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Education for Innovation and Entrepreneurship in the food system: The Erasmus+ BoostEdu approach and results

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## Education for Innovation and Entrepreneurship in the food system: The Erasmus+ BoostEdu approach and results

### Abstract

Innovation and entrepreneurship are key factors to provide added value for food systems. Based on the findings of the Erasmus+ Strategic Partnership BoostEdu, the objective of this paper is to provide answers to three knowledge gaps: 1) identify the needs for innovation and entrepreneurship (I&E) in the food sector; 2) understand the best way to organize learning; 3) provide flexibility in turbulent times. BoostEdu aimed to provide a platform for continuing education within I&E for food professionals and was carried out through co-creation workshops and the development of an e-learning course. The results of the project in particular during the Covid-19 pandemics, highlighted the need for flexible access to modules that are complementary to other sources and based on a mix of theoretical concepts and practical experiences. The main lessons learned concern the need of co-creation and co-learning processes to identify suitable practices for the use of innovative digital technologies.

Keywords: Food; innovation; entrepreneurship; education; training, e-learning; co-construction

### 1. Introduction

In the last twenty years, innovation and entrepreneurship (I&E) have increased their relevance as key factors ensuring the viability of food systems, thus attracting attention by researcher and educational institutions after having been somewhat neglected for years (Knudson *et al.*, 2004). Recent research and strategic documents have focused on I&E needs in the current context and on the potential factors leveraging innovation, including the role of public policies (Bolzani *et al.*, 2015; Dias, Rodrigues and Ferreira, 2019; Claver-Cortés *et al.*, 2020; Arafat *et al.*, 2020). In particular, it is acknowledged that knowledge based innovation and entrepreneurial activities can contribute to ensuring the added value of food systems and value chains, and pave the way towards reaching the goals of growth and employment in the European food sector, as well as meeting increasing world food demand.

Growing attention to innovation has also been paid by the European Commission, both in connection with youth education and professionals' skills development (European Commission, 2016, 2017). This trend has been reinforced further with the recent European Green Deal and the Farm to Fork Strategy. Both of them take innovation as a central point, but also point at wider social objectives, such as compatibility with planet boundaries and the fight to climate change.

A partial reshaping of the I&E agenda has been brought about by the Covid-19 outbreak that has highlighted the need for flexibility, resilient food systems and delivery options ensuring food security and safety. In parallel, a major change in technologies is under way, brought about in particular by increased focus on digitalisation. In general, digitalisation affects opportunities to co-create and disseminate knowledge, as well as to implement innovative education and training. This is high on the policy agenda, as shown for example by the EU digital education action plan. Beyond education using digital technologies, this also affects the way to run business opportunities for entrepreneurial activities exploiting e.g. new social media (Olanrewaju *et al.*, 2020), and the emerging concept of digital entrepreneurship (Satalkina and Steiner, 2020). Education with focus on entrepreneurship is considered instrumental for raising creativity and innovation levels among students and professionals across Europe (European Commission, 2013). For many decades, entrepreneurship and innovation education had its core in business and management programs. However, as new business venturing is receiving increasingly more political attention, and is perceived as a means to create a positive socioeconomic impact, entrepreneurship is being promoted across various academic disciplines and industry sectors. In the last decade, universities have significantly increased the number of

courses within entrepreneurship and innovation and established incubators, accelerators and other programs supporting the development and realization of business ideas (Hoppe, 2016). In a recent study, Meoli *et al.*, 2020 suggest that starting a new venture is affected by the environmental characteristics that surround the individuals. Furthermore, that study highlights the critical role of professional services and support in the execution of entrepreneurial intention in the process of new venture creation.

From the academic side, the topic attracts a wide range of disciplines. Investigations into how entrepreneurship and innovation occurs in a particular discipline are conducted, but also into the underlying background which is related to an individual's behaviour and creativity (Amabile, 1988; Maimone and Sinclair, 2014). These include conceptual models and approaches to education and training (Perry-Smith and Mannucci, 2017).

The literature shows studies specifically investigating factors affecting entrepreneurship in the food sector, both at the level of students (Pouratashi, 2015) and workers within an organisation. A large part of the skills needed for entrepreneurs cannot be easily delivered by formal education; rather they can be developed by building on personal attitudes, through exposure of students to contacts with entrepreneurs and entrepreneurial environments, or during working life (Becot, Conner and Kolodinsky, 2015). Part of the reason relates to the fact that innovation and entrepreneurship are connected to a wider understanding of innovations in complex organisations within and outside food systems, also involving the linkage with agriculture, rural areas and interconnected social structures (Martins and Terblanche, 2003; Klerkx and Leeuwis, 2008).

One issue in entrepreneurship and education is the growing demand to meet wider social objectives. For example those promoted by eco- or green entrepreneurship (Santini, 2017), sustainable development in general (Hermann and Bossle, 2020; Martinho, 2020) or as addressed by the UN Sustainable development goals (Rashid, 2019), resilience (Korber and McNaughton, 2018) and social entrepreneurship (Bansal, Garg and Sharma, 2019). Knowledge intensive entrepreneurship is also attracting attention as a sub-genre of entrepreneurship requiring specific attention (Sousa and Silva, 2019).

In order for the European food sector to navigate among these challenges, future innovations need to be knowledge based and benefit from newly developed continuing education and postgraduate training models for efficient knowledge transfer between industry and higher education institutions. The growing need for innovative solutions and start-ups has shifted entrepreneurship and innovation management from a mere business school agenda to career options, and demands competencies across a wide range of academic disciplines and beyond. A key to this transition is continuing learning and innovation throughout the food system. In particular, higher education institutions should provide lifelong learning and ensure transfer of knowledge and skills needed in a co-creating process. This should use the opportunities brought about by partnerships with the food industry, in the context of more general partnering strategies envisaged to support solutions for current I&E needs (European Commission, 2017). In spite of these needs, the current education practice is still far from being satisfactory, new options need to be explored that address a better understanding of current needs and testing improved solutions.

The objective of this paper is, based on the findings of the Erasmus+ Strategic Partnership BoostEdu, to provide answers to three knowledge gaps: 1) identify the needs for I&E in the food sector, professionals in particular, by co-creation with professionals; 2) understand the best way to organize learnings conducive to more uptake; 3) provide flexibility in turbulent times. BoostEdu aimed to provide a structure and a platform for co-creating and implementing a flexible knowledge path for continuing education within I&E for food professionals across Europe.

## **2. Current knowledge gaps in education for I&E in the European food systems**

In the near future, the food sector will have to face important challenges related to competitiveness and sustainability and therefore it needs a workforce with transversal knowledge and other competences related to management and business knowledge. In the *Food 2030 Strategy* (European Commission, 2020), the European Commission stresses the key role of open innovation, education and skills to make the sector more sustainable and competitive. Education and training keep knowledge up-to-date to face the challenges of the market and technologies, but knowledge translation and open innovation are needed to improve the flow of knowledge between different actors. Education and training are important for all types of employees who need to implement and complement their work with new knowledge. The European Union, through Erasmus+ strategic partnerships, is continuously endeavouring to bring the world of education closer to the needs of industry and farmers (Lazaro-Mojica and Fernandez, 2021).

Innovation and knowledge are considered two useful means to face the challenges that the food sector is facing. In general, innovation can be technological, product/service, process and positioning innovation. This categorisation should not be perceived as something fixed. Companies that carry out product innovation at the same time may also carry out process and/or positioning innovation. Innovation could allow the company to adapt to market changes and new consumer choices, improving its competitiveness, efficiency and entrepreneurship. (Lazaro-Mojica and Fernandez, 2021). For this to happen, entrepreneur must also be able to manage innovation and the innovation process itself. Moreover, Innovation is a continuous process that needs to be continuously implemented and this requires continuous training not only of the entrepreneur but also of all those involved.

In addition, screening the policy documents and literature cited above, three points have been identified as crucial for strengthening the European food sector:

- (1) The innovation policy in the sector indicates new challenges to be met such as sustainability in food systems. A transition towards more sustainable food systems includes adoption of more ecological and less intensive practices at the farm level, but also multi-actor approaches to boost the transition at a systemic level (according to an innovation system perspective), where companies, academia, research centres, policy and different stakeholders interact according to a multi-actor and a co-creation approaches.
- (2) For such a transition to happen, knowledge and learning are needed. In order for all the actors along the supply chain (*i.e.* at the systemic level) to contribute to transitioning, transdisciplinary and agile learning approaches are needed. Learnings in I&E contribute to the process of change starting from the youth to the professionals in the sector. Focus is required on the needs for business and companies at different stages of growth. What is needed therefore, is to understand what the real needs are and how to meet these needs; what way is best to provide knowledge and to build on it.
- (3) A digital transformation however, is also happening in the food sector along the entire supply chain, which could provide more opportunities also in the field of education.

### **3. Method: Evidence from the EU food sector – the BoostEdu strategic partnership project**

#### **3.1 The project and consortium**

The Erasmus+ strategic partnership “Boosting relevant and applicable continuing education in the food sector” (BoostEdu)<sup>1</sup> (<https://ec.europa.eu/programmes/erasmus-plus/projects/eplu-project-details/#project/2017-1-DK01-KA203-034279>) aimed at the definition, piloting and implementation of a

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<sup>1</sup> The project (KA203-2017-005) has been funded under the Erasmus+ programme, Key Action 2: Strategic Partnerships, 2017-2020.

knowledge path for professionals operating in the European food sector to develop knowledge and skills in the field on I&E, in order to promote employability, socio-educational and professional development.

The knowledge path was detailed in the partnership proposal for developing three learning opportunities: A Massive Open Online Course (MOOC), an e-learning course, and an on-site course. The core topic of each of these learning opportunities was I&E in the food sector, while the approaches to develop competences in this field differed per each learning opportunity. The knowledge path intended to first disentangle what the needs of the sector were in this area for the different countries involved. For this aim, a survey was first circulated among selected food European companies and based on the collected results, conclusions were derived on how to proceed in defining contents and approaches for the specific learning opportunities. Subsequently, the skeleton for a MOOC and an e-learning course were defined and shared with different practitioners during a first round of co-creation events. From this, insights were gained on which way of organizing learning opportunities reflects the needs and challenges of food professionals and are therefore more conducive to a higher rate of uptake. Finally, a second round of co-creation events was conducted to finalize and test re-designed learning tools to better align them with the needs and challenges that emerged over time. The final step to be conducted in the project was the implementation of these first two learning opportunities (namely, the MOOC and e-learning course) followed by an on-site course. The latter aimed at (1) enhancing the competences acquired by means of attendance on the two online learning opportunities and (2) build knowledge together with others by means of active engagement and cooperation.

The composition of the BoostEdu partnership reflected the competences needed in order to meet these objectives. The partners were selected based on their knowledge and teaching expertise in the field of innovation, management and entrepreneurship, their experience in working with a wide range of stakeholders across the European food sector, and their reliability and professionalism demonstrated in previous activities within research, education networks, and similar projects.

The University of Copenhagen (UCPH, Denmark) was the coordinator of the project. UCPH originally proposed the idea of a European partnership within structuring and developing continuing education in the food sector based on discussions with private industrial stakeholders about their needs for new knowledge. At UCPH, two departments (Department of Food Science and Department of Food and Resource Economics) contributed to BoostEdu. The department of Food Science is one of the key education and research institutions within food science and technology in Denmark, carrying out research and education that help to solve the global challenges in relation to food. The research and dissemination involves the development of new foods and ways of producing them. The Department of Food and Resource Economics is key within the fields of food, innovation and entrepreneurship, having its origins in the traditions and methodology developed in the Danish agriculture and food production sectors. Both departments work closely with the private sector and public authorities. For the BoostEdu partnership, UCPH contributes with expertise within I&E in the Danish food sector.

Within the BoostEdu partnership frame, Universitat Politècnica de València (UPV) performs the main role of being the e-learning course coordinator. UPV has a wide expertise in MOOC education. It has been positioned as the fifth university world-wide in the number of MOOCs and e-learning courses available in the edX platform, with more than 60 courses and 200,000 students in 2018. In addition, UPV became the first Spanish-speaking university to have more than one million registrations in edX in 2018.

With its mission titled “To explore the potential of nature to improve the quality of life”, Wageningen University & Research (WU, The Netherlands) provides education and research in the domain of: Food and food production; Living environment; Health, lifestyle and livelihood. The strength of WU lies in its ability to join the forces of specialised research institutes and the university. The combined efforts of the various fields of natural and social sciences leads to scientific breakthroughs that can quickly be put into practice and be incorporated into education. In doing so, WU works closely together with governments and the business

community. The WU vision on education has three pillars: (1) relevance for society and industry; (2) international orientation; (3) education on a relatively small scale, approachable staff, and ample opportunities to choose an individual learning track, to participate in extracurricular activities and to develop individual talents in an international atmosphere.

The University of Applied Life Sciences, Vienna, Austria (BOKU) is the only Austrian university in the area of Natural Resources Management and Life Sciences. In particular, The Department of Food Science and Technology (DFST), which is organised in 2 institutes, is the main Austrian research institute for food technology and is an experienced and reliable partner with universities and industries. DFST thematic scope includes: product development, quality and safety management, (bio)chemical, physical, (micro)biological and sensory characterisation of food, nature and properties of enzymes. In addition to these competences, BOKU made available to the partners the knowledge and expertise gained in other e-training and e-learning projects.

The University of Bologna, Italy (UNIBO) is located in 5 Campuses and is today the most internationalised of all Italian universities. To meet the needs of the project, five departments were involved: Dep. of Agricultural Sciences (DIPSA), Dep. of Agricultural and Food Sciences (DISTAL), Dep. of Veterinary Medical Sciences (DIMEVET) and Dep. of Management (DISA). Involving these five departments, UNIBO made available to the consortium its expertise in agricultural and food sciences, agricultural economics and business management. UNIBO was the main partner involved in the design of the survey conducted among food professionals and on the basis of which the topics of the courses implemented within the Boostedu project were determined.

The Technical University of Denmark, National Institute for Food, Denmark (DTU), has a history of high-level education, research, innovation and advice giving at the national and European level on most aspects of Food. It has collaborated on national educational projects in food innovation and entrepreneurship and conducts MOOCs in the food area. Furthermore, strong ties with food entrepreneurs, start-ups, university spin-outs and implementation of a comprehensive student innovation and entrepreneurship centre allowed it to contribute with knowledge of the educational needs of food entrepreneurs in real life.

### 3.2 Materials and methodology

In order to determine what motivates or challenges food companies in engaging with I&E and to build on these learnings to eventually promote a transformation of the food systems, the project launched a survey aiming at providing an overview of the needs of I&E and the challenges EU food companies face. The survey has been disseminated in the first phase of the project.

Literature suggests there is a need for new ways of delivering I&E education for food systems sustainability, therefore the project sketched a first draft of a learning trajectory. It aimed to enhance competences as demanded for new food solutions and new start-ups, by boosting relevant and applicable continuing education in the food sector. A three-stage flexible blended learning platform for food professionals was devised, with contents developed in collaboration with industry and practitioners from each partner country, in order to reflect the specific needs collected locally. In order to do so, a plan embracing different learning opportunities was defined, whose three pillars were: A MOOC aiming at developing knowledge at a *basic* level, with a broad scope; an e-learning course operating at an *intermediary* level; an on-site course operating at an *advanced* level.

Once the skeleton of each of the three learning pillars had been designed and agreed on by means of co-creation approaches among the BoostEdu core team, the partners went through two different rounds of national co-creation events. One of these was a co-creation workshop run by each partner with professionals from food companies. These allowed potential target participants, representing companies of various sizes,

to co-create the contents for each course starting from the proposed designs. Participants were in fact considered as the first who might use the learning opportunities proposed by the project, and clearly its target, hence those who could provide valuable insights to build on for a fully shared co-creation process. Participants engaged in interactive sessions in person, where they were actively involved in providing valuable feedback on different aspects. This process was organized differently in the different countries represented by the project partners. In some cases, visuals were used to enhance the creativity of participants. For example slides and figures in a plenary session fashion explaining the aim of the event and to what each of them were contributing (a more classic top-down approach). In other cases, working groups and focus groups were used as a way to enhance debates and discussions, which were then reported in a plenary session to share with everybody and to allow the different opinions and feedback to be collected (more bottom-up approach). In some cases, 'post-its' were used to guide the discussion from the perspectives of the participants. The results of the co-creation events were then reported in terms of aim of the event, the way in which participants had been contacted, activities performed, educational needs and lessons learned.

In order to adjust the proposed knowledge path to the needs and the requests or suggestions coming from the first round of co-creation events, a second round of co-creation events was planned, although several conditions explained in the remainder of the paper prevented this from happening in some of the countries. Flexibility in the planning and in the tools used was needed to adjust the project activities to the new emerging context: That of the Covid-19 pandemic.

## 4. Results

### 4.1 The survey

In the first stages of the project, a survey was launched in order to support the design of the courses expected to be implemented in the project. The focus of the questionnaire was I&E in continued education in the food industry. The questionnaire was hence focused on these two issues and not on general training needs for the food industry, though the current status of the company was investigated in order to provide explanatory information. The questionnaire kept mostly together I&E (though they could be distinguished) and focused on the educational options that could be implemented in the project.

The questionnaire was distributed to the network of companies available through the project partners using one or both of two main options:

- to ask the company to disseminate the questionnaire and have responses by several people in the same company, on an individual basis;
- to ask one person to bring the opinion of the company as a whole.

The survey was intended to reach companies with different sizes (big and small-medium) and different specialisations (hence bringing different perspectives) within the food industry of the same country; the final reply was however determined by some degree of self-selection by the companies contacted.

UNIBO and WUR with the interaction of the entire partnership provided an online version of the questionnaire in English (implemented on SurveyMonkey®), which was distributed by each partner. The participating companies in the survey (and the national co-creation workshops) were selected by each partner, using the individual national networks and stakeholder databases including start-ups, SMEs and larger companies. The companies were contacted and invited directly by email and personal contact, together with the events being posted by the partner Social Media platforms (LinkedIn® Professional Networking Services), at dedicated web media for food industries and at national food cluster newsletters. Each partner approached companies by translating and collecting data in the way most suitable and reported

back by filling in the online questionnaire. In the end, almost all the companies contacted completed the questionnaire in English directly.

The questionnaire was organised in such a way as to first have a section ask opinions on general needs, and not on personal needs, thus bringing forward the point of view of the company; in a second part more personal viewpoints and experiences with education and training were collected. These two parts were operationally divided in two questionnaires in the online version, in order to allow easier access depending on the chosen options by the country partner and/or by the respondents.

Most of the questions were in a closed ended format, but also open questions were used to allow the respondents to elaborate on the topics addressed. The survey was opened between beginning of May and end of August 2018. Results from the survey are presented below, following the main points it built on.

#### *4.1.1 Opinion of potential users about education needs in food industry*

In the following, we provide a summary of the results, while the full set of results and the questionnaire are available from the project reports.

Altogether, 8 respondents replied on behalf of their companies (all Italian), irrespectively of their role in the company, while 53 provided individual responses (Danish, Austrian, Italian, Spanish), *i.e.* reporting their personal experience. Most of the respondents were working on quality issues, as laboratory staff or as technicians. Of the respondents, 55% were female; most of the respondents had a master degree. The vast majority of respondents were happy with their job (17% extremely satisfied, 70% satisfied). They largely trusted the future of their job and the company they worked in.

All respondents agreed on the importance of continuous education in I&E. More than 90% attended training in the 2 most recent years (2016-2017), most frequently with a duration of 1-2 days in the last two years. Most of them felt a good ability to break traditional mind-set and to give input into the company strategy. In general, some kind of training was available for them in the context of their current company/job (not intended as part of the BOOSTEDU project). They felt that their team was able to provide input to company strategy and new products, processes or services. All respondents had a good innovation attitude, as they liked to learn new things. In terms of new information, they mostly needed updates on products and service daily or weekly, while training less than once per month.

I&E had a rather prominent role in the past training. There was a focus on entrepreneurship in about 40% of learning activities done, while innovation was present in more than 60%. There was some agreement that I&E could make the work better; about 50% also thought training on this topic would allow them to earn a higher wage. About one third of the respondents was also likely to attend an online course on this topic. With respect to education on I&E, they highlighted that more effort was needed and this should be based on concrete examples, accompanied by information about subventions and infrastructures, in order to make it operational.

Research and development was more, or less important, depending on the company. However many respondents highlighted that innovation is a mind-set, not totally transmissible through training activities and indeed not for everybody, as it is also connected to personal characteristics, appropriate staff selection and overall learning environment.

The results of the survey provided a basis for the focus and content of the course, as filtered through co-creation workshops described in section 4.2.

## 4.2 Course structure and contents



As described above, two rounds of national co-creation workshops with participants from higher education institutions (BoostEdu partners) and professionals from food companies were carried out to identify the needs for capacity building. The first round aimed at identifying the main topics to include in the I&E course to face the future employees' requirements in the food sector. In the second round, the specific syllabus of the I&E course and also the planned activities were presented and discussed with the participants.

Based on the results of the survey and the co-creation process, the course structure and content were identified. Participants of the various co-creation workshops manifested a preference to save time and dedicate resources to a few, but well-structured, learning opportunities. In light of this, the MOOC was therefore not pursued. Instead, more effort was dedicated to the e-learning course and the production of short stand-alone appetizer videos for each of the e-learning subthemes, together with targeted on-site courses. Finally, the I&E e-learning course was developed, which includes four overall modules unfolded into 19 complementary full e-learning subtheme lessons. Each subtheme lesson is of 5-15 minutes duration, and ends with checkpoint questions (see table 1). Since December 2020, the e-learning course has been available at the edX platform at the Polytechnic University of Valencia with entrance directly from the platform itself, or from the BoostEdu webpage at DE.boostedu.eu. The continuing pandemic Covid-19 disrupted the opportunities to follow up with national on-site courses, which all had to be cancelled. For a full learning experience, it is envisaged that in the future, the e-learning course can be followed by optional short national on-site or online programmes with targeted focus (if the Covid-19 situation permits).

Table 1 – Structure of the e-learning course

Module	Subtheme lessons
<b>Entre...What?</b>	1. Entrepreneurial mind
	2. Opportunity recognition and idea generation
	3. Entre/Intrapreneurship
	4. Effectuation
<b>Active People</b>	5. Entre/Intrapreneurship in the food sector
	6. Entrepreneurial scientists
	7. Role of the team Intrapreneurs
	8. Role of the team entrepreneurs
	9. Networking/Knowledge sharing
	10. Innovative People
<b>Finding the Golden Nugget</b>	11. Value proposition
	12. Consumer knowledge
	13. Creativity and innovation
	14. Innovation trends
	15. Sustainable business modelling

<b>All about the money</b>	16. Sources of funds
	17. Sustainable revenue models
	18. Financing start up basics and financial plan
	19. Fixed and variable costs & break even point

The first module, “Entre...what?” aims at setting the stage for anyone interested in starting an entrepreneurial journey. It encourages learners to gain an understanding of the main concepts of entrepreneurship, handle important topics and develop knowledge and skills in: Developing an entrepreneurial mind; identifying an opportunity; tackling uncertain outcomes and assessing risks to make entrepreneurial decisions.

The “Active people” module consists of six sub-themes which deal with the actors involved in the innovation process and their characteristics. First, entre- and intra-preneurship profiles are defined within the food sector context. Particular keys to develop intrapreneurial teams are presented. Different intrapreneurship models are also described together with current trends in the food sector. Later, the roles which take part in a startup are discussed, giving examples and reasons for failing and succeeding. Particular attention is paid to the profile of the scientific entrepreneur, for example industrial PhD. opportunities are also discussed. Networking is introduced as an opportunity to have access to like-minded professionals, share knowledge and take advantage of synergies.

“Finding the golden nugget” module includes five main sub-modules providing directions for entrepreneurs and intrapreneurs to identify innovation opportunities and innovative solutions in the food industry. Firstly, identifying value proposition is key to any innovative solutions. Secondly, innovative solutions should be human-centered and based on acquired consumer knowledge. Thirdly, as creativity is core to innovation, the module briefly introduces how one can intentionally nurture creativity. Finally, the module provides an overview of the current innovation trends and the sustainable business models that are relevant to the food industry, in order to give inspiration for identifying innovation opportunities in the food sector.

The “All about money” module provides four main sub modules addressing different aspects connected to funding especially start-ups. A primary concern is to highlight the importance of careful financial planning for the initial activity of a new enterprise, where the business is more fragile with respect to the entity and timing of monetary flows. In addition, the module illustrates the main sources of funding and how they may contribute to starting a new business. Finally, a simple illustration is given of the classification of costs and calculation of the break-even point, in order to provide access to some basic skill to identify a suitable viable volume of production for the business.

#### 4.3 The need for flexibility

The sudden development of the Covid19 pandemic and shut-down of European countries in 2020 and 2021 necessitated re-arranging the knowledge path originally planned. The Covid-19 pandemic has disrupted the way knowledge can be co-created. The impossibility to meet in real-life and to use the approaches and methods (e.g. round tables, focus groups with use of post-its, role games etc.) normally used when people collaborate in the same place and time has represented a hurdle for many. However, the emergence of several different digital platforms and the speed at which they have evolved to keep pace with the very dynamic and challenging situation have proved that it is still possible and valuable to adjust approaches and methods normally used in real-life settings to online settings. The pandemic illustrates the need for flexibility

in courses meant for professionals, to ensure a learning outcome also in another course structure, in this case re-arranging to a 2-staged fully online knowledge path.

## **5. Discussion: what are the main lessons learned?**

Targeting educational tools to final users is a well-known need from the literature mentioned in the introductory sector. This is confirmed also by the BoostEdu experience. In addition, given the highly competitive world of education tools, the high quality of tools needs to be coupled with solutions requiring minimum effort by learners. In this regard, online courses demand a particular audio and image quality to keep learners' attention. Thus, it is preferable that the lecturer is appearing in the presentation, and the videos are recorded in a studio rather than using a screencast option. However, due to the Covid-19 pandemic, the access to these facilities was restricted in most of the partner universities. As a consequence, achieving the audio and image quality demanded in online courses was a big challenge, a situation which is expected to improve as online platforms develop and users become more competent.

The co-creation workshop tool showed that e-learning and MOOC courses should be designed and implemented according to the target group. Interactive exercises, also anonymously performed, could be useful to increase the participation and involvement of those who attend the course. Dissemination material can be in English for these courses, however there is still the need and opportunity for translating and using the local language for any on-site course.

According to the participants (on average), it would be useful to address issues related to specific topics. For example open innovation and the implementation of business models of innovative products not present on the market, and the exploitation of by-products and waste related to food and energy production. It was suggested to not only describe the theoretical description of the business model as a tool, but also to demonstrate its application through examples. Cases were mentioned as relevant for learning in the different workshops run in the BoostEdu partners' countries. Also, including failure cases may contribute to emphasize what must be avoided in order to ensure success in entrepreneurship and innovation in the food sector.

It is as well important to clarify that business is not an activity with ready to use recipes for success; rather it is important to build a mind-set that also accepts failures and learning from them. It was stressed that innovation does not necessarily mean success. Innovation is not only process innovation, but can involve many aspects of a food company, such as product innovation. For example, innovation from the point of view of ingredients has important growth margins even in small volumes and young people could start to create companies from this type of innovation.

It was also discovered that it is hard to coerce professionals into providing their needs for future knowledge. Although a huge effort was done to involve companies in the co-creation workshops, only a limited number of professionals attended. Overall, a major hurdle for co-creating a knowledge path is the time needed for companies and in particular employees to attend such a detailed path. Although online courses offer the chance to create a network especially in challenging times such as under a pandemic, the time burden can become insurmountable where incentives and motivations are missing.

For developers of I&E courses, the need for easy, fast and effective ways to exchange data among partners in a partnership like BoostEdu was emphasized, in order to secure an effective cooperation and continuous progress. The experiences on data exchange between international partners from higher education institutions within BoostEdu show that there is a real need for a European data sharing solution that is secure and GDPR approved.

## **6. Conclusions**

Education and training for entrepreneurship and innovation in food systems are key for the future. The BoostEdu partnership addresses in particular, the issue of providing tools for introducing food professionals to the topic of entrepreneurship using up to date digital technologies.

The project builds on a context in which a good deal of training activity is already going on and the industry staff is generally happy about that. Also, I&E has quite a large role in already existing initiatives. The needs expressed by food professionals are to provide more easy-to-access training solutions able to fit in the busy agenda of the practitioners. Also, I&E training is not something happening in isolation, but rather needs to be embedded into a whole innovation policy and “atmosphere”.

The main outcome and lessons learned of the project provide insights in two main directions. First, on the content side, the project highlights the need to achieve a pervasive view of entrepreneurship and innovation, which also directly involves employees and technical staff. Second, and on the methodological side, it highlights the need of co-learning, which could indeed concern several aspects. In the context of this paper two of them are particularly relevant: a) how to use innovative digital technologies; and b) how to achieve a better understanding of the way potential beneficiaries may have incentives to enter training processes and use them in an interactive and committed way.

Declaration of interest

none

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- Amabile, T. M. (1988) 'A model of creativity and innovation in organizations.', *Research in Organizational Behavior*, 10, pp. 123–167.
- Arafat, M. Y. *et al.* (2020) 'Determinants of agricultural entrepreneurship: a GEM data based study', *International Entrepreneurship and Management Journal*, 16(1), pp. 345–370. doi: 10.1007/s11365-018-0536-1. \*\* In this study, the authors investigate the effect of cognitive and social capital factors on early stage entrepreneurial activity of agricultural sector. Perception of opportunity and self-efficacy are positively and significantly related with the propensity to become entrepreneur. The two social capital factors- 'knowing entrepreneurs personally' and 'having financed others business as a business angel' have positive and significant impact on agriculture start up propensity of the individuals.
- Bansal, S., Garg, I. and Sharma, G. D. (2019) 'Social entrepreneurship as a path for social change and driver of sustainable development: A systematic review and research agenda', *Sustainability (Switzerland)*, 11(4). doi: 10.3390/su11041091. \* This paper aimed at reviewing and consolidating the extant literature studying social entrepreneurship from the context of sustainable development. There is a need for more longitudinal and comparative research on this emerging issue through empirical research. Furthermore, research gaps are identified that should be solved by future research.
- Becot, F., Conner, D. and Kolodinsky, J. (2015) 'Where do agri-food entrepreneurs learn their job and are there skills they wished they had learned?', *International Journal of Entrepreneurship and Innovation*, 16(3), pp. 207–215. doi: 10.5367/ijei.2015.0192. \*\* Starting from the assumption that education and skills influence the profitability of the entrepreneur, the authors conduct the research with the objectives of understanding : (1) Where and how did agri-food entrepreneurs learn the skills needed to start and operate successful agri- food businesses? (2) How do entrepreneurs rate the relative importance of these skills? (3)What is the role of formal education in imparting these skills?. The survey was conducted among farmers in the rural area of Vermont (USA). The authors found that entrepreneurs valued a wide range of skills, making it difficult to tailor training. The importance of informal learning was also confirmed. The authors conclude that the role of higher education in entrepreneurial education is to educate students to think critically, recognize opportunities, develop networks and identify resources. In addition, it is critical to provide students with exposure to entrepreneurs in the field.
- Bolzani, D. *et al.* (2015) 'Promoting Entrepreneurship in the Agri-food Industry: Policy Insights from a Pan-European Public–Private Consortium', *Industry and Innovation*, 22(8), pp. 753–784. doi: 10.1080/13662716.2015.1113860. \*\* The authors offer new insights into how public policy and public–private consortiums can proactively promote entrepreneurship in the agri-food domain. The authors develop, test and validate a multi-item scale, identifying five factors (people, money, network, technology, infrastructure) and 16 specific tools (items) to be used to promote entrepreneurship in the agri-food industry. According this study, the access to funding, human capital development initiatives, and the availability of technological resources are key to effectively stimulate entrepreneurship in the European area.
- Claver-Cortés, E. *et al.* (2020) 'Explanatory factors of entrepreneurship in food and beverage clusters in Spain', *Sustainability (Switzerland)*, 12(14). doi: 10.3390/su12145625. \* The study objectives are to offer new knowledge around the explanatory factors of the entrepreneurial capacity of industrial clusters and to analyze the differences in entrepreneurial capacity in the different food and beverage clusters in Spain. The results of the research showed that "entrepreneurship (as new firm formation)" is favoured by the agglomeration of industry and the presence of institutional thickness that provide different forms of business support. Contrary to the authors' expectations, there is a negative relationship between entrepreneurship and available knowledge.
- Dias, C. S. L., Rodrigues, R. G. and Ferreira, J. J. (2019) 'What's new in the research on agricultural entrepreneurship?', *Journal of Rural Studies*, 65, pp. 99–115. doi: 10.1016/j.jrurstud.2018.11.003. \*\* The

authors conducted a literature review in the period between 2013-2017. This analysis showed that education and training positively influence entrepreneurial behaviour in the agricultural sector. Training courses must attend to the gender role in the family farms, as men generally focus on the agricultural production, while women begin and develop new activities. Young farmers are a particular group that benefits from entrepreneurship programmes since, on the contrary to other sectors, younger people are less likely to become an entrepreneur in the agricultural sector.

European Commission (2016) *A strategic approach to EU agricultural research & innovation*. Bruxelles.

European Commission (2017) *Taking the future into their own hands. Youth work and entrepreneurial learning*. , Luxembourg: Publications Office of the European Union.

European Commission (2020) 'Food 2030. Pathways for action'. Bruxelles.

Hermann, R. R. and Bossle, M. B. (2020) 'Bringing an entrepreneurial focus to sustainability education: A teaching framework based on content analysis', *Journal of Cleaner Production*, 246. doi: 10.1016/j.jclepro.2019.119038. \* Relying on bibliometric mapping of key topics within the literature, this study has sought a novel way of designing programs in higher education by combining sustainability and entrepreneurship goals. The educational framework is based on the use of active-learning pedagogy and involves close collaboration between universities and external actors, enabling students and other learning actors to engage in real-world problems in their learning process.

Hoppe, M. (2016) 'Policy and entrepreneurship education', *Small Business Economics*. Springer US, 46(1), pp. 13–29. doi: 10.1007/s11187-015-9676-7. \*\* The paper is an overview of policies and practices concerning entrepreneurship education in Sweden. According to the study, the implementation of entrepreneurship policy in the Swedish education system has led to an increase in the complexity of the entrepreneurship education field. The main effect of the policy seems to be the growth of an alternative view of entrepreneurship as the main means of achieving learning through action and practice. The implementation tends to favour entrepreneurial learning over the entrepreneurship concept, where entrepreneurial learning comprises a multitude of educational practices to develop internal entrepreneurship and entrepreneurial skills. Traditional ideas of entrepreneurship education to support entrepreneurship are not so much challenged as complemented by new contexts in which entrepreneurship is given meaning.

Klerkx, L. and Leeuwis, C. (2008) 'Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries', *Food Policy*, 33(3), pp. 260–276. doi: 10.1016/j.foodpol.2007.10.001. \*\* This paper aims to give an overview of the different kinds of the so-called innovation intermediaries in The Netherlands and to report on their contributions and the tensions that are being experienced. Innovation intermediaries can contribute to relieve several of the constraints that have emerged for both the demand and the supply side in the market for R&D and KIBS and can facilitate the formation and maintenance of innovation networks.

Knudson, W. *et al.* (2004) 'Entrepreneurship and innovation in the agri-food system', *American Journal of Agricultural Economics*, 86(5), pp. 1330–1336. doi: 10.1111/j.0002-9092.2004.00685.x. \*\*The authors point out that research on entrepreneurship and innovation is limited in the agricultural economics literature. This paper summarizes the state of entrepreneurship and innovation as it pertains to the literature in the fields of economics, agricultural economics, and management. This includes the role of entrepreneurship in innovation and the ability to create entrepreneurs. Finally, the authors introduce a taxonomy of generic types of entrepreneurs.

Korber, S. and McNaughton, R. B. (2018) 'Resilience and entrepreneurship: a systematic literature review', *International Journal of Entrepreneurial Behaviour and Research*, 24(7), pp. 1129–1154. doi: 10.1108/IJEBR-10-2016-0356. \* This paper identifies six conversations or research streams at the intersection of entrepreneurship and resilience: resilience as traits or characteristics of entrepreneurial firms or individuals, resilience as a trigger for entrepreneurial intentions, entrepreneurial behavior as enhancing organizational resilience, entrepreneurial firms fostering macro-level (regions, communities, economies)

resilience, resilience in the context of entrepreneurial failure, and resilience as a process of recovery and transformation. Future research should take a more holistic approach to explore entrepreneurship and resilience from a multi-level and longitudinal perspective.

Lazaro-Mojica, J. and Fernandez, R. (2021) 'Review paper on the future of the food sector through education, capacity building, knowledge translation and open innovation', *Current Opinion in Food Science*. Elsevier Ltd, 38, pp. 162–167. doi: 10.1016/j.cofs.2020.11.009. \*\* In this review, the authors take stock of the needs of businesses operating in the food sector, the challenges they face, the gaps in skills and knowledge and how these gaps are being addressed at European level.

Maimone, F. and Sinclair, M. (2014) 'Dancing in the dark: Creativity, knowledge creation and (emergent) organizational change', *Journal of Organizational Change Management*, 27(2), pp. 344–361. doi: 10.1108/JOCM-12-2012-0197.

Martinho, V. J. P. D. (2020) 'Agricultural entrepreneurship in the European Union: Contributions for a sustainable development', *Applied Sciences (Switzerland)*, 10(6). doi: 10.3390/app10062080. \*This study aims at analysing entrepreneurship in the European Union agricultural sector. Research has shown that :(a) the role of women and young people may make a difference in European farms; (b) entrepreneurship dynamics in the agricultural sector often follow a pattern different to those verified in other economic sectors. (c) agricultural policies are frequently referred to in the literature relative to agricultural entrepreneurship in the European Union, but with a relatively low relevance.

Martins, E. C. and Terblanche, F. (2003) 'Building organisational culture that stimulates creativity and innovation', *European Journal of Innovation Management*, 6(1), pp. 64–74. doi: 10.1108/14601060310456337.

Meoli, A., Fini, R., Sobrero, M., and Wiklund, J. (2020) How entrepreneurial intentions influence entrepreneurial career choices: The moderating influence of social context, *Journal of Business Venturing*, 35(3), 105982 \*\* This research contributes to the emerging literature on the intention-behaviour link in entrepreneurship. The authors modeled how contextual influences at different levels can foster or inhibit the translation of entrepreneurial intention into new venture creation. Analyses were conducted on unique longitudinal data from almost the entire population of Italian university graduates. The authors assessed how the immediate (i.e., the influence of relevant others) and broader context (i.e., organisational and environmental influences) influence the creation of new firms. In practical terms, the research emphasises the indispensable role of universities' professional services and dedicated infrastructures in supporting students' entrepreneurial intentions in their process of new business creation.

Olanrewaju, A.-S. T. *et al.* (2020) 'Social media and entrepreneurship research: A literature review', *International Journal of Information Management*, 50, pp. 90–110. doi: 10.1016/j.ijinfomgt.2019.05.011. \* The paper develops a model that explains what has led entrepreneurs to use SocialMedia and what the impact of such use is. Social media are mainly used for marketing their products, but also for co-creation and innovation on platforms. There is consensus on the role of social media for searching and networking by entrepreneurs; but it is now being harnessed by them to create value for their business.

Perry-Smith, J. E. and Mannucci, P. V. (2017) 'From creativity to innovation: The social network drivers of the four phases of the idea journey', *Academy of Management Review*, 42(1), pp. 53–79. doi: 10.5465/amr.2014.0462. \*\* The authors assume that the increased attention to social networks has influenced individual creativity and innovation, creating inconsistencies both theoretically and empirically. In this article, the authors conceptualize four phases of the journey of an idea, from conception to completion: idea generation, idea elaboration, idea championing, and idea implementation.

Pouratashi, M. (2015) 'Entrepreneurial Intentions of Agricultural Students: Levels and Determinants', *Journal of Agricultural Education and Extension*, 21(5), pp. 467–477. doi: 10.1080/1389224X.2014.960528. \*\* This paper examined levels and determinants of entrepreneurial intentions amongst agricultural students. The survey was carried out among the students of agriculture at University of Tehran. The authors found that education support has a significant impact on students' intention to start their own

businesses. So, it is essential for agricultural colleges to integrate entrepreneurship education into their educational programs through curriculum development. It is also recommended that agricultural colleges introduce entrepreneurship ideas as a starting point for students to motivate them.

Rashid, L. (2019) 'Entrepreneurship education and sustainable development goals: A literature review and a closer look at fragile states and technology-enabled approaches', *Sustainability (Switzerland)*, 11(19). doi: 10.3390/su11195343. \* This systematic review attempts to analyze literature to identify the extent to which entrepreneurship education and training (EET) research addresses Sustainable Development Goals (SDGs). The study reveals a shortage of EET research outside of western countries and university, with little focus on environmental sustainability and innovative entrepreneurship particularly in less-stable countries. The reviewed articles seldom mentioned low-income groups, women or minorities, with no research found on EET targeting conflict-affected individuals or migrants.

Santini, C. (2017) 'Ecopreneurship and Ecopreneurs: Limits, trends and characteristics', *Sustainability (Switzerland)*, 9(4). doi: 10.3390/su9040492. \*\* This literature review aims to highlight research outputs and trends in ecopreneurship. In particular, The authors also draw attention to the link between eco-entrepreneurship and traditional entrepreneurship, pointing out that the issue is controversial in the literature.

Satalkina, L. and Steiner, G. (2020) 'Digital entrepreneurship and its role in innovation systems: A systematic literature review as a basis for future research avenues for sustainable transitions', *Sustainability (Switzerland)*, 12(7). doi: 10.3390/su12072764. \*\* The authors conducted a systematic review of the literature with the aim of gaining a rigorous understanding of the hybrid concept of digital entrepreneurship and its role in the transformation of the innovation system. The analysis leads to the distinction of the determinants of digital entrepreneurship within three core dimensions of the innovation system, which encompass the entrepreneur, the entrepreneurial process, and its relevant ecosystem. For the future, it is necessary to extend research in fields related to method, content and theory in order to understand and investigate the interrelationships between the transformation of entrepreneurial structures within innovation systems and the socio-economic system.

Sousa, C. and Silva, L. S. (2019) 'Knowledge-intensive entrepreneurship: a systematic review and future directions', *Management Research*, 17(1), pp. 50–67. doi: 10.1108/MRJIAM-11-2018-0876. \*\* This study explores the existing literature to understand how the theoretical and empirical contributions in Knowledge-intensive entrepreneurship (KIE) are structured. The authors have divided the topic into 5 key categories :(1) entrepreneur; (2) innovation; (3) internationalization; (4) location; and (5) triple alliance. For the future, the authors recommend that researchers identify the synergies between and within the five categories found, and that new research of a broad nature or focused on a specific theme be carried out, mainly because this production requires a complex and non-linear articulation of themes that are related to entrepreneurship