The second step horizontal integration of all business partners of an added value. Virtualization is the last step where there is a fully integrated business partner network. This allows interactions of multi stakeholders in real time.
- The data sharing in all processes will be necessary in future since all the parts from the value chain will need to inform accordingly. This way will be the core where to work in order to reduce costs and do processes more efficient.
- It will be very important the interrelationship between the processes of both suppliers and customers to inform the system and inform themselves from the system.

- Again, this tendency is real and we see already changes in this direction. Whether it has penetrated rather parts than the whole sector is not clear. The involvement of single stakeholders in this system will be more punctual. The overall management remains at the companies management level.
- will improve interaction and information , but real-time information might put extra pressure on managers and operational staff from time to time.
- Its power will be enormous and will allow a better interaction between the firm, employers and customers.
- Can be a decisive advantage for long complex furniture supply chains to react quickly to demand.
- The presence and constant update of digital information at management level and at production level demand an increased interaction with the platforms which should be constantly updated. They provide valuable information that can be decisive at the time of decision making.
- This is the way: digital tools to support all the activities. Technology is not an end by itself. It's a support to achieve an added value activity..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

2. Factors with HIGH IMPACT (> 6,5) and LOWER PROBABILITY (< or = 69)

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

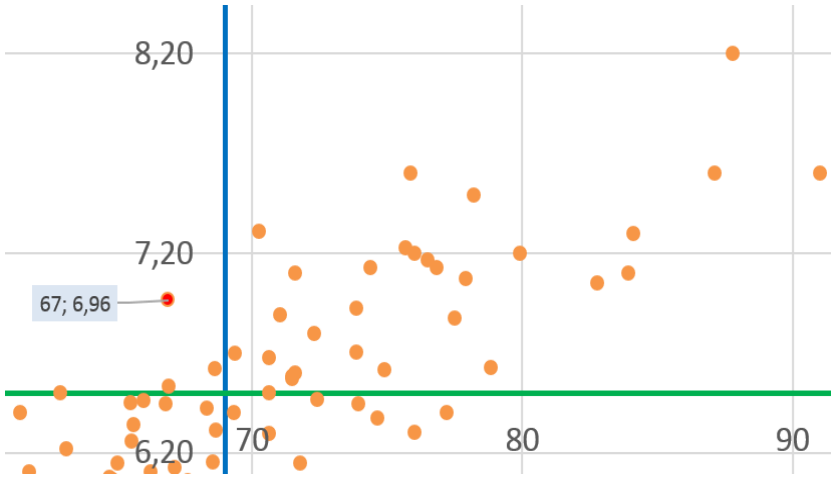
Energy- and resource-efficient business models will be needed for factories to achieve the 'triple-zero' objectives: zero waste, zero net energy cost and zero environmental impact. This circular economy business model will be driven by market costs, society demands, and hence the consumer for more environmentally 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.): **30th**



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

Survey respondents comments:

- This aspect will be very much about the furniture industry, but the impact will be gradual simply because this sector, at least in some countries, is already very far ahead. Companies already are concerned about circular economy in terms of their products and their companies. There are already end-of-life product collection consorts, eco design and use of green materials. Customers are also increasingly aware of these issues.
- The shift to a circular economy is driven both by public policies and market demands. It is therefore very likely that this will affect the furniture companies. It is important to remark that this shift is already happening in the sector (e.g. recycling of materials, reuse of industrial residues, use of eco-design to produce more sustainable products); an intensification of this trend is thus very likely to happen.
- Companies to be competitive in the global market must develop a system based on the circular economy both for business development and for the global development of the market and society.

- I think that circular economy will be one of the key success forces, which will be driven mainly by customers in western world. Companies that will not be able to adapt to environmentally-friendly processes will lose competitive advantage over those who will adapt.
- I must admit my forecast is fundamentally based on the expectations of a rational future, with society and responsible governments enforcing a virtuous path, than solely on market forces and demand making it happen. Having said that, the furniture sector presents a suitable case for the circular economy, with recycling and environmentally friendly business models reinforcing the possibility of new offerings, materials, and faster replacement cycles.
- new business opportunities
- it will be compulsory and companies with lack of consciousness will be kicked off the market. However, will the consumer assume the prices increase?
- I strongly believe in the circular economy. Nevertheless, this is a global trend in general and not only for furniture market. For this reason, i believe that all the companies who want to compete on this market has to adapt to this future reality but i don't think that this "environmental-friendly" is going to be a positive marketing strategy. It is going to be a mandatory for the sector but not as any differential advantage.
- As it happens in other industries the commercial advantage comes through creating the need to change the furniture with new designs. We can see that today with cellular phones, car industry, clothes...I don't think that re-manufacturing or environmental issues will be a commercial argument. It sounds nice but unfortunately consumers need to consume new products every time
- I wish this market strategy worked today in our sector. Nowadays people doesn't want to pay a little bit more for more eco-friendly products. As an example, in my company we offer water-based lacquers but almost everybody prefer toxic solvent for a better price. I don't think in 2025 this will have changed, maybe for a small minority. The only way to enhance sustainability I think that is through stronger laws.
- This scenario will come, mainly from 2 sides: a) the demand and b) legal regulations. Both, looking for long-term economical efficiency an social responsibility. These two sides are the most strong drivers for a business model implementation.
- As society advances its awareness towards the environment, the pressure on governments and companies will be higher in order to increase the efficiency of the use of materials and energy
- Nowadays it´s difficult to foresee since actual population is not 100% committed to environmental policies of the companies. However, in 2025, population will take this into account by selecting and purchasing products including furniture, which is even more sensible to global sustainability
- A definitive and positive trend, but so far it has been hardly possible to charge a premium to consumers to justify the extra effort. Certification schemes are a good example. People request it but don't want to pay for it. There is also a strong technological component that is beyond the control of individual businesses (I can't do anything with my residues at the moment for ex.)
- Only in the markets of the advanced economies and with environmental "conscience". Low and medium impact still in developing economies.
- Costs of landfill will rise. Eco friendly approach will grow. More sustainability will be required. Packaging will be more environmentally friendly.
- The future will force the production to go this way. The social media will have a huge impact from the consumers side. The wood use will also be a piece to reach a better environment, carbonstore for example.
- I think the statement describes a general trend for industrial production, more an more confronted with societal and environmental imperatives. There are however, also some opposing trends.

- This is relevant, but a lot will depend on government policy. By preference, this policy should be at EU level.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

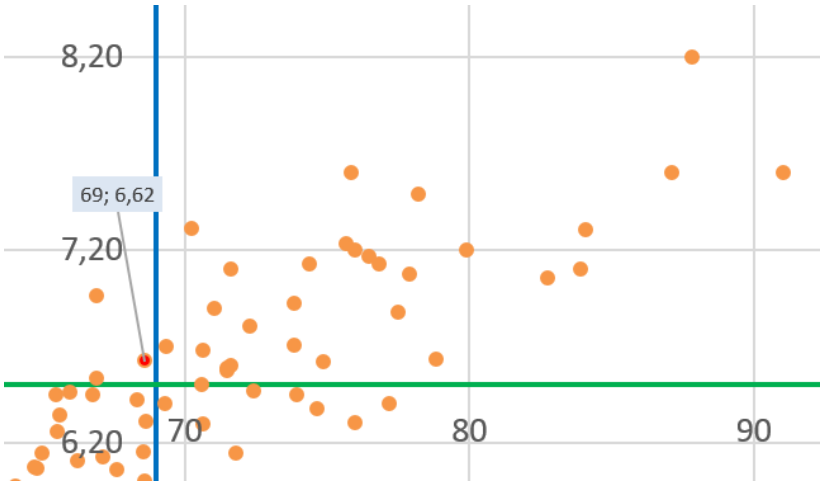
As technology develops, particularly in software development and ICT services, there will be an increasing number of highly skilled "software craftsmen" whose unique skills and creativity will be available on a freelance basis. The work of these developers will accelerate the innovation and will be in 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.): **31st**



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

Survey respondents comments:

- We already see a very high impact of specific ICT skills in the furniture sector. Due to trends in global customization and the need for creativity and individualized design in the sector, it is very likely that the demand for highly skilled and creative ICT craftsmen will increase. I expect the demand for such experts in more traditional sectors such as the furniture industry will significantly increase and slowly reaches the level on new and more ICT specific areas such as app designers or computer game developers. What I expect that such technical and creative skills that are currently required for an app or game developer, will also bee needed for ICT specialists in other industries, for example the furniture sector.
- Especially with the new generations coming who's perception of the "job" is a little bit different then ours/present/in the past :) More working from home, more creative work than labour, etc.
- There is a big individualization trend in manufacturing/consumer goods. Being able to design and see products online and then order a product specifically for you is an increasing trend. With new tech enabling flexible automation and 3D printing in many materials including wood composites there will be a drive to implement in the furniture market - digital craftsmen..

- According to Jeremy Rifkin, what happens in the virtual world anticipates patterns applicable to real world in the following ten years. Youtubers act as a TV channels because of the Zero Marginal Cost effect. Having automated manufacturing facilities as a materialization of digital model services, the talent from sites like www.opendesk.com can be materialized at low cost.
- High software skills will most likely be integrated in large companies and used on a freelance basis in some of the smaller companies.
- Software development and ICT services are essential in furniture product design and customizations, automation, integration of the manufacture and supply chain processes, and providing e-commerce and servitization. A cradle-to-cradle approach to design will encourage companies to create waste-free products. As part of fixer movement, companies will offer services such as repair as an important part of reuse.
- At present furniture companies lack human resources with high ICT skills, despite the growing demand for technologically advanced products. It is thus foreseeable that "software craftsmen" will be more and more requested by companies (either as free-lancers or in-house resources).
- n the global market these technologies will accelerate development. People's attitudes will evolve.
- As stated in on of the previous answers, I believe that these freelancers of experts, who find the niche in the market will be main driving force of digitalisation. I think that companies will look for own ICT centres, let it be through M&A or self-supply, because the thread of concentrating the companies' internal processes and designs outside the firm leading to data leak or even re-selling of implemented solutions to competition is very high.
- This is a general trend. I do not anticipate a special differential for the furniture sector. As long as it is happening across the board, the possibilities it offers depend fundamentally on the "innovativeness" of the companies and their capability to take advantage of it.
- Actually many companies don't have software craftsman in their plants yet and the old craftsman don't have propency for learning these skills. So companies have to introduce new young resources from specialized schools. But the specialized schools are not so many.
- machine manufacturers do not have this skills yet. therefore external Support is very important
- It is a must to turn into a tech sector and those craftsmen/women will be crucial to implement new technology in all the sector as well as new knowledge to improve all procedures and products.
- This is going to upgrade personalization to the next level in this sector. With this innovation acceleration most of the people will be able to have more flexibility on their demands and more personalized products due to it's going to be more affordable to have personalized products and innovations.
- One of the strong points some furniture companies will have, will be personalization through cutting edge processes. The kind of consumer who wants to stand out, will buy these furniture pieces, the rest, the ones who buy cheap, will all have the same pieces (IKEA).
- In my case, in our sector (melamine paper printers for furniture producers) we already work with a pool of freelancers from software craftsmen to specialised carpenters.
- Especially for SMEs, this is talent that you are not able, financially, to integrate or retain. But this is one of the most critical elements to build a brand identity and maintain customer loyalty: the unique design skills.
- This situation is already occurring. The work of Opensource developers is changing the perception of the big software companies and make them react with improvements. They are making available to medium and small furniture companies, solutions that make them competitive.
- More in design and use of new and combined material as in the production and its organization.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

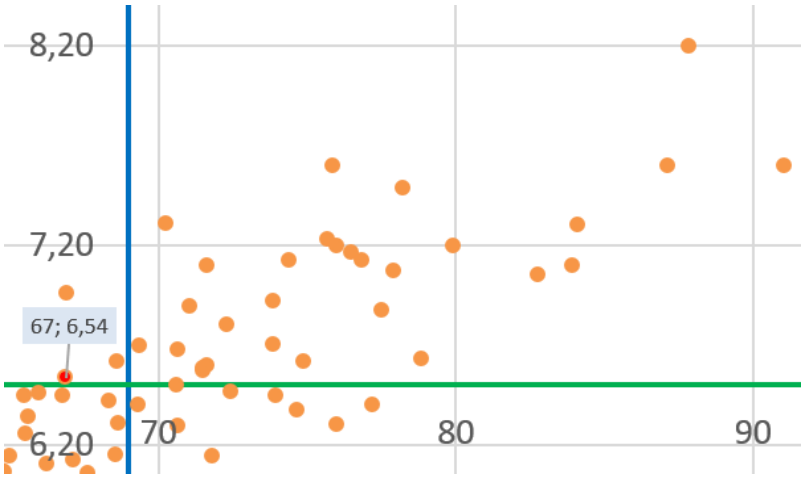
Firms will design products with their entire life cycle in mind in order to optimise their durability and to reduce the costs of recycling, recovery of materials, reuse and remanufacturing of spare parts, and waste disposal. 'Circular design' will focus on material selection and modularity among standardised 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.): **32nd**



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

Survey respondents comments:

- If it finally happen on the market it's going to make important changes in the way the companies make the profit. For sure, the sales are going to fall dramatically but there are some services done by the firms which can substitute this profits.
- This will impact in terms of increased costs.
- As explained before, if it means a reduction of price they will do it...
- Since the Design for Sustainability will be a key factor to improve competitively of the companies, this will have a strong impact in the future design processes of the companies
- why bear the extra cost? First the consumers need to be educated about that to get a sales premium. Otherwise no point
- The life cycle approach becomes more important. However, we had also in the past the idea of maintaining products and repair them. The positive connotations are probably somewhat overestimated in this scenario..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

3. Factors with MEDIUM-HIGH IMPACT and HIGH STANDARD DEVIATIONS

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

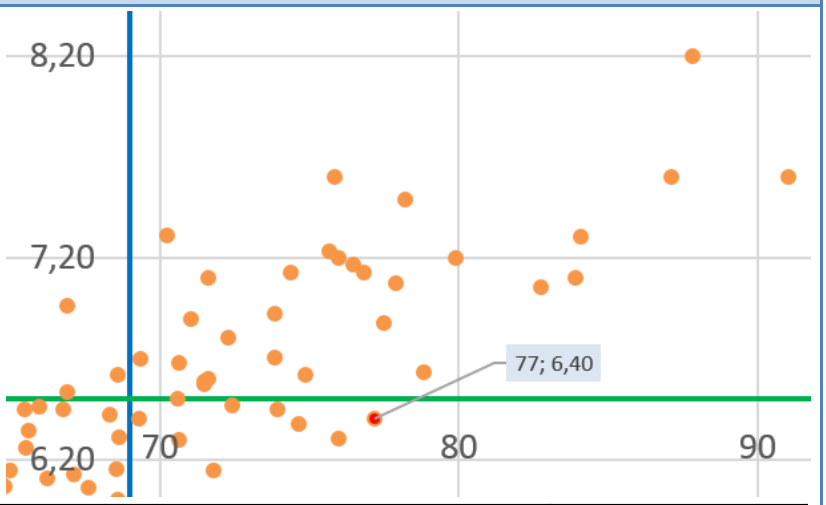
The arrival of "big data" on the industrial landscape will force companies to consider innovative, cheap and efficient mechanisms to store the data collected in a safe and secure manner. Internal high-capacity servers or outsourced storage services will be needed to store exabytes of valued data useful 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.): **33rd**



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

Survey respondents comments:

- I think that the increasing amount of sheer data will cause more problems than advances on longer term. Instead of investing into very large-scale data storage, I expect analysis techniques to evolve in a way that less data needs to be actually stored due to intelligent pre-processing.
- The very big ones might set up own servers, but most will rely on hosted services from e.g. Amazon or the likes.
- It mostly affects large companies.
- Big data storage needs to be able to handle capacity and provide low latency for analytics work. Small companies will also need the ability to handle relatively large data sets and handle them quickly. This can be done with hyper scale computing environments or adopt NAS or object storage in more traditional IT departments.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

4.1.5 Cybersecurity

FACT SHEET ID 58 // Working Group: DIGITIZATION

Factor:

4 - Knowledge Management

4.1.3 Data Storage

4.1.5 Cybersecurity

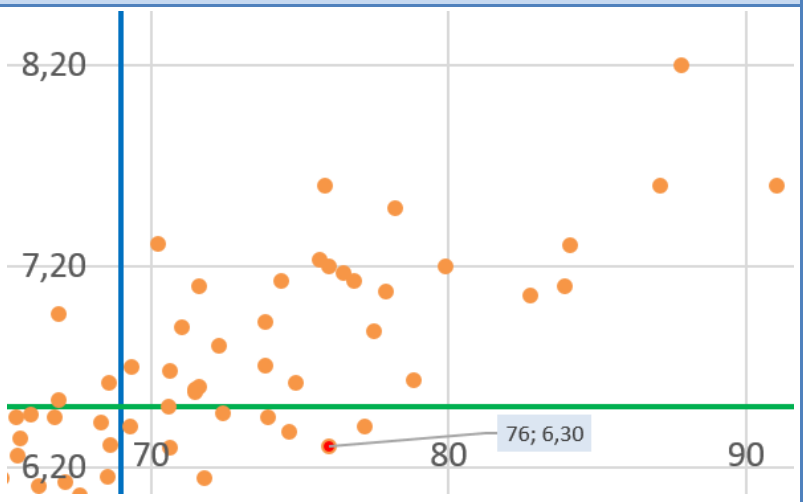
Firms will need to invest and implement strong, adaptive and resilient security systems and techniques to protect their data from cyber-attacks from competitors, foreign intelligence services or hacktivists. They will also need to define and communicate on a transparent privacy charter to manage customers' 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.): **34th**



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

Survey respondents comments:

- Although cybersecurity will play an increasingly important role in all areas (including furniture manufacturing) , I do not expect it to have specifically large impact on the furniture sector (probably lower than average when compared to other manufacturing areas).
- Important for all business in even-more connected world (people & devices (IOT).
- All sectors will need to adapt
- Communications and systems must be generally secure by design. New simple and power mechanisms are needed such as Data Diodes that are unhackable.
- Only relevant for the very big companies - the rest will rely on data hosting providers.
- It is a general need.
- It is important to be aware of the serious cybersecurity problems that affect technology, and protect and secure it. The only way customers can have confidence in business is through strong data protection practices, with effective legislation. Data protection is enforced by law designed to protect personal information, which is collected, processed and stored by automated means. Companies need to adhere to this..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

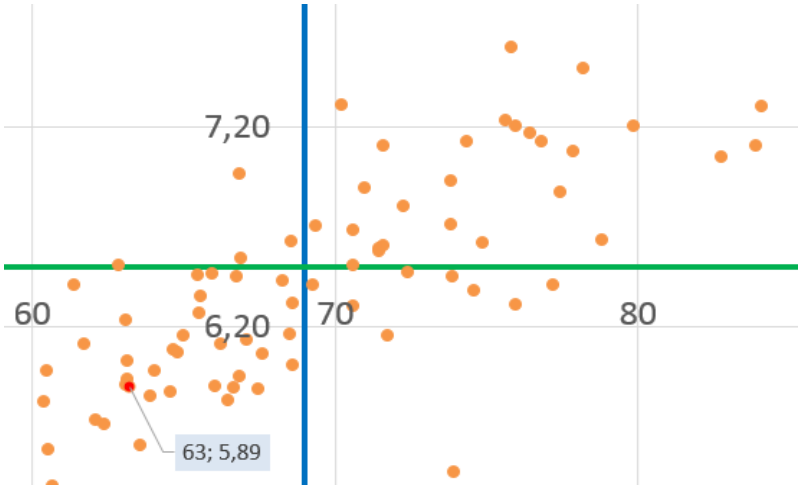
Developing more frugal and cheap products and services will be a focus of attention for firms in their attempt to conquer vast market segments of developing countries.

Summary of statistics:

Number of respondents: **19**

Field of expertise respondents groups: **FURNITURE**

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



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

Survey respondents comments:

- As I said, IKEA business model will be the future and most companies will shift to a very specialised sector with little competence or very innovative and DIY products. On that direction, extra products will rise as a must. The new products in low cost production and cheaper will be a good think to increase export to developing countries where furniture sector is under developed. It is happening at the moment but with high-end products.
- As I mention before, people is concerned about green and ethical but also it's much more Price sensitive than before. Also, the using and throwing culture is very implemented in all the markets. For this reason, the trend is more about cheap and frugal products than big investments in products. There are some people who prefer to change the furniture 3 times in 10 years than have a good investment in 1 furniture and keep it well more than 10 years.
- Fashion and trendy products will be more and more in demand. Furniture will not be a product for the whole life
- More companies will base their business on this modal of cheaper furniture with a faster turnover, low costs; therefore, tradesmen will be in decline.
- As social attitudes are changing, businesses must change to developing only cheap products and services is not going to be the business model in the future.
- This will happen mainly to develop products on the developing countries. However, on mature markets, the customers will request more high added products and will not be so sensible to price.

- Depends your positioning. High-end products are high-end anywhere... not sure I understand correctly the question...
- Only for companies with expansion possibilities based on cost leadership strategy and high levels of investment.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

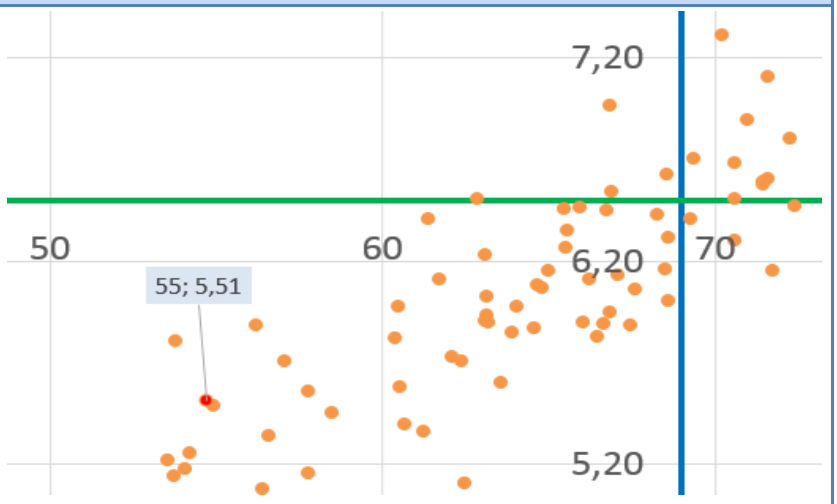
Humans and collaborative robots (cobots) will work in harmony on the plant floor thanks to personalised machine-to-user interfaces and human-like robot behaviour and features (e.g. humanoid design, voice recognition, natural language, gesture understanding, etc.). Human-machine interactions will be designed 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.): **36th**



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

Survey respondents comments:

- It will happen and in human friendly manner and safe of course. Once it did it will be a "game changer" (in every manufacturing industry, including furniture of course).
- Same with all industries
- Cobots are one form of cyber-physical approaches. There are another ones.
- The flexibility that comes with cobots will be a huge benefit in terms of combining craftsmanship (people) with heavy/repetitive/ect operations (robots) - also in small enterprises
- State of the art but not so quick in my opinion to be generalized and introduced until 2525
- This is the trend, but 2025 is too early for seeing this as an established practice.
- One lesson learned in the industry is that robots move processes while humans improve them. With people who constantly improve the process, the manufacturers find ways to make it better. Hence it is important to get the right mix of humans and machines, where machines do the repetitive tasks.
- Collaborative robots will help companies to increase the flexible process operation. Machine-to-user interfaces will be step by step implemented in the manufacturing processes.
- For the same reason of above.

- Other industries are more advanced in this relation. The development of such production system needs more time.
- Human workers and collaborative robots will definitely work together. There is no doubt about it. "Harmony" is a questionable word when you look at some research works performed at the moment (e.g. Fraunhofer Institute for DGUV): some physical contacts would be allowed between machines and workers, and the level of pain (of the worker!) could be a criterion in allowing or not these contacts... Low pain: allowed!!!!
- Unlikely to have a large application by 2025 but with huge impact in those firms that will use it.
- 2025 seems to be too close for such a scenario. However, other problems will arise in the human/robot collaboration: contact to humans cannot be replaced by robots, therefore workers may feel isolated and lonely. Lack of social contacts may lead frustration and to psychosocial problems
- It can become a key competitive element in complex manufacturing chains such as furniture
- Robots will change the industry perspective. The growth of automation threatens many highly qualify people, as software designers. (Martin Ford - Rise of the Robots Technology and the Threat of a Jobless Future (2015) and not only workers with repetitive tasks.
- only in some parts of the production process
- We need to integrate robots in our daily activities. As PCs and Internet had exponentially increase our productivity and enlarge our potentiality, the same it will happen integrating robots with our human skills..

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):

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

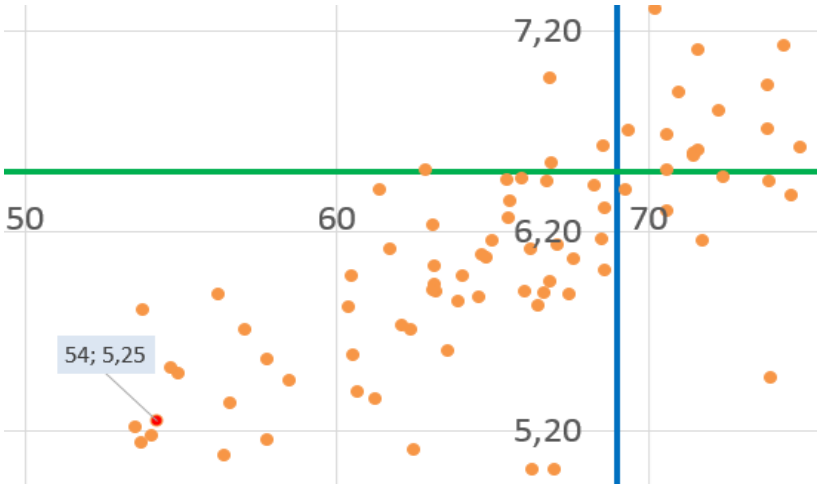
Firms will consider human resources globally and factories will move where skills and talents are located. Continuing geographic differences in skills will result in a divergence of value chains across the world, and will result in the "hybridisation" of the global value chain with specialist parts of 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.): **37th**



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

Survey respondents comments:

- While the search for skills at global level is already a reality for many furniture companies, especially for what concerns the design of the products, the search for human resources and expertise will take place mostly at local level (or European).
- Companies to be competitive in the global market are forced to act in this way.
- This idea, that firms will be located in "talented hub", seems to me good. However, I think that rather labour force will move to countries where successful firms are currently located, because other factors such as environment, services, education and others on must be beard on mind.
- I see a strong rationale for hybridisation, for example, splitting design and manufacturing. This trend will increase as CAD/CAM and other (relatively) standard automated manufacturing gain grounds. I think this trend will be likely stronger than "local customisation", especially in the low cost, mass furniture market, due to the side effect of cultural homogenisation. How fast and strong is it going to be? it depends critically of the digitisation of design-manufacturing.
- value of local and unique employment stress.

TO BE FILLED IN DURING THE WORKING GROUPS SESSION

Possible reasons for its strong impact (> 6.5):
Concrete actions to capitalise opportunities from this factor (by actors/stakeholders):