Experiences and outcomes from a traveling innovation lab experiment

Florian Saegebrecht, Christian John, Peter Schmiedgen and Jörg Rainer Noennig

Abstract

Purpose – *The purpose of this paper is a case study evaluation based on a mobile innovation lab experiment – a new training and service format that offers innovation trainings on a mobile basis for schools in rural regions.*

Design/methodology/approach – *The research aims to connect concepts of "entrepreneurial orientation and education" and "innovation adoption." The objective of the case study is to test the readiness of pupils and schools for the provided innovation trainings and services to increase innovation capacities.*

Findings – *The case study is based on an explorative survey of 778 pupils at 18 schools and shows an increased awareness of innovative thinking and entrepreneurial capabilities.*

Research limitations/implications – *The findings and implications are not generalizable owing to predefined project region and the prototype character. The study offers basic insights into the specific processes and determining factors and mechanisms of innovation promotion in limited spatial work forms.*

Practical implications – *A mobile innovation environment focused on trainings and modern technologies was created. The workshops strengthened the entrepreneurial intention and potential of pupils to foster long-lasting innovation potential in the region.*

Social implications – *The tested concept improves the method-based development of creative project ideas, thereby strengthening the regional cohesion and the economic perspective in the project region.*

Originality/value – *After extensive research, the authors assume there is no comparable concept offering entrepreneurship education and latest technologies in a mobile innovation environment, at the time of submitting this paper.*

Keywords *Entrepreneurship education, Entrepreneurial orientation, Technology acceptance, Rapid prototyping, Innovation adoption, Rural regions*

Paper type *Case study*

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1. Introduction

The digital transformation and associated business models are drivers of economic and social change worldwide (EFI – Expertenkommission Forschung und Innovation, 2017). Especially in growing urban areas, an ecosystem of services and offerings is being developed, which will further educate in the fields of digitization, business modeling, marketing and prototyping and thus specifically promote the development of new business models (Johnson and Robinson, 2014; Hollander, 2015). Social and economic coexistence has always been determined by trends that often arise in the interplay of technical and cultural developments. Some of these trends fundamentally change lives and are summarized as megatrends. These megatrends are predictive of the social and economic future and often determine the success and survival of existing constructs. Occupational perspectives, care, diversity, luxury, cultural offerings and many other arguments attract people to large cities and urban regions, whose attractiveness therefore continues to increase (West and Noel, 2009). Meanwhile, more than half of the population lives in cities and the trend of rural depopulation continues. This is particularly noticeable in East

Germany and East Saxony (Barakat, 2015). Owing to diverse historical and economical reasons the rural regions are suffering from a shrinking population, which poses enormous challenges for the local economy and infrastructure (Lin *et al.*, 2007).

People, organizations and regions must therefore deal with these megatrends as early as possible in order not to be overwhelmed by them in the next decade and conversely benefit as much as possible from them. Besides these problems, challenges and dangers, megatrends also offer enormous opportunities. But what needs to be done to stop this trend and make rural regions as attractive as possible to let young people return after their qualification or better still stay? A significant role can be taken over by local schools and knowledge carriers such as self-organized initiatives for local development and prosperity. For example, networking with clubs such as sports, music and firefighters, businesses, parents and other educational stakeholders can create an identity for the region. Education is the hard and soft factor at the same time.

A culture can emerge that benefits a region only if the young generation feels comfortable and “at home” (Monitoring-Report, 2016).

The following case study therefore holds a pilot character as it connects educational institutions with latest entrepreneurial methods and technology. In the concrete implementation, a novel driving laboratory is designed that provides all necessary functions, rooms and equipment in three converted, newly designed container modules. In these mobile units, various educational formats were tested with pupils from schools in a rural region – from “ideation of new products” and “services and sensitization for entrepreneurship,” over “creation of simple prototypes” to “get in touch with new technologies” and “encouragement for creative work practices.” The overall objective of the pilot project is to promote the development of innovation capacities and foster entrepreneurial intention in an underdeveloped rural region.

This paper contains a detailed overview regarding the operating system of the mobile innovation laboratories, as well as explorative insights and outcomes into main results of the project. These are mainly based on first-hand experiences of participants conducted in a case study to assess the quality and usefulness of the offered innovation trainings and service formats.

2. Theory

The theoretical framework of the study is based on concepts of “entrepreneurial orientation and education,” “spatial usability,” “innovation adoption” and “technology acceptance” applied to the specific processes and determining factors and mechanisms in limited special work forms. The aim of the project was to investigate to what extent a flexible space supports people (here: pupils). Hence, a concept was developed for the traveling innovation labs, which allows the user to make non-bureaucratic, quick and flexible necessary adjustments to the workspace to strengthen the idea of owning the space (Presutti *et al.*, 2011).

2.1 Innovation

Innovating companies generate higher returns and grow faster than non-innovating companies (Cainelli *et al.*, 2006). Literature shows a multiplicity of definitions of the term innovation. Very widely used is the understanding of Schumpeter, who was one of the first to deal with the notions of innovation and to advance its demarcation. The precursor of innovation, according to Schumpeter, is the invention. It is the result of brainstorming and represents a mostly technical realization of a new problem solution. The invention is oriented towards project goals and can arise either planned or unplanned. An invention then becomes an innovation when its potential for success is awarded and, ultimately, successfully incorporated into the value creation process. Thus, according to Schumpeter, the focus is on economic use and implementation. In addition, Schumpeter sees innovation as a destructive process, which is understood as a creative destruction – the breaking up of previous solutions. The act of creative destruction refers to products, processes and structures (Schumpeter, 2003). The innovation can be both incremental and disruptive. Incremental innovation optimizes a sub-aspect and disruptive innovations pursue a completely new approach, which often replaces entire previous solutions or even dissolves whole markets and creates new ones ("game changer").

As part of the project and the focused region of East Saxony it is always important to include the surrounding systems of innovations as promoters as well as barriers (Acs *et al.*, 2013). In addition to the industry, the innovation ecosystem plays a key role which has a say in success and failure (Gelbmann and Vorbach, 2007). External influencing factors include ecological factors (e.g. encouragement of sustainability), technological influencing factors (e.g. development dynamics), socio–cultural influencing factors (e.g. demography), legal–political influencing factors (e.g. legal framework), economic influencing factors (e.g. available competent employees) and market trends (e.g. competition) (Inkpen and Tsang, 2005).

To summarize, innovation in research and practice is viewed at various levels and depends on many factors and goals that should be traced back to the company's goals. In order for innovation to not just run its course by accident, professional innovation management is required.

2.2 Entrepreneurship

Closely related to innovation management is the term entrepreneurship. It is about the design, planning and implementation of an entrepreneurial project that pursues new approaches and thus represents a novelty in the market (Krueger and Brazeal, 1994). As described above, these approaches can be disruptive as well as incremental, which implies that sometimes the innovation becomes visible only in detail (e.g. location, price). It is important to note that not every enterprise is an innovation and vice versa. For the development and design of an enterprise in early stages, methods of business modeling have become more and more popular in recent years (e.g. design thinking, business model generation) (Osterwalder and Pigneur, 2011; Sood and Tellis, 2005). These methods pursue a creative approach to the finding and describing of core elements of a business model and put the formulation and the critical consideration of classical approaches behind. For this reason, one speaks deliberately of modeling, as the business model is formed in the first steps mentally and with visualization techniques. The advantage is to focus visionary on the possibilities and then find solutions to problems that arise, rather than limiting yourself to challenges and restrictions (Anderson *et al.*, 2014).

Entrepreneurship is often understood only as a process in which people start their own business. However, forms such as corporate entrepreneurship and intrapreneurship are now widespread and ensure the economic success of companies. In corporate entrepreneurship for example, employees develop new business models and set them up as a subsidiary from the company. In intrapreneurship, new business models within a company are created by the employees, for example to strengthen the performance and competitiveness of the company or a special department. Against the backdrop of ever-increasing international competition and unstoppable megatrends that are shaking up in the economy, improving the understanding of entrepreneurship and the ability to develop new business models is a factor of success and, in many cases, the base of survival (Gong *et al.*, 2013; Morris, 2009).

2.3 Innovation network

The aim of the experiment is to establish a resilient and sustainably usable innovation network in rural areas, which makes it possible to tie innovative knowledge between educational institutions and local innovation initiatives and to develop innovative products and services. Networks are the union of elements and are only able to act when the individual elements communicate with one another (Luhmann, 2006). Thus, it is crucial for the experiment not to look at network partners separately from each other but to strengthen them in a standardized way through innovation-promoting offers and to reduce communication barriers. This networking with each other ensures simultaneously for stability (Albert *et al.*, 2000; Kruse, 2010). To build resilience requires it needs more dynamism Communication structures and a synchronization of shared communication (Malone, 2004). Static networks, on the other hand, increase vulnerability (Bonacich, 1987). The creation of a dynamic innovation network that creates synergies between participating network partners is to be tested and evaluated in the experiment described in this article.

2.4 Uncanny principle

The project pursues the "uncanny principle," which has received increasing attention in the past two decades of innovation research. The term "uncanny" in this context does not mean "scary" but rather "unusual" and "uncomfortable." Uncanny places are environments that initially seem strange to people and do not invite to relax but at the same time do not deter or disturb. They are not installed in such high quality that they inhibit spreading and wild experimentation (such as in offices or rented rooms). Active work should rather be deliberately stimulated (Pilskalns, 2009). The unfamiliar spaces should deliberately stimulate new thinking. If the person is too familiar with the environment – his comfort zone – it is harder to develop new patterns of thinking (Craddock, 2015). This effect is often seen in successful startups who have taken their first steps in garages, sheds, basements or shared rooms. As a fact the environment plays a central role in the innovation process. Meanwhile this has also been recognized by many companies.

They equip their development teams with rooms that provide environments away from classic offices, laboratories or manufacturing facilities that not only allow but also facilitate creative work (such as makerspaces, exploration hubs, living labs).

2.5 Research questions

This paper will assess the impact of a new entrepreneurship education program focusing on pupils in the age between 14 and 19 years, in middle, high and vocational schools located in the rural area of Eastern Saxony.

The program took place in a special framework as one day workshops in a mobile innovation laboratory during a period of 18 months from May 2017 to October 2018:

- As the program has a prototype character, under which conditions pupils will accept such a new and innovative training program next to their school day?
- Second, under which conditions do schools, teachers and their administrations accept such workshop and training formats as an additional offering next to their stringent curriculum?

Owing to increased requirements over time, schools tend to select very specific which offering they test even when it is free of charge.

3. Methodology

As this pilot project is using a new designed approach path it is necessary to use an explorative research method which describes the "hows" and "whys" of human interaction and decision-making. After evaluating various methods, the authors rated an explorative structured case study design as the best method to face the research questions hypothesized earlier (Yin, 1993). Other possible research methods should be of qualitative and explorative nature because of the new approach and research setting. Open or semi-structured interviews with direct participants and surrounding people can also deepen the understanding of the research setting. This can also be conducted in two steps before analyzing the data via qualitative content analysis (Mayring, 2015).

The starting point is formed by the subjective action orientations and implicit decision-making maxims of the workshop participants. The goal is the development of implicit knowledge sets and routines that expand the existing theory of this field of research by interpreting social reality. The study is divided into three main fields as case studies are known for triangulation to assure accuracy (Stake, 1995). Starting with an analysis and observation on the use of the mobile innovation laboratories by the focus group participants of the workshops with the aim of identifying the usability of the laboratories and, if necessary, optimizing them (spatial analysis). The second part is an explorative observation of the subjects by means on their usage behavior of the workshop materials, technologies and the methodology of the workshops themselves. The last part evaluates the workshop results and the derived indicators on the innovation potential of the focus group. A well prepared case study is partitioned into four different stages. At first the case study design must be developed which is predefined by the usage of a closed container environment and the workshop design. The second step conduct of the case study which took place in the 18-month period described earlier. The authors then analyzed the case study evidence and then developed conclusions and implications for further research (Tellis, 1997).

In this experiment, 778 pupils at 18 different school places were investigated by their behavior and outcomes of the workshops.

4. Case study design

The dictum "form follows function" perfectly describes the methodological design of this study. The following chapter defines the setting of the case study to give an understanding of the used methodology and underline the results of this article.

4.1 Analysis of the focus group: pupils of middle, high and vocational schools

Focus group of the experiment are pupils of middle, high and vocational schools. Vocational schools are in the exact designation vocational, professional, technical and technical secondary schools as well as vocational high schools. Some of them also run under the concept "vocational school centers" in the region. The experiment is independent of all vocational schools, vocational colleges, technical colleges and high schools located in the project area.

A vocational school fulfils its educational mission as part of vocational training or vocational preparation. The technical orientation varies between commercial-administrative, commercial-technical, domestic-care as well as agricultural and mining vocational orientations. Its task is to enable students to acquire vocational and inter-occupational competences, paying particular attention to the requirements of vocational training. It enables the pursuit of a profession and the co-creation of the working world and society in social, economic and ecological responsibility. The provision of such skills is also a central content of the project, which is why this group is particularly qualified to participate in the workshops. Participants of this group get impulses and ideas for inventing new products and services that they create on their own (Laforet, 2013).

The approach of the study is to investigate if and how the entrepreneurial thinking of the students and the training in the use of future technologies and the understanding of future megatrends significantly influence the creative abilities and lead to a significant increase in innovation in the project region (Ambrosini and Bowman, 2009).

4.2 Container concept

The mobile laboratory concept is based on the approach of "sheds" or "garage labs." Some of the most significant innovations and inventions in recent history have not originated in high-tech laboratories, but in simple spaces such as sheds or garages. Many, today for their success well-known companies, started their business in small rooms or even garages. Whether in the garage, in the shed or in the living room – the own four walls offer space for tinkerers to develop their ideas far from bureaucratic regulations to production readiness. If the early stage capital is low but the idea is good, entrepreneurs have to improvise (Noennig and Schlenker, 2013). The startup in the garage has produced well-known companies and the term garage company has been established which is known for startups who nowadays became global players with little start-up capital but a revolutionary idea. These include the top three companies with the world's largest brand value – Google, Apple and Microsoft. The project picks up on this concept and extends it to three mobile innovation laboratories with different properties and features. The first and largest container is the so-called "IDEA Lab".

It is designed as a flexible meeting, event and co-working space with an area for cross-group work and presentation. The second smaller container is named "FAB Lab," which acts as a makerspace and is equipped with 3D printers, 3D pens, a large format printer for printing presentation posters and various hot wire saws for making simple surface models and bodies (Fastermann, 2014). The third container, the "ORGA Lab" or Virtual Lab, offers participants an insight into virtual reality by using VR glasses, as well as prototyping and programming through the use of LEGO MINDSTORMS©.

The mobility of the containers allows them to be moved easily to a variety of educational institutions such as middle, high and vocational schools in the project area and activated *ad hoc* on site as a local "innovation hub".

4.3 Uncanny containers

According to the uncanny principle explained in *2.4*, the concept has been transferred to the experiment. The containers were deliberately set up only to be workable in the best possible way, but avoid feeling too comfortable:

- no distracting objects (pictures, sculptures, ornaments, etc.);
- reduced design of interior and walls;
- light through fully glazed doors and LED lighting;
- stools instead of padded chairs;
- only required working materials;
- lots of space on the walls to visualize ideas (whiteboards, pin areas); and
- tables adjustable in height to allow standing work.

The aim is to take the participants into unfamiliar spaces that stimulate the innovation process and provide a space for creative work. In addition, the reduced space in container places a spatial focus on the essentials of the workshops and minimizes distraction

(Moorefield-Lang, 2015).This certainly has a disconcerting effect on pupils – which is also part of the principle. However, pre-projects and initial experience show that this is precisely what creates an "aha effect" after a short period of time plus the rooms make a significant contribution to raise awareness, communicating innovation formats and activating previously unused thinking patterns (Smolinski and Bodek, 2017).

4.4 Technologies

In the mobile innovation laboratories, latest technologies will be presented to the pupils to make them aware of their significance and their use in the future world of work. Because of the multitude of trend technologies and budget limits, criteria for the selection of the technologies offered in the innovation laboratories were defined as follows:

- *Degree of establishment*: The technology is already being widely used in makerspaces or frequently used in advanced companies in the field.
- *Maturity*: The technology should not be a prototype but have already filed teething troubles. That is, it should be functional, less susceptible to interference and usable over the long term.
- *Relevance*: The technology should be relevant to the broad target groups. Technologies with too high degree of specialization and niche applications are not considered.
- *Installation*: The containers offer only limited space. Therefore, the technologies must be compact to fit in a container. In addition, they must not exceed a certain weight, as the floors cannot be reinforced for heavy equipment. Furthermore, a simple power connection to the operation must be sufficient.
- *Availability*: The technologies should also be commercially available so that local initiatives or schools can purchase them if they are interested.
- *Budget*: To provide a variety of technologies in the containers, individual technologies should not exceed a budget of €5,000. Local initiatives and schools should also be shown that new technologies can already be integrated for lower budget.
- *Entry threshold*: For the technologies, people should be able to build up entry-level knowledge within one day, even without prior knowledge.

The following technologies are ultimately selected for the project and serve to impart different principles:

- *LEGO MINDSTORMS©*. Often incorrectly categorized as a toy for children, LEGO MINDSTORMS© combines LEGO principles and components with software and hardware elements. Thus it is robust, demanding, offers a steep learning curve in a short time and enables the creative implementation of own ideas. LEGO MINDSTORMS© essentially consists of components that are already familiar with the LEGO Techniques series and extends them with motors, connecting cables, sensors and a CPU. In addition, LEGO MINDSTORMS© provides a simple, modular programming interface as software that programs the CPU. LEGO MINDSTORMS© offers the opportunity to understand basic elements of digitization within a short time. At the same time, the interaction of sensors, programs, motors, etc., is learned, independently developed and finally transferred to own applications. For these reasons, many universities already use these kits to teach students first steps in robotics, automation and sensor technology. In addition, it is used by companies to introduce employees without a technical background to topics of digitization (Kandlhofer and Steinbauer, 2016).

- *Virtual reality*. Virtual reality is a central element of digitization. An increasing number of industries is using this technology in their processes and experimenting with new application scenarios. Engineers create virtual models and work collaborative across the globe in a virtual space, regardless of time and locations. Marketing departments use the virtual space to create experiences for customers to promote purchase intentions. Thus, the participants in the experiment are offered the opportunity to set up their own VR glasses and to demonstrate their potential applications in the economy (Sternig *et al.*, 2018).
- *3D Printer*. One of the key technologies of the future is 3D printing. In the meantime, it is, for example, used in medicine (tissue, bone replacement, fracture splints), the construction industry (architectural models), industrial production (prototypes, shell molds, spare parts) and the fashion industry (new tissue structures). These are not always just small printers. Meanwhile, complete machines (e.g. turbines), real estate (e.g. family homes) and infrastructure (e.g. streets) are being printed.

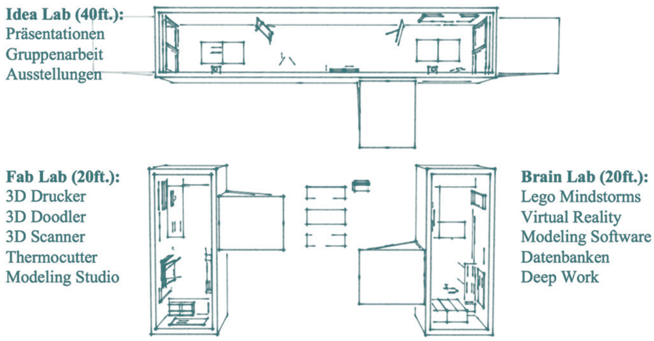
  Basic principles will be taught in the workshops. These include the basic functionalities of the technical elements (modeling software, conversion to print file, printer including components), the process (from 3D model to print result) and application possibilities and future potential (Nemec and Vobornik, 2017).
- *3D doodler*. The 3D doodler is based on similar principles as 3D printing. The pen heats filament, which comes from the nozzle in liquid form. Thus, as in a normal pen, lines can be drawn, which in this case are made of plastic. The peculiarity lies in the fact that with the hardening of the plastic with a little practice three-dimensional (thus upward) can also be drawn. Thus, it is possible to freely draw 3D plastic models. This opens up completely new ways of transferring thoughts into sketches. In practice, designers and engineers use this technology to capture initial ideas, even before they are translated on the computer into 3D models and later 3D printed.
- *StyroCutter*. The StyroCutter is not a new technology in itself but celebrates a comeback in the recent past. On the one hand, shapes can be cut to size or freehand with no further technique or prior knowledge. On the other hand, it represents expensive technologies such as laser cutters, which can cut plastics through the hot wire with almost no resistance. The strengths lie in a high learning curve and the ability to create *ad hoc* prototypes within a few minutes – for example, in contrast to 3D printers, which take several hours to reach the result.

4.5 Analysis of the spatial use of the innovation laboratories

Common trainings on site generally use existing premises of the school (classroom, break room, etc.). However, these spaces are often not equipped for workshop formats and the environment is too familiar which hinders innovative thinking (Noennig, 2011). As an ideal workshop environment for the formats of the experiment, these rooms would always have to be elaborately prepared and the technologies previously installed. On the other hand, the labs in the experiment follow the principle of garage labs (Noennig and Jannack, 2013). The combination of space and the selected technologies resulted in the concept consisting of three containers (see Figure 1).

Preliminary studies have shown distinct advantages of containers compared to other mobile solutions (e.g. trucks, tents) as a place for innovation and creativity (Schmiedgen *et al.*, 2017). The “Idea Lab” offers the largest room with 40 ft in length and is used for presentations, group work and exhibitions. In the “Fab Lab” (20 ft) necessary equipment, materials and tools are available to perform rapid prototyping sessions and to demonstrate new production processes. The “brain lab” (20 ft) offers the opportunity to convey and test the basic principles and trends of digitization. The concept of the containers also shows that the rooms are each used flexibly depending on the formats picked. As a result, the

Figure 1 Spatial concept of the innovation labs (top view)



Source: Own illustration of Idea Lab, Brain Lab and Fab Lab as holistic moving education and training modules

furnishings are rarely placed firmly and thus can be rearranged according to group size and content.

4.6 Setting of the workshop-program

The third pillar of the experiment is the one-day workshop-program, which can also be tailored to individual profiles of schools. They primarily contain methods and tools that help develop an idea into a business model and incorporate new technologies. The methods and tools were selected in such a way that on the one hand they have a high degree of practical relevance and are established in successfully innovative companies. On the other hand, they have a low entry threshold, so they can be quickly understood, applied and then simply reproduced. The following combination for a daily program is an example and at the same time represents the most frequently used program so far:

- container village on a weekly school day; and
- 15-25 pupils plus a teacher as supervisor (Table I).

5. Findings

To answer the first research question:

RQ1. Under which conditions pupils will accept such a new and innovative training program next to their school day?

Various factors of influence were considered. The expected number of participants at the beginning of the experiment was set at 180 students. To achieve this goal, as previously described, a modular workshop concept was developed that takes the individual needs and interests of the pupils into account. From the observations during the workshop days and the evaluation interviews with participating pupils and teachers, five conditions (see Table II) were deduced, under which pupils are willing to participate in innovation-promoting workshop formats such as those of the experiment, in addition to their daily school routine.

The flexible workshop concept made it possible to organize the content of the workshop subject-oriented and interest-based. The modular daily schedule also allowed groups to be subdivided into subgroups and assigned to different topics, adding to the heterogeneity of the workshops. For example, one group can work on business model development and

Table I Optimal schedule of a one-day workshop-program

Time	*Agenda*	*Content*
9:00	Introduction	Explaining the concept of mobile innovation laboratories Disadvantages of rural areas for innovation (e.g. long distances, less intellectual capital, less financial capital) Inspiration through startups from the garage
9:30	Speed ideation	Pupils create ideas for new products and services Three rounds with rotating partners Always groups of two to three pupils
10:00	*Break*	
10:15	Introduction: business model canvas (BMC)	Teamwork in groups of four to six pupils Instructed step-by-step development of the selected product or service Teaching project management and processual thinking
11:30	Tech overview and introduction to prototyping	Introduction to modern technologies (3D printing, 3D doodlers, LEGO MINDSTORMS©, virtual reality) and show of possible use cases in everyday life Final tasks regarding the afternoon
12:00	*Lunch break*	
13:00	Rapid prototyping	Using materials available on site to create functional prototypes Pupils should create a brand and understanding of their product for potential customers
14:00	Pitch-session	All teams have to present their "company" in a short pitch of 2 min The audience will ask questions afterwards Trainers have to give motivation as to which teams did well and can improve

Source: Own illustration

Table II Valuation model for pupil participation conditions

Conditions	*Characteristic*	*Valuation*
App-oriented workshop design	Available	++
Combinative lab concept	Available	++
Modular workshop-program	Available	++
Flexible daily schedule	Necessary	+
Offer on site	Necessary	++

Source: Own research

another group already builds their prototype. Finally, because of the high demand and growing popularity of the experiment, the originally planned numbers were far exceeded, as the following Table III shows.

The number of participants impressively demonstrates the increased interest in the workshops in the context of the experiment and proves the need for such innovation-promoting training and service offers in rural regions.

To answer the second research question:

> *RQ2.* Under which conditions schools, teachers and their administrations do accept such workshop and training formats as an additional offering next to their stringent curriculum?

Table III Number of participants planned and in total

Total number of participants planned	180
Total number of participants achieved	778
Goal achievement absolutely	+598
Target achievement relative	+332,22%

Source: Own research

Factors such as the local spatial availability, sustainability of teaching and administrative involvement of the school representatives were taken into account. In total, five conditions were formulated for an optimal design of participation of schools in the experiment (see Table IV). In addition, exploratory meetings were held at each location with the participating schools, in which the individual school profiles and main focuses of education were recorded. At each site, inspections were also conducted to determine the placement options for the containers. The flexibility in the mobile innovation laboratories design of the experiment played a decisive role.

Owing to the modular design of the container concept, it was possible to adapt the number of containers to not only the possibilities of the local schools but also their configuration. Favored forms of placement were a U-shape or L-shape.

Originally a number of 16 schools were planned for participating in the program. Because of the meticulousness in the preparation of each site and the continuous optimization of the concept with each additional location, it was possible to achieve a virtually trouble-free process in the execution of the experiment at respective locations. This aspect resulted in time savings and less administrative effort for the participants in the experiment and allowed the sites to be expanded beyond the originally planned numbers as following Table V below shows.

The overachievement of the originally planned number of participating schools underlines the conditions under which schools with given spatial, temporal and structural circumstances are willing to participate in innovation-promoting measures. This should be further investigated and optimized for dependent variables.

6. Implications

The innovativeness of the project will be to modify such formats and use them to strengthen local and regional development in smaller cities and communities. To achieve this, the formats and offers, as well as their spatial surroundings, are mobilized and adapted for the target groups – the pupils of middle, high and vocational schools in the project region (Bharati and Chaudhury, 2015).

6.1 Practical implications

During the experiment, schools received a free supplement to the curriculum through new, scientifically tested and practice-proven entourage. Students were given a new foundation

Table IV Valuation model for school participation conditions

Conditions	*Characteristics*	*Valuation*
Spatial flexibility	Necessary	++
Sustainable didactics	Available	++
Pre-explonary meetings	Necessary	++
Offer on site	Necessary	+
Administrative involvement	Necessary	–

Source: Own research

Table V Number of schools participating in the experiment planned and in total

Total number of schools planned	16
Total number of schools achieved	18
Goal achievement absolutely	+2
Target achievement relative	+112,50%

Source: Own research

in innovation and entrepreneurship that is essential to the working world of the future. The experiment has shown that students are able to understand the basic principles, e.g. to understand and apply a business model and at the same time to combine it with principles and technologies of digital transformation within a day. The participating pupils received impulses and ideas for finding and structuring self-made products or services. This should encourage entrepreneurship at an early stage, which pupils can later use to implement to their own projects or within employers (Osterwalder *et al.*, 2015). In addition, the mobile innovation laboratories were given access to a working environment equipped with tools and materials that they could use to make simple prototypes or visual models. In this way, knowledge of the method of rapid prototyping was built up, which helps in many occupational fields to make ideas within a short time visible and tangible. They had the opportunity to test current technologies such as virtual reality glasses or 3D printing and thus built up technical competences that increased their understanding of future production processes. Led by innovation trainers, the pupils worked on their own product or service ideas, learning modern working and presentation methods such as: co-working and pitching. These new ways of working enable them for a working world of the future. A large number of project ideas arose, which lay above all in the pupils own interests. It shows that there is a commitment to own topics (Schmiedgen *et al.*, 2017). This is exactly what the potential of the project approach shows. Great potential rests in schools in the project region and sometimes only needs the right impulse to develop. The experiment creates incentives to promote this potential, to awaken the entrepreneurial spirit of young talents in the region to anchor the innovation potential in the long term. The project brought three mobile innovation laboratories directly to 18 schools in Eastern Saxony for one week each. In the innovation laboratories, pupils get to know entrepreneurship and design thinking to create their own projects and visible prototypes (Sonntag, 2017).

6.2 Social implications

Studies show that rural areas such as the project region have properties that, according to the regional scientific theory approaches, are considered enriching for innovation production. These include a strong cooperation tradition, close trusting network relationships based on long-term acquaintances and occasionally close economic-political ties (Haase *et al.*, 2016). The examples of new regional development, such as the project approach, all of which are outside of established centers, are credited with an enormous capacity to use traditional conventions through close network relations and intact and local/regional largely coherent solidarity in the region’s sense and to show innovative capacities. Because “old industry traditions” are predominantly established in rural areas, it can be assumed that innovations in rural regions so far have been more incremental and less radical (Hospers, 2013). Innovative startups are significantly influenced by their environment. Startups were and will be important drivers of innovation and create jobs in promising sectors. This benefits the founders, their employees and the startup region. Appealing jobs lead to an increased attractiveness of the location and regional added value. This, in turn, translates into higher regional purchasing power or increased tax returns. Likewise, today’s founders support future generations of founders as experience providers, sources of inspiration, business angels and network partners (Geißler, 2017). Through its holistic approach to education and business, the experiment aims to foster young, agile entrepreneurial foundations, making a significant contribution to empowering rural areas in the age of increasing digital transformation.

7. Conclusions

Especially new examples of regional development, such as the project approach, all of which are off-the-beaten-track, are given a tremendous capacity to exploit the traditional conventions of close network relations and intact and local/regional largely coherent social coherence in the region and to show innovative capacity (Lin *et al.*, 2007). The experiment consciously create space for new ideas, which together lead from the knowledge carriers as well as the pupils, the so-called "young potentials," to new innovations, products and services. At the same time, current topics and challenges of companies should not be discarded, but should be specifically integrated into the innovation process to establish a common background for the expansion of innovation capacities between schools and companies. For this, it is necessary to expand the project offer both width wise and in depth when the need arises.

The main benefit of the rural regions experiment was the uncomplicated availability of innovation-oriented educational services and services to schools, thus building up entrepreneurial thinking at an early stage. As part of the experiment, a validated education and training program was developed and subsequently made available to teachers and innovative actors in the region. The exchange of ideas, actors and projects should generate a growing network of creative ideas, which in the medium term should grow together into a vital innovation community ("innovation ecosystem"). The goal was to build sustainable innovation capacities in schools.

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