



MEZeroE

**Measuring Envelope products
and systems contributing to next
generation of healthy nearly
Zero Energy buildings**

D2.1 Needs/requirements and barriers breaking innovation of building envelope products

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Executive summary

Technological innovation in the construction sector is considerably difficult to implement due to several factors such as the fragmentation and complexity of this sector. Many disciplines are involved at various stages, design and production are usually separated, there is a large number of players with a vast majority of small-medium enterprises (SME), and supply chains are long and variegated. As a result, gathering the different specialists together is difficult, and many potentially effective innovative solutions do not even reach the market.

H2020 MEZeroE project aims at tackling this complex issue by creating an EU distributed open innovation ecosystem for (i) developing nearly Zero Energy Building (nZEB) Enabler Envelope technology solutions; (ii) transferring knowledge; (iii) matching testing needs with existing facilities; (iv) providing monitoring in living labs; and; (v) standardizing cutting-edge solutions coming from SMEs and larger industries, to foster inclusive change in the building sector, being accessible via a single-entry point to all users.

MEZeroE ecosystem will be accessed via a single-entry point web-based multi-side virtual marketplace which will include 9 Pilot Measurement & Verification Lines (PM&VL), 3 Open Innovation Services (OIS), and resources for training, business model development, systematic intellectual property (IP) and knowledge management. MEZeroE will fast-track prototypes to the market as fully characterized products.

The first step to create these services is to analyse the reference market and define which are the most relevant needs. This deliverable summarizes the information obtained from several building envelope stakeholders asking them about their needs during their innovation process.

For the research, these steps were followed: (1) interviews (bilateral virtual meetings) with industrial partners inside MEZeroE project; (2) online form interviews to external industrial companies; (3) specific roundtables (virtual events) with internal and external industrial companies about their needs related to Open Innovation; and (4) final virtual workshop to present the work done and collect the last feedback.

As a conclusion of the research a list of needs have been defined, and possible services that could be offered in MEZeroE single-entry point virtual marketplace to address these needs have been proposed.

The main needs that emerged are: (i) a need for a matchmaking service: between research partners and industrial partners, suppliers and manufacturers, start-ups and big companies, etc. ; (ii) expert mentorship has been also requested to help during the certification of the products, during the intellectual property (IP) management in open innovation collaborations, etc. ; (iii) the testing procedures for innovation products are often not clear, so a need for new and effective testing procedures has been identified; (iv) innovation processes are typically highly expensive paths, so help while asking for funding to support the product developer effort is also required; (v) it is not easy for innovative product developers to find real evidences to highlight the benefits of installing their products in the building. So, MEZeroE ecosystem should offer a service to enable it.

We hope that this report will be of particular interest to anyone working in the building sector, in general, and working in the process of development, validation, certification or commissioning of nearly Zero Energy Building (nZEB) Enabler Envelope technology solutions, in particular.



Measuring Envelope products and systems contributing to next generation of healthy nearly Zero Energy buildings

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1. Introduction

1.1 MEZeroE project

The aim of H2020 MEZeroE project is to develop an European distributed open innovation ecosystem for: (i) developing nearly Zero Energy Buildings (nZEB) Enabler Envelope technology solutions; (ii) transferring knowledge; (iii) matching testing needs with existing facilities; (iv) providing monitoring in living labs; and (v) standardizing cutting-edge solutions coming from small and medium enterprises (SMEs) and larger industries, to foster inclusive change in the building sector, being accessible via a single-entry point to all users.

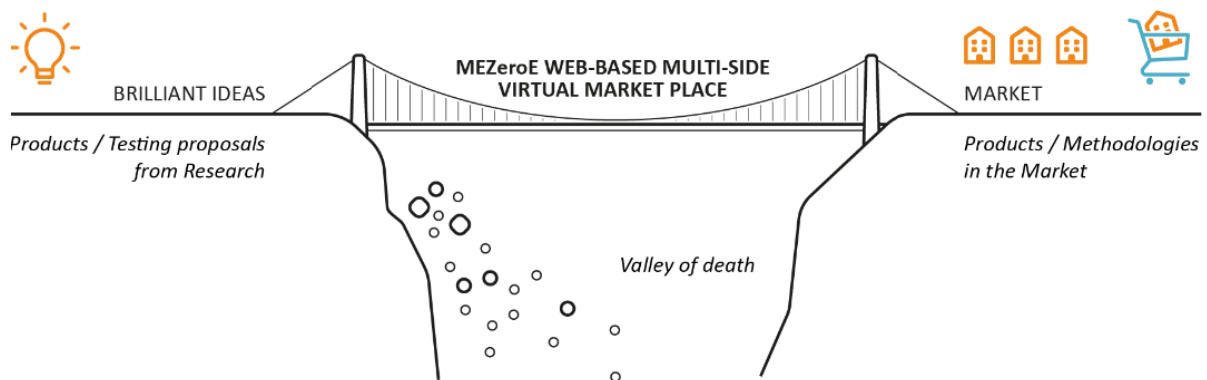


Figure 1: Test bed function illustration¹.

The challenge to overcome is the open upscaling of products from lab validation to higher TRLs and successful market entry. Such upscaling allows to reduce the technological risks and to increase investments' attractiveness, by creating general recommendations and providing a "Premium Service Package", driven by marketability, cost-effectiveness and flexibility.

The MEZeroE ecosystem will create a single-entry point web-based multi-side virtual marketplace, including an access to the following services:

1. Pilot Measurement & Verification Lines (PM&VL), which is defined as a test chain focused on a specific envelope performance or technology to support the development and performance characterization of envelope products by means of experimental measurements and modelling. The following 9 PM&VLs will be developed:
 - a. **PM&VL1 - Advanced Building Integrated Photovoltaic (BIPV) and hybrid Photovoltaic/Thermal (PV/T) systems characterisation facing Efficiency and Safety requirements:** (TECNALIA) Test-chain for a comprehensive advanced BIPV and hybrid PV/T systems characterisation.
 - b. **PM&VL2 - Building envelope/Indoor Environment Quality (IEQ) interaction facing Health requirements:** (EURAC) Test-chain for a thorough energy demand, and indoor occupants' comfort and behaviour analysis and performance characterization.

¹ MEZeroE Consortium, 2020. Grant Agreement number: 953157 - MEZeroE — H2020-NMBP-TO-IND-2018-2020/H2020-NMBP-TO-IND-2020-twostage

- c. **PM&VL3 - Active energy component characterization facing Efficiency requirement:** (LEITAT) Test-chain for a comprehensive stability characterization of active envelope components for energy production.
 - d. **PM&VL4 - Visual and thermal performance analysis of dynamic glass systems facing Efficiency requirement:** (LEITAT) Testchain for testing of innovative dynamic glazing solutions and the definition of new measurements and validation protocols for the assessment of visual and thermal comfort.
 - e. **PM&VL5 - Building/user interaction characterization facing Efficiency requirement:** (DTU) Test-chain for building/user characterization for the optimization of the mutual behavioural control and interaction through IoT and AI solutions based on building envelope and users' needs and corrections.
 - f. **PM&VL6 - Multi-layers dry nZEB Enabler Envelope Solution characterization facing Healthy and Safety requirement:** (POLIMI) Test-chain for the comprehensive characterisation of building envelope components on: thermal, acoustic and air resistance, coupled with accessibility in use and optimization of the structural performances of the nZEB Enabler Envelope Solution on life cycle focusing on mechanical behaviour when exposed to accidental actions (e.g. wind) and/or extreme conditions (e.g. fire).
 - g. **PM&VL7 - Mechanical resistance and stability characterization of connections/joints between component materials and supporting structures facing Safety requirement:** (CUT) Test-chain for durability characterisation of block-walls.
 - h. **PM&VL8 - Solar gain control in semi-transparent envelope component, facing Healthy requirement:** (UIBK) Test-chain for thermal-optical characterisation of advanced façade system.
 - i. **PM&VL9 - Wooden prefab components assessment line facing Safety requirement:** (ZAG) Test-chain for fire safety, hygrothermal, and acoustic characterisation of wooden-based prefab façade systems.
2. Open Innovation Services (OIS), which is defined as combination of tools and methods to address a specific transversal topic. The following 3 OISs will be developed:
 - a. **OIS1 - Standard framework procedures for certification and marking:** Roadmap for product certification and marking applied to a set of products (provided by industrial partners) and general framework to support the creation of new roadmaps for specific products outside of the consortium.
 - b. **OIS2 - Cost-effective Measurement and Verification smart kit for living labs:** Protocol Measurement and Verification in living labs to verify and characterise the performance of building envelope products.
 - c. **OIS3 - Guidance for open innovation life cycle management:** Set of digital services accessible from a unique point of access (Digital Platform), where users can obtain Guidance for support performance-based innovation process by using a common language and standard reference for performance characterisation, while assuring sustainability and feasibility of the product development.
 3. Furthermore, other services such as training, business model development, systematic intellectual property (IP) and knowledge management.

In addition, MEZeroE ecosystem will enable the testing of innovative product in monitored real buildings (Living Labs), providing product developers with real data about the performance of their products.



Different type of Living Labs will be available inside MEZeroE, from fully controlled test bed facilities to real buildings as living labs:

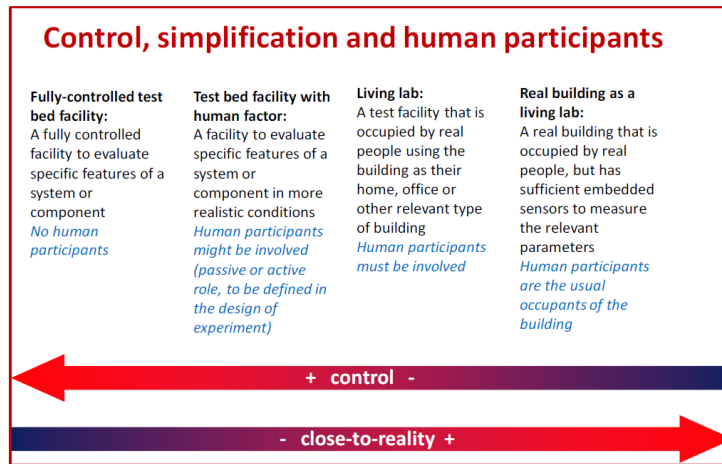


Figure 2: Different Living Lab description².

In order to define more precisely what services should be included in the single-entry point marketplace, the first step done during MEZeroE project was to collect the market needs.

1.2 Aim of the work

This deliverable summarized the information obtained from different searches and contacts with building envelope stakeholders asking them about their needs to during the innovation process.

1.3 Research procedure

As described in the section above, this document sums up a comprehensive revision of the key requirements, needs and barriers hindering the market entrance of innovative building envelope products that was carried out during the first year of MEZeroE project. In order to collect the required information, several steps were performed:

1. Interviews to MEZeroE industrial partners for data collection on needs and barriers breaking innovation of construction industry focusing on envelope products and related supply chains.
2. Surveys among stakeholders and possible end-users of the MEZeroE open innovation test bed for data collection on needs and barriers breaking innovation of construction industry focusing on envelope products and related supply chains.
3. Roundtables with partners, stakeholders and possible end-users of the MEZeroE open innovation test bed to have a deeper understanding about their needs related to open innovation.

² MEZeroE Consortium, 2020. Grant Agreement number: 953157 - MEZeroE — H2020-NMBP-TO-IND-2018-2020/H2020-NMBP-TO-IND-2020-twostage

4. A workshop to share this information and collect feedback and additional inputs from the participants.

For the current research, the process starting with an innovative idea and ending when it becomes a product in the market is divided in 4 steps:

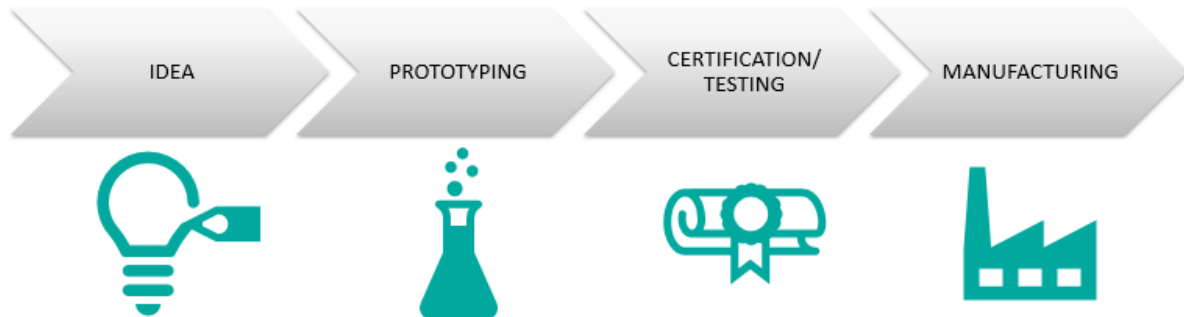


Figure 3: Innovation phases.

- *IDEA: Having an idea:* during this phase the stakeholder will create or choose the best idea to solve the need/problem that it has been identified.
- *PROTOTYPING: Developing the idea, create the product:* during this phase the stakeholder will develop the first prototype of the chosen solution.
- *CERTIFICATION/TESTING: Introducing the product in the market, certification:* during this phase the stakeholder will carry out the required steps to assess the properties of its innovative product.
- *MANUFACTURING: Manufacturing the product:* during this phase the stakeholder will develop the upscaling to manufacture the product in large scale.

1.4 Document description

In the following sections, the work done during 2021 to collect the needs and barriers hindering the market entrance of innovative building envelope products is summarized.

Section 2 describes the interviews carried out among internal industrial partners during the first half of the year. It is explained the procedure of the interviews, listing the discussed questions. Furthermore, the obtained answers are analysed and the main conclusions are listed.

Section 3 describes the surveys shared with different stakeholders and possible MEZeroE virtual marketplace end users. Firstly, the survey (questions) is illustrated, and afterwards the analysis of the answers is described.

Section 4 explains the three round tables carried out with internal and external industrial partners related to the open innovation services. The roundtable procedure and the main conclusions are highlighted.

To finish, section 5 describes the main conclusions of the whole research process that were also presented during the final workshop carried out in December 2021.

2 Interviews among MEZeroE industrial partners

2.1 Procedure

As a first step, the current-practice procedure of MEZeroE industrial partners from the point when someone has an innovative idea until the moment that this idea became a product in the market was explored. 10 interviews of 1'5 hours with the industrial partners from MEZeroE were carried out. Before the interviews, the questions were shared via email with the partners. These are the questions that were discussed during the interviews:

2.1.1 General information of the industrial partners

1. Company name:
2. Nr. of employees:
3. Head Quarter Location:
4. Manufacturing plants locations:
5. Company field:
6. Innovative product characteristics:
 - a. Products TRL:
 - b. Raw material: (wood, glass,...)
 - c. Performance: (create energy, ventilation, isolate, load bearing member...)
 - d. Market:
 - i. Country:
 - ii. Building type:
 - iii. Building height:
 - iv. Location on the building (roof, façade,...):
 - v. ...
7. Differences/advantages over current products (added value):
 - a. Economic:
 - b. Performance:
 - c. Technology:
 - d. Materials:
 - e. Aesthetic:
 - f. ...
8. Product requirements:
 - a. Which are the requirements that the company has already identified?
 - i. Mechanical resistance and stability:
 - ii. Safety in case of fire:
 - iii. Hygiene, health and the environment:
 - iv. Safety and accessibility in use:
 - v. Protection against noise:
 - vi. Energy economy and heat retention:
 - vii. Sustainable use of natural resources:
 - viii. Others (electrical,...)



9. Applicable certification/regulation: (ISO, local regulations,...)
10. Existing IT systems used for the design, testing and production or for the interaction with suppliers and customers (PLM or ERP software being used)

2.1.2 Having an idea

1. Does the company have resources to create innovative products? (e.g. a team fully dedicated to it, a day on the month for it,...)
2. Which % of the company is involved?
3. Is the company self-sufficient in the process of the creation? (an external party is involved for the creation of ideas,...)
4. Which are the main difficulties and needs of the company on the 'idea creation' process?

2.1.3 Developing the idea, create the product

1. Once, an idea is created, does the company have enough resources to develop the first prototype? Or does it usually need an external technical assistance?
2. Which are the main difficulties and needs of the company on the 'prototype creation' process?

2.1.4 Introducing the product in the market, certification

1. Are usually the requirements of the innovative products well defined?
2. Which are typically the specific problems of the company on the definition of the requirements?
 - a. Lack of knowledge
 - b. Lack of regulation
 - c. Difficulties to understand the regulations
 - d. Need of legal assistance
 - e. Others:
3. Which are the main difficulties that the company has identified in order to fulfil the requirements?
 - a. No official regulations/standards for all or some of the requirements (which ones?):
 - b. Lack of harmonisation for some of the requirements (identified which requirements):
 - i. Different regulation for each country (which ones?):
 - ii. Different regulation depending on the application (building type, building part,...) (which ones?):
 - iii. Other type of diversity
 - c. Expensive and time-consuming certification processes (via ETA/EAD,...):
 - d. Difficulties to perform the tests (difficulties finding labs,...):
 - e. Others (difficulties on understanding the regulations,...):
4. Does the company usually have problems for Intellectual Property Right management?
5. Which are the main difficulties and needs of the company on the 'certification' process?

2.1.5 Manufacturing the product

- For the new innovative products, does the company usually easily find the suppliers? Or does it usually need an external assistance?
- Is it easy for the company to manage product distribution?



- Does the company use any Manufacturing Operations Management (MOM) software?
- Which are the main difficulties and needs of the company on the ‘manufacturing of the product’ process?

2.1.6 Conclusions

- Which are the main needs that a company will have in order to introduce an innovative product on the market?
 - Technical assistance:
 - Legal assistance:
 - Economic assistance:
 - Others:

2.2 Data analysis

2.2.1 General information of the industrial partners

In the first part of the interview, general information about the interviewed companies was discussed. In this section a summary of the answers is presented. The headquarters of all the industrial partners are in Europe as it can be seen in the image below. However, the 70% of the companies sells their products also outside Europe, specially to USA. Just one of the interviewed companies has a manufacturing plant outside Europe.



Figure 4: Companies' headquarter location.

Related to the size of the companies, start-ups, small-medium enterprises and big companies are part of MEZeroE. The percentage of each group can be seen in the image below.

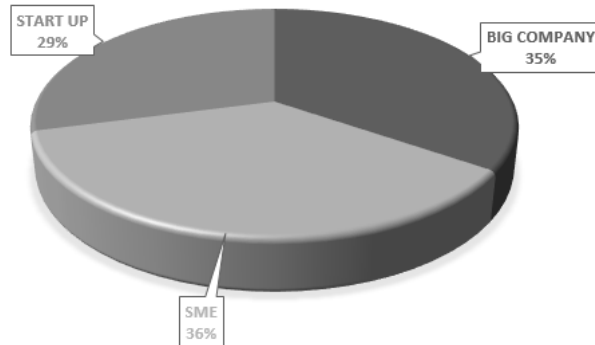


Figure 5: Size of the companies.

The companies that were interviewed have innovative products from a very low TRL to the TRL 9, so they are familiar with the whole process of creating and developing innovative products. Therefore, they can feed the project MEZeroE with their experiences helping with the definition of the main barriers of the companies hindering the market.

The innovative products considered in this research could have different raw materials such as ceramic, wood, glass, polyurethanes, aluminium, steel, granite, concrete or plastic. Furthermore, each of them has different performance (for instance, energy creation, thermal isolation, load bearing, noise reduction, hygrothermal control, ventilation and lighting), so that the research done could identify the needs of a wide range of products. Furthermore, they could be installed in different type of buildings (for instance, residential, high-rise, hospitals or hotels) and in different parts of the buildings (for instance, façade or roof).

Regarding the diversity of the MEZeroE industrial partners, carrying out interviews about their innovation process will provide this research the needs of a wide range of building envelope industry.

2.2.2 Idea

In the second part of the interviews, the challenges of the industrial partners while having ideas to solve the problems or needs related to product development were discussed. Bigger companies have dedicated teams to create ideas that could solve the new challenges of the company. However, in small companies and start-ups, typically, all the team is involved while creating new ideas. They do not have a dedicated team for it. Regarding the resources that they use typically for the creation of ideas a big difference can be seen between different companies. In general, as it is shown in the image below, smaller companies use more % of the resources in the creation of the ideas.

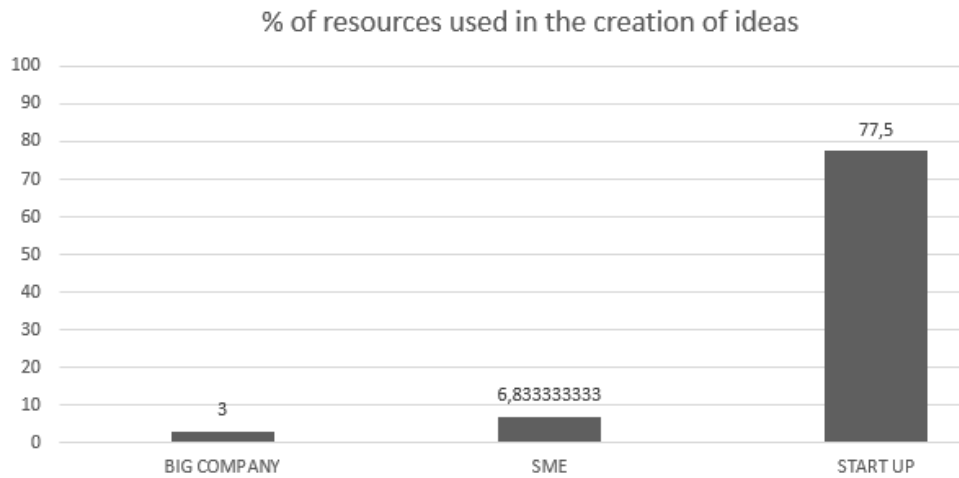


Figure 6: Percentage of resources used in the creation of ideas.

The last question related to this topic was if the companies are self-sufficient while creating the idea. The image below demonstrates that just the 22% of the interviewed companies are self-sufficient in this phase. During the interviews, it was highlighted that typically they contact research centres or universities that could help them. Most of them have a trustful partners' network to collaborate with. In this sense, it could be useful to offer a matchmaking service offering them possible partners to collaborate with in the idea creation process. This way, the MEZeroE virtual marketplace could be a bridge between industrial partners that need help to elaborate ideas that could solve their needs and research partners that have this capability. Moreover, each Pilot Measurement & Verification Line of MEZeroE could be also useful for the different stakeholders in collaboration with the leaders of the PM&VLs, assisting them on the developing of the innovative idea. In addition, in this context of open collaboration, the management of the IP rights is usually a challenge for them. Therefore, MEZeroE virtual marketplace should also be able to answer this need.

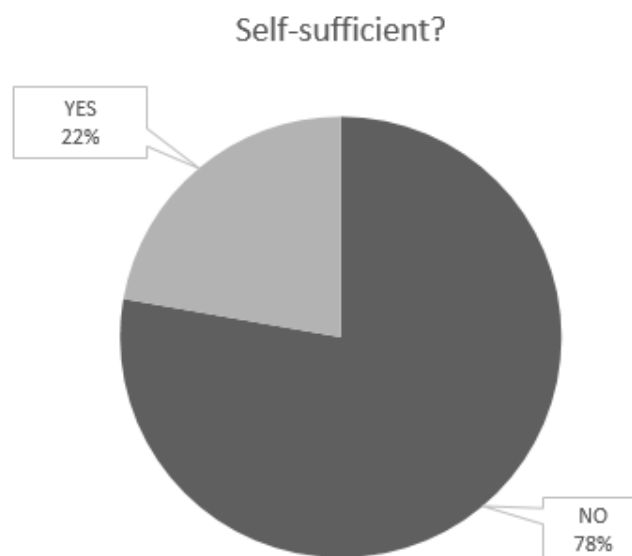


Figure 7: Percentage of companies that are self-sufficient while creating innovative ideas.

Moreover, several partners requested help to find funding for the developing of ideas. Typically, it is a challenge to find resources to create innovative ideas, as it is out of their daily production tasks. Therefore, it could be useful to offer some kind of assistance to deal with this issue inside MEZeroE virtual marketplace.

Furthermore, another need related to the creation of innovative solutions is the challenge of defining which solutions are the optimal ones to solve the problem in each case. Sometimes, the company could have several ideas to solve the same problem, but not enough resources to evaluate all of them. Therefore, they need to decide with a fast analysis which of them could be the most appropriate ones to analyse deeper. The assistance that could offer each Pilot Measurement & Verification Line leader, could be really useful and could help the manufacturers to deal with this challenge.

2.2.3 Prototyping

The third part of the interviews were related to the prototyping phase. The challenges that industrial partners are facing while creating the first prototypes where their innovative ideas will be implemented were discussed. The first question was if they could manufacture the prototypes by themselves or they need external manufacturers to help them. As it is show in the figure below, most of the partners have enough resources to create their own prototypes. Just few start-ups need external assistance to create their products.

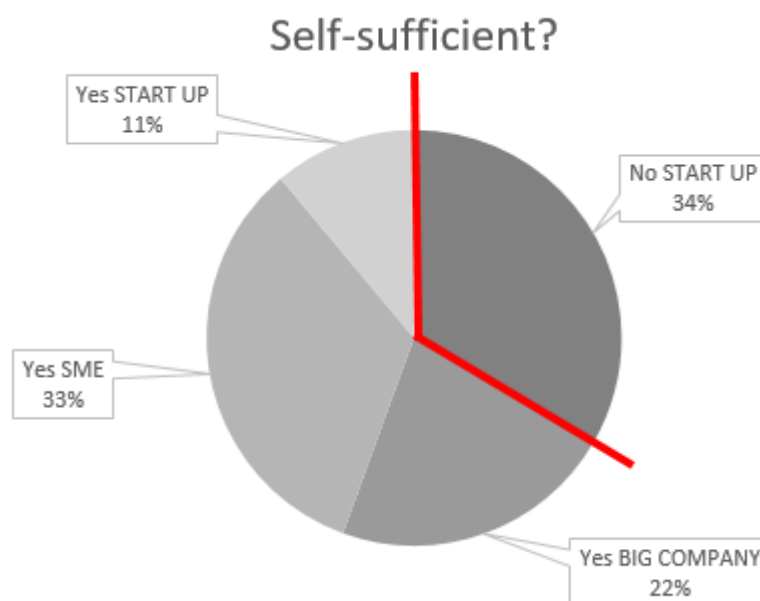


Figure 8: Percentage of self-sufficient companies while prototyping.

Even if most of the companies could manufacture the prototypes by themselves, during the interviews, the interest of some of the companies to have access to a database showing the potential manufacturers for special and innovative products was identified. In some cases, even if they could have capability to manufacture the prototypes, the workload of the production machines to fulfil the standard product purchases in some periods of the year could be high. Therefore, it could not be feasible to use the manufacturing machines for prototyping. Moreover, in some scenarios, even big

companies, could not have the proper machinery to manufacture some components of the innovative prototypes. Therefore, they would need find external collaboration. MEZeroE virtual marketplace could help with this challenge creating an ecosystem database, with a customized searching tool, where companies could find proper manufacturers.

Apart from this, finding funding for this step is also a challenge for some of the industrial partners. Similar to the idea creation step, it could be useful to offer some kind of assistance to deal with this issue inside MEZeroE virtual marketplace.

Another challenge related to small companies, specially start-ups, is that some of the innovative products need to be part of bigger products, because it could not be checked the performance of the prototype without testing it together with the whole product. This could be the case of a sealing for example. MEZeroE could help dealing with this challenge by a matchmaking service. It must be highlighted that a service of matchmaking must be based on reliable stakeholders and always assuring that the interest of all the involved partners are covered and respected. Furthermore, MEZeroE virtual marketplace, could also offer a service of installing and monitoring the products in Living Labs, so different components could be included on these Living Labs to assess their performance together.

2.2.4 Certification/Testing

The fourth part of the interviews was dedicated to the testing and certification of the innovative products. This step is a challenge for all type of companies, starting from start-ups to big companies. They all need external assistance while dealing with the testing/certification step of innovative products.

As it is known, in order to be able to introduce any product in the market, it is mandatory to comply with the regulations of each place. Typically, complying with the regulations means assessing that the performance of the product is adequate for its use. For that, the first step is to identify and understand which are the regulations that should be considered and how could the manufacturer comply with them. This challenge is usually hard for the manufacturers, even for standard products. However, it could be a real nightmare if it is related to innovative products. The main issue is that typically, the existing regulations are related to standard products and do not cover innovative ones. Innovation of the products moves faster than the creation of new regulations. Therefore, an expert and deep understanding of the regulations is needed to be able to adapt their requirements to innovative products. In this sense, the regulations related to the products of most of the partners are not clear for them. They could face different challenges as could be seen in the image below: lack of knowledge to analyse the regulations, difficulties to understand the regulations or lack of regulations related to their product.



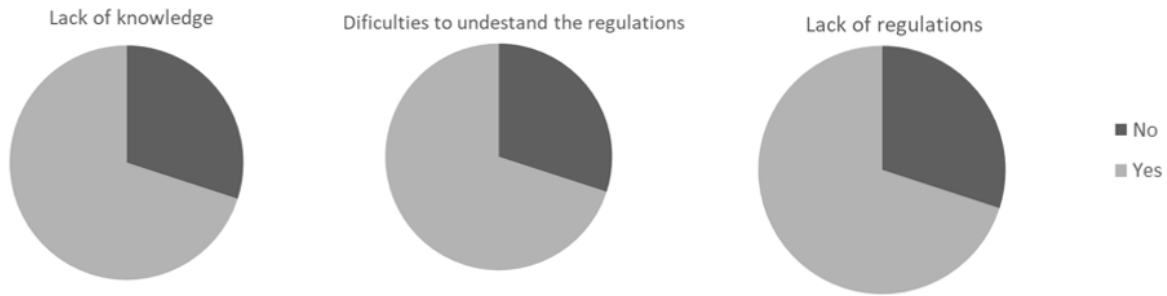


Figure 9: Main difficulties related to certification.

During the interviews, the conclusion was that in all the process of innovation, for most of them, the main challenge is the certification part. Therefore, the services of MEZeroE should help with this challenge to the industrial stakeholders. To cover this need, a specific service has been defined inside the project of MEZeroE. This service will enable the development of certification schemes for innovative construction products: technical guidance, evaluation and support to achieve technical certification of innovative products.

Apart from this, finding funding for this step is also a challenge for some of the industrial partners. Certification process are time and cost consuming and especially small companies are not able to afford them by themselves. Therefore, it could be useful to offer some kind of assistance to deal with this issue inside MEZeroE virtual marketplace.

2.2.5 Manufacturing

The fifth part of the interviews was dedicated to identifying the challenges that industrial partners could face while upscaling the manufacturing process to large scale. The image below shows that most of the partners are self-sufficient in the up-scaling process, especially the big partners.

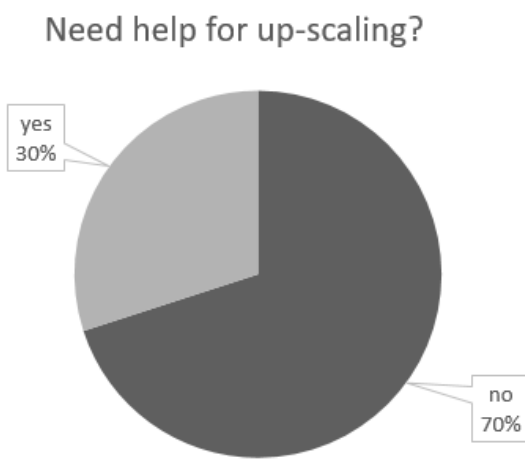


Figure 10: Percentage of companies that are self-sufficient for the up-scaling.

It is not the case for small companies and start-ups, because normally they do not have manufacturing plants where they can produce the innovative product in a large scale. Therefore, they have a need to find the proper partners in the up-scaling step. MEZeroE virtual marketplace could be a good enabler of this matchmaking.

Moreover, even if big companies are normally self-sufficient during the upscaling, in some of the conversations, the need of a matchmaking with suppliers for purchasing some kind of materials was explained. Typically, if some components of the innovative products are out of the scope of their usual suppliers, it is a challenge for them to find proper suppliers for the new materials. MEZeroE virtual marketplace could help dealing this this challenge.

2.2.6 Conclusions

The interviews with the industrial partners are a worthy tool to a better definition of the challenges that MEZeroE project should cover. During these interviews several points were identified:

- **Matchmaking:** a need for a good matchmaking service was identified in several steps of the innovation process. This matchmaking could be for instance, between start-ups and big companies, between companies and suppliers, between companies and research centres or universities. The virtual marketplace of MEZeroE, as central ecosystem related to building envelope products could be a perfect tool to encourage the success of the required matchmakings.
- **Funding:** the challenge of finding funding is relevant for the industrial partners. Specially for the smaller ones it is really a challenge to find out how to afford their need to perform innovation. Several stakeholders related to building envelope products will be part of the future ecosystem created in the MEZeroE virtual marketplace. Therefore, this marketplace could be a proper space to help each other finding the best way to support innovation costs
- **IP management:** while doing open innovation, the management of the IP rights is a challenge nowadays. Companies have issues defining which could be the best way to share IP rights while doing collaborative innovation. MEZeroE virtual marketplace will encourage open innovation. Therefore, a special effort needs to be done inside MEZeroE defining which is the optimal procedure for the IP management during open innovation.
- **Certification/testing:** the main challenge for the industrial partners during the creation of innovative products is the certification and testing process. One of the main objectives of MEZeroE is to help innovative product developers introducing their products in the market. Therefore, assisting them during the certification and related testing process inside MEZeroE platform is definitely a service that will be offered in the virtual marketplace.
- **Added value of the innovation:** during the research it was also analysed which are the differences and advantages of the innovative products of MEZeroE industrial partners comparing with the ones that are already in the market. In general, it was highlighted that even though the selling price of the innovative products is higher, at the end, the customer will have economic savings because of the higher performance of the innovative product. For example, intelligent window systems are more expensive than the traditional ones. However, as intelligent window systems optimize the energy consumption of the building, the over cost of buying intelligent windows will be compensated with the light and gas invoice reduction of the building. This added value is not always easy to highlight. MEZeroE virtual marketplace should



help in this issue. A specific service will be offered for the monitoring of the innovative systems installed in the living labs. This will provide evidences to the companies about the improvement of the performance of real buildings thanks to their products.

3 Surveys to stakeholders and possible end-users of the MEZeroE open innovation test bed

3.1 Procedure

As a second step, the usual procedure of external stakeholders from the point when someone has an innovative idea until the moment that this idea become a product in the market was explored. 63 Microsoft surveys were sent via e-mail to different stakeholders and 25 answers were obtained. The members of MEZeroE project are really thankful to these stakeholders and appreciate a lot the effort and time dedicated to answer this survey. These are the questions of the Microsoft form survey:

3.1.1 General Questions

1. Which type is your organization/company?
 - a. Manufacturing company
 - b. Innovation centre and research centre
 - c. Certification laboratory
 - d. Association or agency
 - e. Consulting company
 - f. Design firms
 - g. Technical assessment and regulation company
 - h. Financial entity (Investors, crowdfunding)
 - i. Public entity
 - j. General contractors
 - k. Others
2. Which are the expected performances of the innovative building envelope products that your organisation/company is related to? (choose more than one if necessary)
 - a. Energy creation (thermal, electricity,...)
 - b. Ventilation/ air circulation
 - c. Isolation (thermal, acoustic,...)
 - d. Support loads
 - e. Aesthetic
 - f. Human comfort
 - g. Building material protection (against fire, against environmental phenomena, against aging,...)
 - h. Air cleaning
 - i. Any kind of performance
 - j. Others
3. Which are the raw materials of the innovative building envelope products that your organisation/company is related to? (choose more than one if necessary)
 - a. Wood
 - b. Glass



- c. Plastic
 - d. Concrete
 - e. Composites
 - f. Metal
 - g. Wool
 - h. Plasterboard
 - i. Others
4. In which continent has your organisation/company the main business/activities? (choose more than one if necessary)
- a. Asia
 - b. Africa
 - c. Europe
 - d. North America
 - e. South America
 - f. Australia/Oceania
 - g. Antarctica
 - h. All over the world
 - i. Others
5. In which country has your organisation/company the main business/activities?

3.1.2 Need, barriers and requirements definition

6. Which are the main difficulties and needs on the 'idea creation' process for building envelope innovative products?
- a. Lack of human resources
 - b. Lack of financial resources
 - c. Lack of knowledge
 - d. Lack of habit
 - e. Lack of dedication time
 - f. Others:
7. Which are the main difficulties and needs on the 'developing the idea: prototype stage' process for building envelope innovative products?
- a. Lack of human resources
 - b. Lack of financial resources
 - c. Lack of dedication time
 - d. Lack of manufacturing resource
 - e. Lack of knowledge
 - f. Others:
8. Are usually the legal requirements for the introduction of the innovative products in the market well defined?
- a. Yes
 - b. No
9. Which are the main difficulties in order to fulfil the requirements for building envelopment innovative products?
- a. No official regulations/standards for all or some of the requirements:
 - b. Lack of harmonisation for some of the requirements (identified which requirements):
 - c. Expensive and time-consuming certification processes (via ETA/EAD,...)



- d. Difficulties to perform the tests (difficulties finding labs,...):
 - e. Difficulties to understand the standards/regulations
 - f. Others:
10. Which are the main difficulties and needs on the 'go to the market' process for building envelope innovative products?
- a. Intellectual Property Right management
 - b. Market strategy
 - c. Customer acceptance
 - d. Others

3.1.3 Conclusions

11. From 0 (very easy) to 10 (very difficult), how difficult is to introduce in the market an innovative building envelope product?

0	1	2	3	4	5	6	7	8	9	10
Very easy					Very difficult					

12. Which is the most difficult step from the beginning of innovative ideas to ready-to-market phase for building envelope innovative products?
- a. Having the idea
 - b. Manufacturing the first prototype
 - c. Validation process
 - d. Certification process
 - e. Intellectual Property Right management
 - f. Manufacturing operation management
 - g. Supplier management
 - h. Financial management
 - i. Market strategy definition
 - j. Others:

3.2 Data analysis

3.2.1 General information of the industrial partners

In the first part of the survey, general information about the interviewed companies were asked. In this section a summary of the answers is presented. The aim of this part is to characterize the interviewed stakeholder in order to give to the reader of this document enough information to be able to understand the results. Therefore, it is summed up how many stakeholders have been considered, which type are them or where is their main business located.

Related to the type of companies that have been considered, the survey was sent to manufacturing companies, innovation/research centre, certification laboratories, associations or agencies, consulting companies, design firms, technical assessment and regulation companies, financial entities, public entities and general contractors. However, just manufacturing companies, innovation/research centres, associations, consulting companies and technical assessment and regulations companies answered



the survey. The figure below shows how many companies are of each type. Apart from these types, a software company, distributor company and an engineering company have answered the survey.

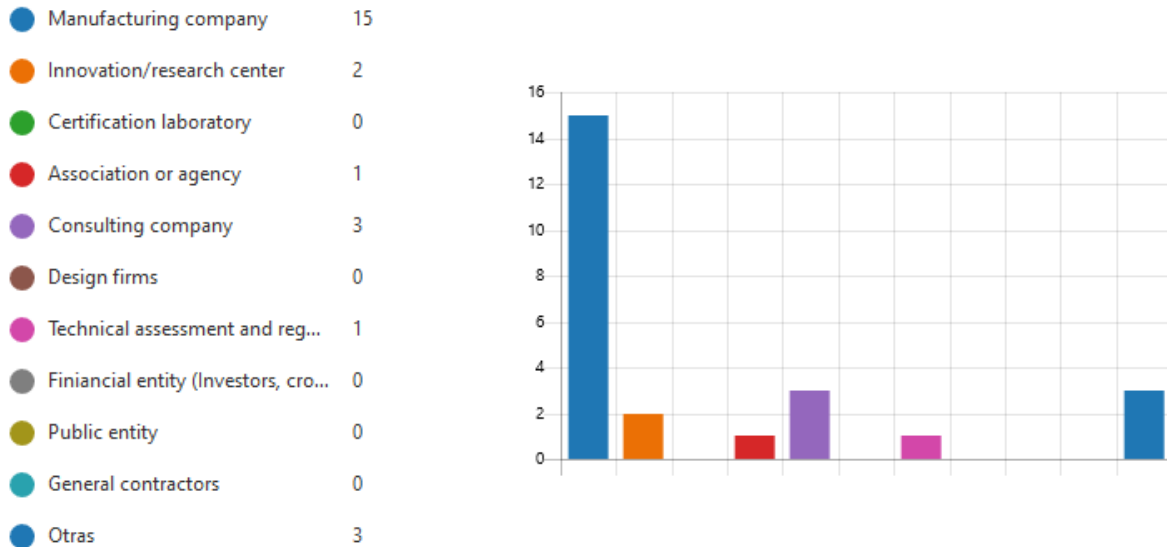


Figure 11: Type of companies.

In order to be able to collect the needs of a wide range of the community of building envelop products and not focus just in few products, the survey was sent to different stakeholders that are related to different kind of products. The image below shows the different possible performances of the wide range of products that the participant of this research are developing.

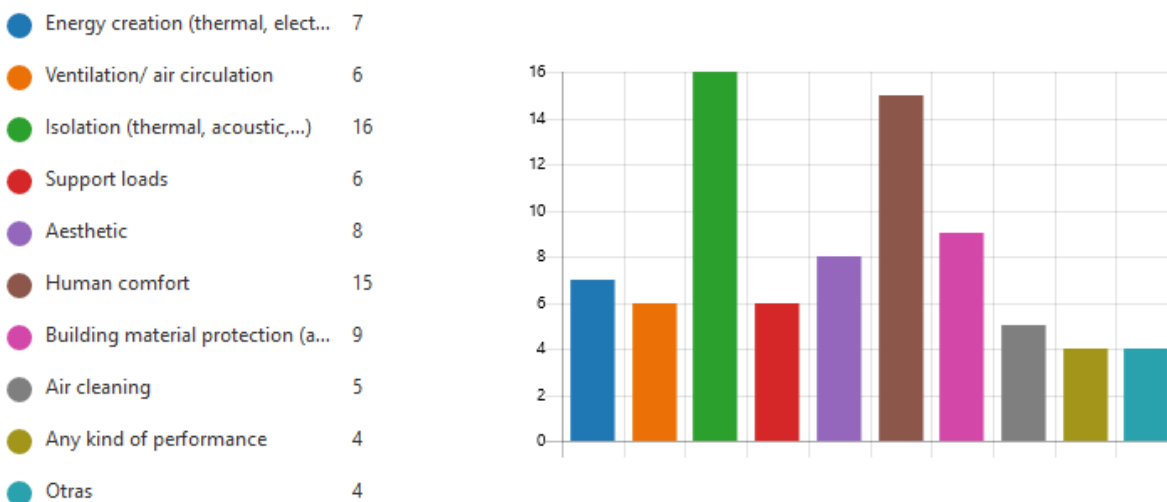


Figure 12: Product performances.

Furthermore, this study is mainly focused in the European market. The figure below shows that most of the company's business activity is located just in Europe. Anyway, some of them also have business activities in America, Asia, Africa or Australia, so the needs collected in this study could be also useful to propose services outside Europe.



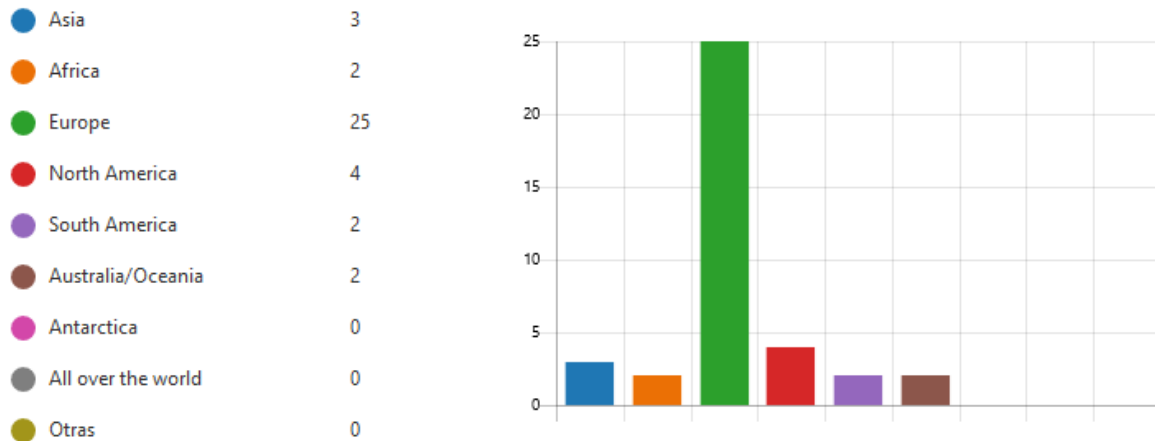


Figure 13: Business countries.

3.2.2 Need, barriers and requirements definition

In the second part of the survey, the information related to their requirements, needs and barriers hindering the market entrance with innovative building envelope products were collected.

First of all, their needs related to the ‘idea creation’ step were obtained. As it can be seen in the image below, in general, they are facing lack of human resources, lack of financial resources, lack of knowledge, lack of habit and lack of dedication time. Therefore, the services offered by the virtual marketplace of MEZeroE should help stakeholders dealing with these difficulties.

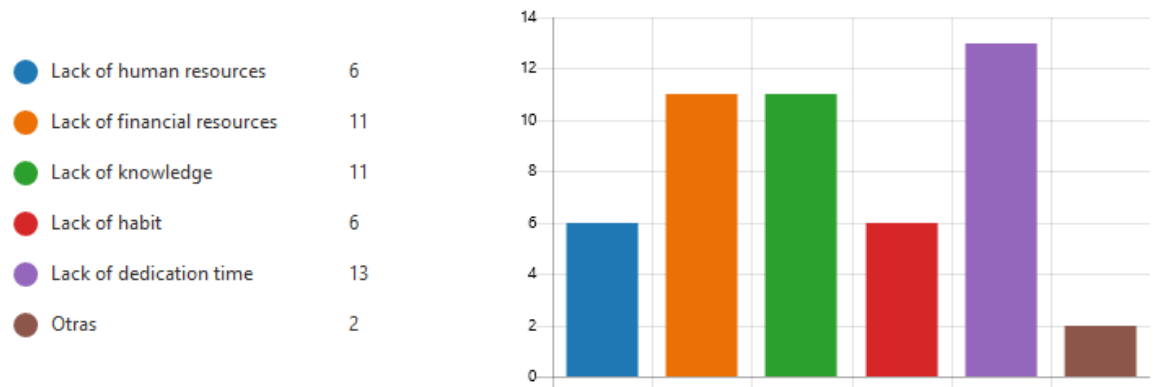


Figure 14: Needs during the idea creation step.

Afterwards, their needs while developing the prototype were got. In this case, there is one main difficulty for most of the stakeholders, which is the financial resource. They have problems to find financial resources to develop prototypes of their ideas. Therefore, it would be interesting to offer a service in the virtual marketplace of MEZeroE handling this need. Apart from this, some of the stakeholders are also struggling with the lack of human resources, lack of knowledge, lack of habit or lack of dedication time.

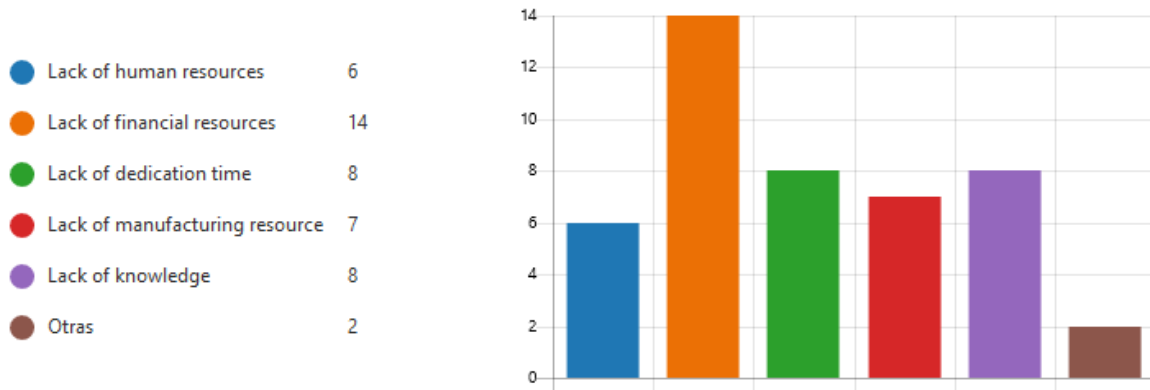


Figure 15: Needs during the prototyping step.

The next two questions of the survey were related to the certification and testing step. First, it was asked if the legal requirements for the introduction of the of the innovative products in the market are well defined. Most of them answered that they are usually not well defined as it can be seen in the figure below. This confirms the need that was highlighted in the interviews to MEZeroE industrial partners. Therefore, the service that is being defined in to the MEZeroE project that is focused in the development of certification schemes for innovative construction products is a critical service.

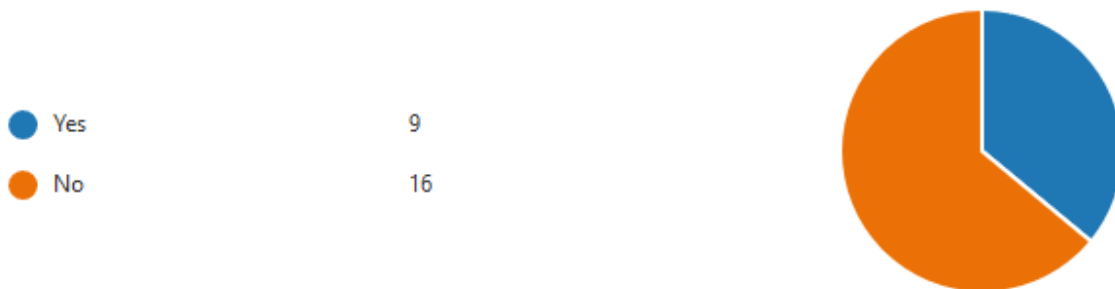


Figure 16. Are the legal requirements for the introduction of the innovative products into the market well defined?

While asking about the main difficulties to fulfil the requirements of the building envelope products, not one single difficulty was prioritized. Most of them have difficulties to understand the standards, or there are no standards, certifications processes are expensive and time consuming and it is difficult to find proper laboratories to perform the tests. The Pilot Measurement & Verification Line and the open innovation service one that are being developed inside MEZeroE project will cover these needs. Moreover, in the MEZeroE virtual marketplace, it would be possible to choose a proper laboratory to perform the required tests for innovative building envelope products.

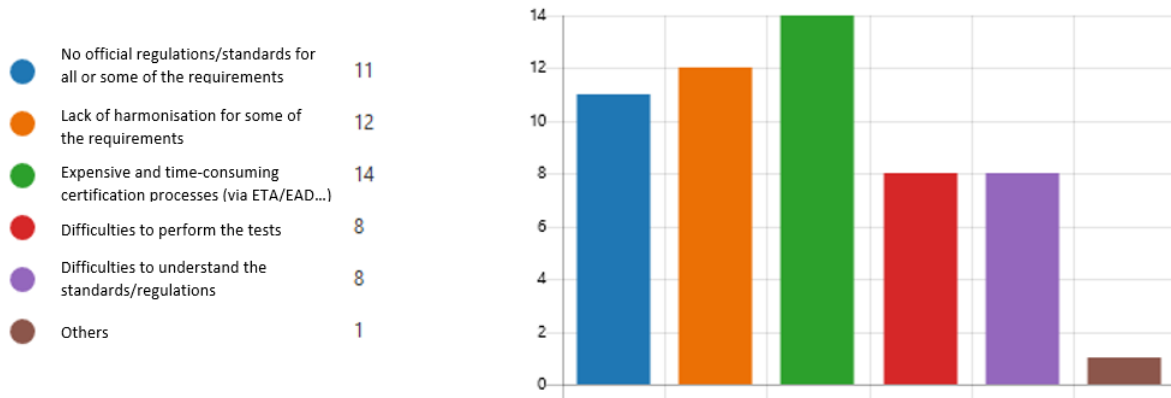


Figure 17: Needs during the certification/testing step.

The last question related to their needs and barriers was about the last step, 'manufacturing and go to the market' step. In this part, several issues must be taken account, Intellectual Property Right (IPR) management, market strategy, customer acceptance, etc. In these cases, defining the market strategy and customer acceptance are a challenge for different stakeholders as it can be seen in the figure below.

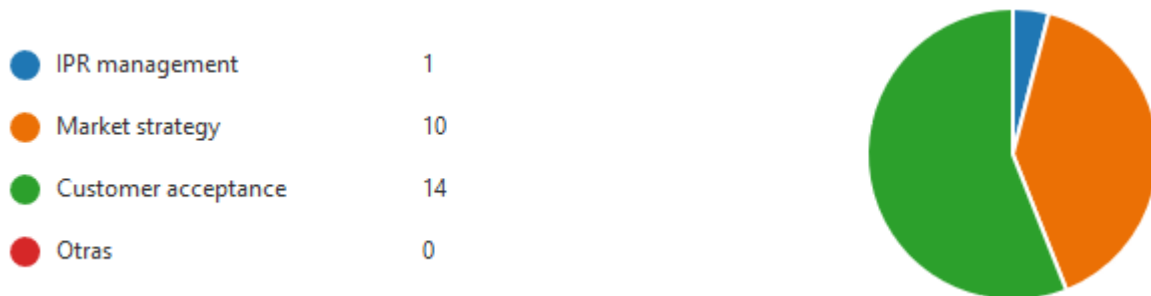


Figure 18. Needs during the 'manufacturing and go-to market' step.

3.2.3 Conclusions

The aim of the last question of the survey was to identify the main challenge while hindering the market of building envelope with innovative products. The figure below shows that the validation and certification issues are the two main needs for the stakeholders. One of the objectives of MEZeroE is the creation of nine Pilot Measurement & Verification Lines that will be offered in the virtual marketplace to allow the stakeholders an easier validation process. Furthermore, to support these Pilot Measurement & Verification Lines, the development of certification schemes for innovative construction products is also being developed inside MEZeroE project in open innovation service one.

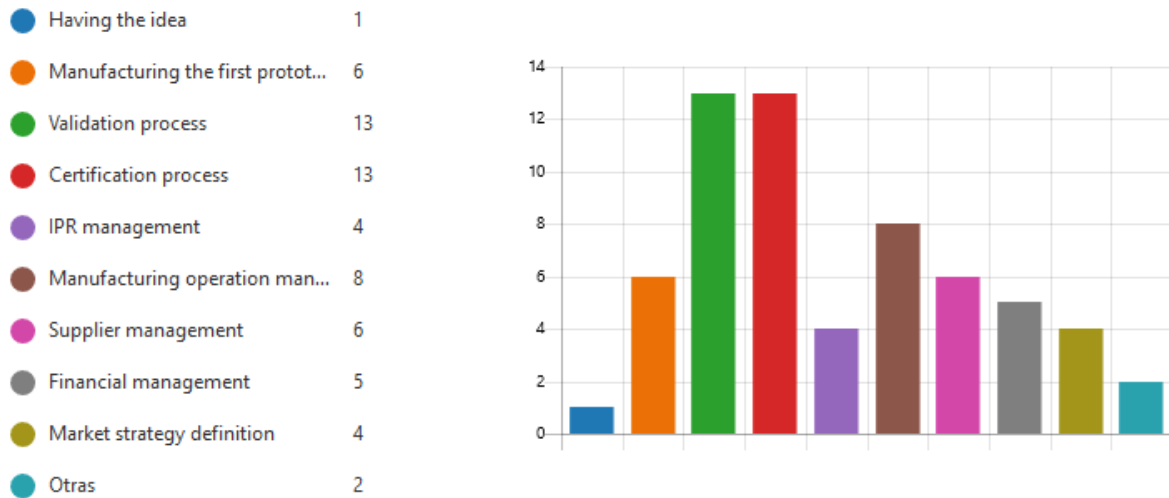


Figure 19: Main needs.

4 Roundtables among partners, stakeholders and possible end-users of the MEZeroE open innovation test bed

4.1 Procedure

As a third step, three different round tables were carried out: one with start-ups, one with small-medium enterprises and one with bigger companies. Partners of the consortium and external stakeholders had participated in the roundtables. All of them were virtual roundtables carried out via Teams. The objective of these roundtables was to have a better understanding of the needs of building envelope stakeholders related to Open Innovation. These are the different Open Innovation services discussed during the roundtables:

- The Challenge Creation Service

What do we do?

With this service, we help large industrial companies specializing (or involved in creating) in nZEB Enabler Envelope Solution products find new ideas for products and services.

Who is it for?

This service is interesting for companies that have positive cash-flow and are ready to bring new products and services into the market but have limited resources for innovation. They require support to bring new products and services into the market.

How we do it:

We create challenges to attract entrepreneurs and start-ups in the same industry. We attract great ideas and teams that require corporate-industrial level support to come into the market. This can be



achieved by organizing prize-based idea competitions, calls for ideas or even creating a corporate accelerator/incubation program. The winners of the challenge are supported either financially or through perks such as access to company infrastructure or clientele in exchange for a % equity.

- Expert Mentorship

What do we do?

With this service we help small-medium enterprises and start-ups validate and develop their idea or product.

Who is it for?

Aimed at start-ups and small-medium enterprises who require support with certain parts of the innovation chain to bring a product/service to market.

E.g.: A technical small-medium enterprise that has created a working prototype but requires further support in areas such as: market data, legal feasibility, IP handling, financial forecasting, exploitation plans, marketing plan, commercialization strategies, etc.

The service could also be directed at a small-medium enterprise which is strongly skilled in commercialization, diffusion and exploitation, but requires technical support for product development. In such a case, services such as: concept development, product design, certification, prototype development, etc. are offered.

How we do it:

We analyze the small-medium enterprise or start-up's idea to understand what part of the product or service development process requires support from MEZEROE. Based on this, we provide an offer with the work to be executed. The product/service development process is executed as a standard project, with a project manager, work plan, resources and defined schedule. The applicant company will generally also participate in the project, being responsible for those activities they are capable of executing.

- Funding Management Service

What do we do?

With this service we help organizations of all sizes find funding options for the development of their idea, product or service.

Who is it for?

This service is aimed at organizations that have a prototype or proof-of-concept, or even organizations that want to expand into different markets with an existing product or service, but require funding of the operations.



How we do it:

We analyse the proposed product or service and scout adequate funding sources. We work with bank loans, national grants, European grants, private equity, venture capital, etc. In the case of start-ups, we can connect the with corporate incubators or corporate accelerators.

- Matchmaking

What do we do?

This service aims to facilitate partnerships amongst companies with a common goal of creating a viable nZEB Enabler Envelope Solution product or service. We connect organizations on different points of the value chain, who can work together synergistically.

Who is it for?

This service is specifically aimed at organizations that have key skills in certain areas but require partnering with other companies to bring viable products and services into the market.

For example, connecting a laboratory, a manufacturer, and an innovative small-medium enterprise with an innovative product.

How we do it:

We analyse the requirements of the applicant company and scout for partners that can match the requirements. The service is specifically intended to create partnerships; this is not a subcontracting service. We connect companies that are interested in forming alliances and being stakeholders in an innovative and promising product or service.

- Event Management

What do we do?

This service helps large organizations looking for great ideas products and services find them by attracting young talent and start-ups by celebrating events.

Who is it for?

This service is aimed at large organizations who wish to expand their catalogue of products and services but have limited human resources in the innovation department.

How we do it:

We analyse the requirements of the applicant company and propose a range of events that could rapidly attract the right talent and ideas. We create the event, challenge and marketing campaign and oversee its celebration and success.



What kind of events?

Hackathons, Workshops, Digital events, Start-up competitions, Pitch competitions, Design competitions.

4.2 Data analysis

In this section the summary of the discussions of the roundtables related to each service is summarized. First of all, the roundtable of start-ups is explained, then the roundtable of small-medium enterprises and to finish the roundtable of bigger companies.

- **Start-ups**
 - The Challenge Creation Service

These are the answers obtained via Microsoft Form during the roundtable:



As it can be concluded for the forms, none of the participants were familiar with challenge creation services. However, they would be interested in a service that will help them using this kind of platforms. Therefore, MEZeroE virtual marketplace could offer this service for Start-ups.

- Expert mentorship

These are the answers obtained via Microsoft Form during the roundtable:



Does your company require expert mentorship in certain areas?



As it can be concluded for the forms, as the size of the start-ups is small, typically they don't have a legal department to assist them. Therefore, expert mentorship service seems to be useful for them. Different needs were highlighted during the roundtable:

Certification process: an expert mentorship helping them with all the standard analysis and certification process will be useful for them. Open innovation service one could cover this.

Commercialization: an expert mentorship helping them with all the process needed to commercialize their innovative product will be useful for them. Needs to be discussed if this service is in the scope of MEZeroE or beyond it.

- Funding Management Service

These are the answers obtained via Microsoft Form during the roundtable:

Regarding fundings, is your company a user of public funding programs?



Would your company be interested in paying for services that will help finding fundings for open innovation?



As it can be concluded for the forms, in general, public funding are necessary for the survival of the start-ups, so they use a lot of resources finding funding. The usefulness of the service that would help them with funding related to open innovation was diverse, 50% of them have indicated that they would be interested and 50% of them that they will not be interested.

- Matchmaking

These are the answers obtained via Microsoft Form during the roundtable:



Would your company be interested in paying for services that will help in Matchmaking with other building envelope companies?



As it can be concluded for the forms, normally start-ups are small and new companies, so they are not yet very known in the market. Therefore, they have not done yet a reliable net around them. So, matchmaking service will be useful for them. In this way, they would be able to find bigger companies with who they can collaborate.

- Event management

These are the answers obtained via Microsoft Form during the roundtable:

Would your company be interested in paying for services of event management related to open innovation?



Would your company be interested in paying to participate in events related to open innovation?



As it can be concluded for the forms, the general opinion is that creating events is beyond their scope. Therefore, they will not be interested in paying for a service of an event management. However, some of them consider that they will be interested in participating (with an inscription fee) in events created by MEZeroE related to open innovation in building envelopments. The price couldn't be too high.

- **Small-medium enterprises**
 - The Challenge Creation Service

These are the answers obtained via Microsoft Form during the roundtable:

Are you user of Open Innovation platforms?



Would it be useful to have assistance to use open innovation platforms?



Would your company be interested in this kind of platforms customized for building envelopments?



As it can be concluded for the forms, in general, they are not familiar with the existing challenge creation services. As it can be seen in the answers. They would appreciate to have a service that will help them to use open innovation platforms. Nowadays, typically, if they have any challenges, they search in their reliable partners net and try to find the best one to solve it. Therefore, the service to assist small-medium enterprises using open innovation platforms could be a possible service to offer in MEZeroE virtual marketplace.

- Expert mentorship

Different needs related to the expert mentorship were mentioned:

IP management: typically, they handle it internally when it is just their product, but for collaborative development, it will be useful to have an expert mentorship service related to IP management. This request was also highlighted during individual interviews with internal MEZeroE partners. Therefore, it seems that it is a need that its important and should be covered by MEZeroE virtual marketplace services.

Certification: it is an important request for them. Certification paths are not simple and they will appreciate to have expert mentorship for it. This need should be covered by open innovation service one and the 9 Pilot Measurement & Verification Lines.

- Funding Management Service

These are the answers obtained via Microsoft Form during the roundtable:

Regarding fundings, is your company a user of public funding programs?



Would your company be interested in paying for services that will help finding fundings for open innovation?



Public funding: The general opinion is that it is necessary to invest more and more time to prepare proposals for public funding, so it will be useful a service that will help them doing it. However, a deep understanding of the technology is necessary to prepare a correct proposal, so some doubts were highlighted about the effectiveness of this service. Moreover, it was highlighted that already several consulting companies are available that can help them with the proposal preparation. It was mentioned that it will be useful to have a service for finding funding related to open innovation, which is not a common service for the existing consulting companies.

Privat funding: they do not have many experiences finding private funding, but they consider it could be useful.

- Matchmaking

These are the answers obtained via Microsoft Form during the roundtable:

Would your company be interested in paying for services that will help in Matchmaking with other building envelope companies?



The general opinion is that they have already a close and reliable partners net and they collaboration with them is successful. Anyway, it was explained that sometimes it is interesting to contact other partners outside this close net and for that it will be useful to have a matchmaking service. The general worry was that it is not easy to find a reliable partner to make open innovation. Therefore, if it is decided to offer this service inside MEZeroE, it should be taken account that proper and reliable partners should be matched.

- Event management

These are the answers obtained via Microsoft Form during the roundtable:

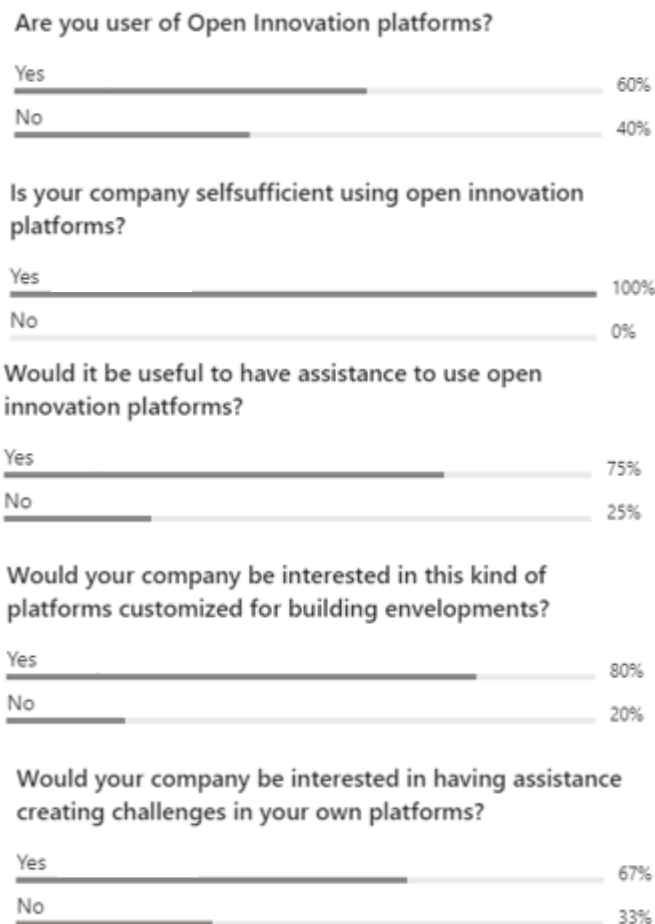
Would your company be interested in paying for services of event management related to open innovation?



The general opinion is that organising events is typically beyond the scope of a small-medium enterprise. Small-medium enterprises are more interested in participating on the event that is created more than creating the services by themselves. Therefore, this service will not be so interesting for small-medium enterprises.

- **Bigger companies**
 - The Challenge Creation Service

These are the answers obtained via Microsoft Form during the roundtable:



In general, most of the participants were familiar with challenge creation services. Some of them have some experiences, participating in challenges on building materials or creating them for students for example. Others managed to solve the challenges internally and have no experience using open innovation platforms. Furthermore, there was not any unified answer about the interest of a service that will help them using this kind of platforms. Therefore, it is not so clear if the service to assist Big Companies using open innovation platforms or creating challenges would be a proper service to offer in MEZeroE.

- Expert mentorship

These are the answers obtained via Microsoft Form during the roundtable:



Does your company require expert mentorship in certain areas?



Related to expert mentorship, the need related to certification and regulations was highlighted. This request is important as for the case of small-medium enterprises. Certification paths are not simple and they will appreciate to have expert mentorship for it. They consider that it is difficult to find really the expert, so sometimes, even if they pay for this kind services to external partners, at the end, they need to make a big part of the work, because the third partner has not a deep knowledge of the product.

- Funding Management Service

These are the answers obtained via Microsoft Form during the roundtable:

Regarding fundings, is your company a user of public funding programs?



Would your company be interested in paying for services that will help finding fundings for open innovation?



In general, the opinion of the big companies is that they participate in the public funding programs, but not because of the money. The money received for this kind of projects is not relevant for them. Therefore, typically, they participate in public funding projects or events in order to share their needs, their opinion about the products, meet new partners, etc. more than for money itself.

- Matchmaking

These are the answers obtained via Microsoft Form during the roundtable:

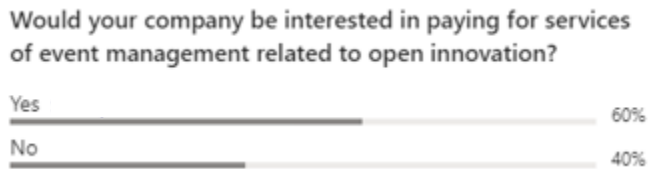
Would your company be interested in paying for services that will help in Matchmaking with other building envelope companies?



As it can be concluded for the forms, the general opinion is that they have already a close and reliable partners net to collaborate with. Typically, they are known companies, so they manage to make the matchmaking by themselves. Therefore, this service will not be useful for big companies.

- Event management

These are the answers obtained via Microsoft Form during the roundtable:



The general opinion is that if they want to create events their marketing department take care of it. However, some of them consider that they will be interested in participating (with an inscription fee) in events created by MEZeroE related to open innovation in building envelopments. The price couldn't be too high.

5 Conclusions

During 2021 year, several steps were carried out in MEZeroE project to define the needs, requirements and barriers breaking innovation of building envelope products. These are the main conclusions obtained after the whole analysis that were also present to the MEZeroE partners during the workshop of December 2021:

5.1 Idea creation

The first step to create an innovative product is to have a good idea that could create better products. To be able to create this idea the stakeholder needs to have available human resources, financial resources and knowledge. During this research, the conclusion is that most of the stakeholders are not self-sufficient to develop a proper idea for an innovative product.

The scenario could be different depending on the size of the stakeholder. Small stakeholders typically have not enough financial resources to develop the idea. Therefore, it is usual a situation of a start-up being part of a public project, because with internal resources they wouldn't be able to develop new ideas.

The scenario for bigger companies is usually different. They could have enough financial resources, but not enough human resources, because they daily product manufacturing issues let them without time to think about innovative products. Therefore, in general, industrial stakeholders collaborate with research centres and universities to create innovative ideas that could solve their problems. MEZeroE ecosystem would be the enabler that would match different stakeholders with different needs to find synergies and make it easy for all of them to create good ideas that would be the seed for innovative products. At this point, it would be important the added value of the ecosystem of MEZeroE in order to find reliable matchings. This ecosystem could be the market where industrial partners could present their needs and where research partners could offer their skills. This could be done for instance by specific roundtables or website publications.



The table below summarize the identified need and the service proposal of the MEZeroE virtual marketplace, which will be the single-entry point to access to the Pilot Measurement & Verification Lines, Open Innovation Services and Living Lab services:

Table 1: Market needs and MEZeroE proposal related to the idea creation phase.

Market needs	MEZeroE proposal
<ul style="list-style-type: none"> • Lack of human resources • Lack of financial resources • Lack of knowledge • Lack of habit • Lack of dedication time • Difficulties to find trustful partnerships 	<ul style="list-style-type: none"> • Matchmaking: research centres/universities with industrial stakeholders, start-ups with bigger companies, etc. MEZeroE ecosystem could be a marketplace where the industrial companies could explain their needs and research partners could offer their capabilities in an open innovation collaboration (Open Innovation Service 3). Furthermore, the leader of each Pilot Measurement & Verification Line could also help the industrial companies during the developing of the innovative ideas. • Expert mentorship: IP management related to open innovation, etc. among the services that will be offered in MEZeroE virtual marketplace, there could be one related to the IP management during open innovation processes (Open Innovation Service 3). • Funding help: MEZeroE ecosystem will guide industrial companies during the process of finding financial support to use the services offered in MEZeroE virtual marketplace.

5.2 Prototyping

The second step is to create a prototype to become real the innovative idea. During this step, the stakeholders need the proper knowledge, machines, manufacturing tools and materials to create the prototype. The conclusion of this research process is that most of the stakeholders need help during this process. Bigger companies have more resources, so they could be self-sufficient to build a prototype. However, small-medium enterprises and start-ups usually do not have the required resources, so they need external assistance to create the prototypes.

One of the possible scenarios in this step is a big company in a high production period. In theory, it has the required machinery, tools, knowledge and material to build a prototype for the innovative product. However, as it is a high demanding period for the standard production purchases of the company, they are not able to use their resources for innovative product prototyping. Therefore, they need to find external manufactures for the prototyping.

Other possible scenario is a start up with no manufacturing resources. In this case, the start-up partners could have the innovative idea, but they need external partner to help them with the manufacturing of the prototype.



Another scenario discussed during the interviews is the case of a big company with high manufacturing resources for their standard product but not qualified machinery for innovative products. For example, a company could be specialised in wood-based products, but for an innovative case, they need to add some metallic part to the product. They do not have proper machinery to produce metallic pieces, so they need external help.

MEZeroE virtual marketplace could cover these needs, creating bridges and links between innovative product prototype manufacturers and idea creation stakeholders.

The table below summarize the identified need and the service proposal of the MEZeroE virtual marketplace:

Table 2: Market needs and MEZeroE proposal related to the prototyping phase.

Market needs	MEZeroE proposal
<ul style="list-style-type: none"> • Lack of human resources • Lack of financial resources • Lack of knowledge • Lack of habit • Lack of dedication time • Difficulties to find trustful partnerships 	<ul style="list-style-type: none"> • Matchmaking: research centres/universities with industrial stakeholders, start-ups with bigger companies, etc. MEZeroE virtual marketplace could contain a database with potential suppliers and manufacturers. Industrial companies could use this database to easily find the proper partner for prototyping. • Expert mentorship: IP management related to open innovation, etc. among the services that will be offered in MEZeroE virtual marketplace, there could be one related to the IP management during open innovation processes (Open Innovation Service 3). • Funding help: MEZeroE ecosystem will guide industrial companies during the process of finding financial support to use the services offered in MEZeroE virtual marketplace.

5.3 Certification/testing

The third step to introduce in the market an innovative product is to validate and certify its properties and behaviour. During the several discussions of 2021, most of the stakeholders assured that this step is the hardest one for them. None of the analysed stakeholders are self-sufficient during this step.

Most of the involved stakeholders has request help to:

- Requirement identification:
It is not easy for them to identify which requirements should be analyse and asses for each product and for each use case. Typically, innovative product development goes



faster than related regulation development. Therefore, the stakeholders have not a clear idea of what are the requirements that should be analysed to validate their product. This is a common need for big companies, small-medium enterprises and start-ups.

MEZeroE ecosystem, via the open innovation service 1 and the Pilot Measurement & Verification Lines will help to cover this need and will guide the stakeholders during the requirement identification path.

- Testing method definition and testing facilities:

Once it has been defined which properties of the innovative product should be analysed, it is not easy for them to know how they should analyse them. Typically, they have the knowledge about the assessment methods of their standard products. However, their knowledge about the innovative product is limited.

MEZeroE virtual marketplace will offer 9 Pilot Measurement & Verification Lines to help the stakeholders in the definition of the test methods for the innovative products. In the virtual marketplace, also a huge facility database will be located, where each stakeholder could find the proper facility for their need.

- Regulation/standard analysis:

In few cases, the regulations and standards related to the innovative product are already created. In these cases, the product developers must identify and understand these regulations to assess the certification path. Typically, this is a difficult task for the different stakeholders, especially for the small ones. Bigger companies have qualified people that enables them the understanding of the regulations and standards. However, small companies have not this knowledge.

MEZeroE virtual marketplace would offer a service related to expert mentorship for regulation and standard analysis related to building envelope products.

- Certification costs:

It is known that testing and certification paths are cost and time-consuming processes. This is a huge issue specially for small-medium enterprises and start-ups. There could be a scenario, where a start-up of 5 partners would like to obtain a CE mark for its product, but they don't have enough financial resources to afford it.

Inside MEZeroE ecosystem several research and technology development centres will be involved and they would help manufacturers to identify the optimal way to find financial support to carry out the needed certification process.

- Evidences of the improvement thanks to innovative products:

Typically, the standards are defined for typical products and do not consider innovative products. Therefore, following the testing procedures that are defined in the standards, it is not easy to highlight the advantages of using innovative products. MEZeroE ecosystem will offer a service where the innovative products could be installed in living labs and their performance will be collected and analysed.

The table below summarizes the identified need and the service proposal of the MEZeroE virtual marketplace:



Table 3: Market needs and MEZeroE proposal related to the certification/testing phase.

Market needs	MEZeroE proposal
<ul style="list-style-type: none"> Difficulties to understand the regulations and the standards Not unified regulations Lack of knowledge Lack of regulations Lack of testing facilities Lack of financial resources: certifications processes are expensive and time consuming Difficulties to find proper laboratories to perform the tests 	<ul style="list-style-type: none"> Open Innovation Service 1: Development of certification schemes for innovative construction products: technical guidance, evaluation and support to achieve technical certification of innovative products. The experts of MEZeroE ecosystem will help the product developers finding the best path for the certification. Open Innovation Service 2 and Living labs: MEZeroE virtual marketplace, will offer the opportunity of test and evaluate the innovative products in real buildings. 9 Pilot Measurement & Verification Lines: each PM&VL will define specific testing procedures for the specific innovative products. Funding help: MEZeroE ecosystem will guide industrial companies during the process of finding financial support to use the services offered in MEZeroE virtual marketplace.

5.4 Manufacturing

The last step creating an innovative product is the large-scale manufacturing of the product. During this step, the stakeholders need to find proper suppliers (reliable and cost effective), optimal manufacturing processes, etc. In this step the needs collected during the research could be divided in 2 type of stakeholders: big companies and small companies.

The typical scenario for big companies is that they are self-sufficient to make the up scaling of the manufacturing process. The main issue that they could have is that their current suppliers are not able to offer the required materials for the innovative product. In this case, they would need assistance on finding proper suppliers. MEZeroE virtual marketplace could be the one helping them in this task.

The typical scenario for smaller companies is quite different. Normally they do not have manufacturing plants, so they need to merge with bigger companies to up-scale their product manufacturing process.



In this case, it was highlighted the importance to find proper and reliable partners. MEZeroE virtual marketplace could be the enabler to create these collaborations, matchmaking different stakeholders and assuring their reliability.

The table below summarize the identified need and the service proposal of the MEZeroE virtual marketplace:

Table 4: Market needs and MEZeroE proposal related to the manufacturing phase.

Market needs	MEZeroE proposal
<ul style="list-style-type: none"> • Lack of manufacturing resources • Lack of reliable partners • Market knowledge 	<ul style="list-style-type: none"> • Matchmaking: finding proper suppliers, start-ups with bigger companies, etc. MEZeroE virtual marketplace could contain a database with potential suppliers and manufacturers. Industrial companies could use this database to easily find the proper partner for prototyping. • Expert mentorship: market analysis, business plan, etc.