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Overview about Service Labs worldwide: Approaches, Methods and Use Cases to test Service across Lifecycle

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Abstract

As product-service systems are very complex, an integrated approach how to test a service is needed. The paper provides a framework for the development and testing of new services, and thereby grants a lot of space and tools for service innovation. In product-service-systems different types of resources are involved, for instance people, technology, information and organization. In the framework provided by mixed reality laboratory environments, all of these resources are brought together as well. The resources people, technology, information and organization are integrated. The interdisciplinary knowledge concerning these relevant resources is merged in the laboratory environments. Furthermore mixed reality laboratory environments are unifying academic expertise and practical, business-driven interests. Since service relevance in manufacturing companies is growing, the testing of new service concepts gets more important. Various methods are available, which help to verify service concepts. Due to this, the focus of this paper is on the analysis of established Service and Innovation Labs worldwide. To give an overview 24 Service labs are identified and analysed.

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1. Servitization in manufacturing companies

Products in manufacturing are becoming more and more complex and differentiated. This trend represents huge growth opportunities for the service systems that accompany the products. Service systems hereby can be defined as dynamic configurations of resources that create and deliver value between providers and customers of services. Service innovation is a means to exploit the above mentioned opportunities.

An important part of it is the testing of service concepts which is – not like the testing of products – in the early stages. This is proven by the very rare service test laboratories and their lack of a broad spectrum of specific tools and methods which are explicitly suitable for testing service. Methods and tools used in such environments are identified and the possibilities to transfer these methods and tools to the topic of testing of services specifically in manufacturing companies

are discussed. This will not only push the development of the topic of Service Engineering, furthermore the results can be enhanced into the discipline of Service Operations Management and provide useful implications for managerial decisions. [1].

Servitization for manufacturing companies becomes more important in order to find new business opportunities and new customers [2,3,4]. Traditional product-centric sectors change step by step to being more service-centric, which is a grand challenge for every company, for their products, services and employees. This evolutionary process is often referred to as the servitization process for non-tertiary sectors. However, the servitization process is not just a change in the business model: it involves all the aspects of the enterprise, which therefore needs methodological and technical support concerning an integrated development and management of service offerings [2,5].

2. Service Lifecycle Management

Service Lifecycle Management is a part of Service Science, Management and Engineering (SSME) [3,5]. SSME is a young field of research that addresses the open questions and challenges coming from the servitization process. It covers all relevant aspects of a service economy and service business and hereby provides helpful input for research as well as industry. Furthermore SSME can be regarded as a new academic discipline and research area that complements many other disciplines or research fields by providing and contributing specific knowledge about service. [6]. Specialists agree that the foundation of a SSME-oriented economy has to be laid in the field of education, for example in companies with special trainings as well as in universities in special subjects of study or at least in special service subjects.

A Service Lifecycle Management creates a connection between Service Management [1,3,8] and Service Engineering [4,5,15,16,17]. The SLM topic is quite new and innovative. Nevertheless there are still some approaches, for instances the approach of Freitag [10, 12]. Here the Service Lifecycle Management framework consists of four parts:

- Phases of Service Life Cycle Management [10],
- Role Model for Service Life Cycle Management [12],
- Methods and Tools for Service Life Cycle Management,
- Interactions between product and service lifecycle management [9, 20].

The three main phases of the Service Lifecycle are service creation, service engineering and service operations management [10, 12]. An overview is given in Fig.1.

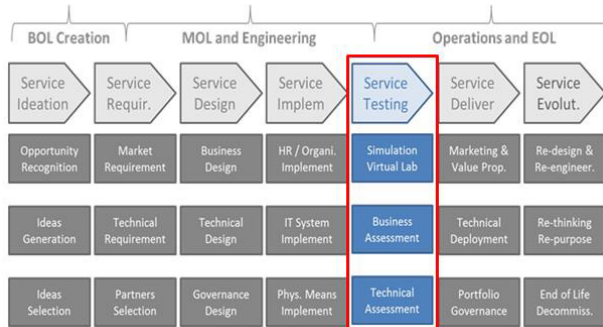


Fig.1. Service Lifecycle [10]

This paper focuses on the phase “Service Testing”. A systematic testing phase before the market launch is crucial to assure a certain quality of new services. However, appropriate solutions, processes and methods seem to be missing [1]. The current business practice confirms that service testing tends to be neglected, even though several examples can be found of methods employed by a minority of companies to overcome this problem [1]. Examples there are:

- conceptual tests, where the consistency and plausibility of the service documentation is verified. Usually there is no interaction with real customers, the test is only theoretical.
- Usability and technology tests, here the question is whether or not the company's employees and customers are able to handle the new resources and if the new resources work properly for the associated purpose.
- Prototyping and simulation tests: This kind of tests focuses on the visualization of customer contact points. Interactions and processes are tested with real customers under realistic conditions, either in test branches or special virtual laboratory environments.
- Practical and pilot tests: In this case, the services concerned are offered to a limited number of customers (sometimes only to one customer), so that the company has a chance to adapt them if necessary prior to the general market launch. [11,13].

Still, though there is a broad range of methods for testing services, there are many deficits and unspecific procedures. These deficits are addressed by two solutions: first, a standardized test approach for service concepts and second, a test environment platform for prototyping customer contact points. [7].

Laboratory Environments offer a new approach to prototype and test services. Such platforms typically provide supportive techniques to act out a new service using a virtual reality (VR) environment, to evaluate the design of service environment (“servicescape”), to plan and test work organization methods and measures, to develop, demonstrate and communicate new concepts of interaction between service providers and service clients. This area of research is as already described very new but there are already some approaches for such a testing environment provided by several laboratories all over the world.

3. Challenges for testing a service

The challenges are based on a study carried out in 2014 about testing of services [14]. The study is based on 205 responses from directors of large and medium large enterprises from the manufacturing industry in Germany.

The result in Fig. 2 shows a strong need for suitable measure and tools, best practices and guidelines how to test services.

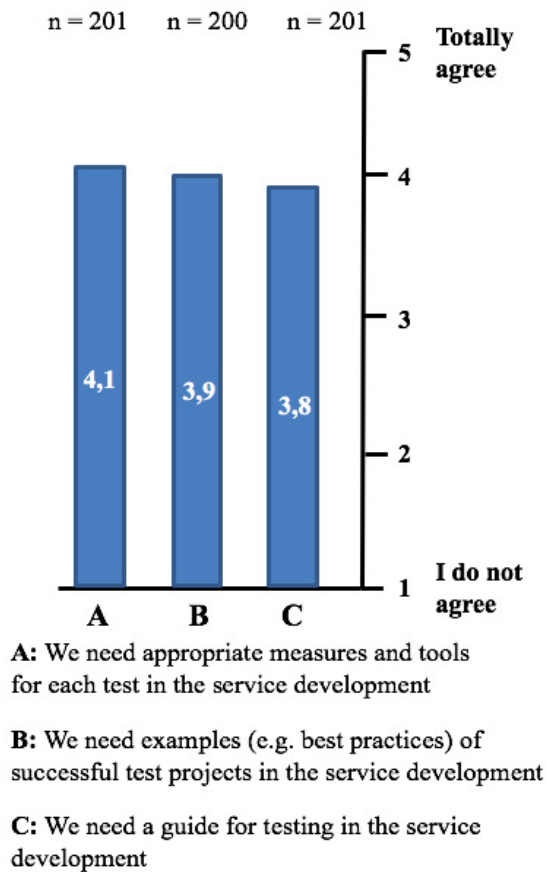


Fig.2. Fields of action [14]

4. Service and Innovation Labs worldwide

All over the world, several research institutes have developed similar laboratories that should support service-offering manufacturers with developing new services. To compare the (different) approaches on developing and particularly testing services, some of the Service Labs worldwide were compiled in a research. The results thereof will be presented in the following. The first challenge was to determine a structured approach for the research of Service and Innovation Labs worldwide. First of all, literature was collected [7,14]. In the second step, Service and Innovation Labs were searched.

The research based on the web consisted of pages like ‘Google Books’ and ‘Google Scholar’, by using the following key words:

- Service Laboratories
- Testing Laboratories
- Innovation Laboratories
- Service and Innovation Laboratories
- Service and Innovation Labs
- Service Labs
- ServLabs

- Innovation Labs
- ILabs

The term ‘Service Laboratories’ e.g. result in over 2 million hits. Most of the papers, journals or books are from the last 10-15 years. This is a sign that in recent years awareness has been created for the area *testing services*.

The first hundred hits of each term were checked by reading the summary or the abstract. Based on this information a first selection was made and listed in an Excel file with the corresponding web links, see Fig.3.

Lab	Description	Methods	Case Study
SILK Kent (GB)	Provide a creative environment for people to work together. Drawing upon best practice from business, design and social science.	http://www.enginegroup.co.uk/service_design/methods/	http://www.enginegroup.co.uk/projects/
Mobile Service Lab Stockholm (SWE)	Context aware and adaptive service functionality, intelligent content and media delivery, substantially increasing the Quality of Mobile Experience, mobile service scalability.	http://www.kth.se/en/ict/om/organisation/for_skningsheter/cos/about-cos/laboratories/mobile-service-lab-1.77009	https://www.kth.se/en/om/organisation
Nesta London (GB)	National Endowment for Science, Technology and the Arts. They invest in early-stage companies, inform policy, and deliver practical programmes.	http://www.nesta.org.uk/	http://www.nesta.org.uk/areas_of_work
...

Fig.3. Overview of the research approach: extract of the Excel file

Through this search 23 Service and Innovation Labs were found, which generally are applicable. They design services, test it on the basis of customer experiences and support their implementation. The *Engine Service Design Lab* in London e.g. is a specialist group of designers, researchers and strategists. They design services, test it on the basis of customer experiences and support their implementation. They work across sectors and around the world to improve and innovate services. The *Engine Service Design Lab* has a systematic way how to develop a service and how to manage all the challenges. Due to this, this Lab fits very well into the required profile.

Laboratory	Service Based	Methods & Tools	Best Practice	Sum
Engine Service Design, London (GB)	1	1	1	3
SILK, Kent (GB)	1	1	1	3
Service Innovation Lab, Rüschtikon (CH)	1	0	0	1
S-Scape, (KOR)	1	0	0	1
Mobile Service Lab, Stockholm (SWE)	1	0	0	1
Service Lab, Hamburg (GER)	1	0	0	1
D-LAB, Stanford (USA)	1	0	0	1
C-Lab, Paderborn (GER)	1	0	0	1
Quality and Usability Lab, Berlin (GER)	1	1	1	3
Nesta, London (GB)	1	1	1	3
Service Innovation Lab, Leipzig (GER)	1	1	1	3
Co Innovation Lab, Walldorf (GER, JPN, KOR, IND)	0	0	0	0
Innovation Lab, Sydney (AUS)	0	0	0	0
Computation Lab, Sydney (AUS)	0	0	0	0
MIT Media Lab, Massachusetts (USA)	1	1	1	3
Financial Innovation Center, Cork (IRL)	1	1	1	3
HP Open Innovation (SIN, CHN, IND)	1	1	0	2
Innovation Lab A/S, Aarhus (DEN)	1	1	1	3
J-Lab, Washington (USA)	0	0	0	0
ED-Labs, Harvard (USA)	0	0	0	0
Automotive Service Lab, Munich (GER)	1	1	0	2
Social Media Lab, Stuttgart (GER)	1	1	0	2
SSIL, Aachen (GER)	1	1	1	3
ServLab, Stuttgart (GER)	1	1	1	3

Fig.4. Lab Rating

Fig.4 shows the list of all 23 laboratories and the three criteria by which they were assessed more accurately.

Based on the literature and the web-search each of the Labs was evaluated on the basis of the three questions:

- Is it service-based?
- Are there specific Methods & Tools?
- Can Best Practice be notified?

For evaluation the following rate is used:

- “0” denote that the accordingly Lab don’t fulfill the criterion and
- “1” denote that it fulfill it.

Referring to the Lab rating 10 out of 24 Laboratories are appropriate Labs for further research. These are:

Engine Service Design, London (GB): One of the world’s leading service design and innovation consultancies. They work on a wide range of service design and innovation projects for some organizations across the private and public sector.

SILK, Kent (GB): Was set up in 2007 with two ambitions. First, to provide a creative environment for a wide range of people to work together on some of the toughest challenges the county faces and second, by drawing upon best practice from business, design and social science.

Quality and Usability Lab, Berlin (GER): With usability it is possible to increase the sales and the quality of interactive products. User often misunderstands, what is reasoned for developer.

Nesta, London (GB): An independent body with a mission to make the UK more innovative. They invest in early-stage companies, inform policy, and deliver practical programs that inspire others to solve the big challenges of the future.

Service Innovation Lab, Leipzig (GER): The main challenge for the service sector is the increasing pressure for innovations, because of changing needs of the customers. Thus, service companies have to implement modern concepts and methods for the innovations management. Furthermore is the spreading of Service Engineering concepts as a scientific discipline in the praxis an essential part of their ambitions.

MIT Media Lab, Massachusetts (USA): The domain of MIT Media Lab is applying unorthodox research approaches for envisioning the impact of emerging technologies on everyday life. Unconstrained by traditional disciplines, Lab designers, engineers, artists, and scientists work atelier-style, conducting more than 350 projects that range from neuroengineering, to how children learn, to a stackable, electric car for tomorrow’s city. Lab researchers foster a unique culture of learning by doing, developing technologies that empower people of all ages, from all walks of life, in all societies, to design and invent new possibilities for themselves and their communities.

Financial Service Innovation Center, Cork (IRL): Innovation Workshops – They help planning, designing, facilitating and managing the output from an innovation workshop. Market and Strategy Research –Product and Process Prototypes – The FSIC can help you with product and process prototypes that might include new hardware, software or services.

Innovation Lab A/S, Aarhus (DK): Through talks and articles, workshops, seminars and projects they strive to

provide a comprehensive list of the potentials and challenges facing businesses and organizations; and their extensive insight is a valuable advantage. They are approximately 40 Service employees.

Science Innovation Lab, Aachen (GER): The SSIL provides participating partners from industry with the opportunity to jointly benefit from its unique development environment. The lab brings together researchers and decision makers from various companies and economic sectors in order to develop future scenarios for new services and processes under the guidance of experts. Jointly developed service concepts will be evaluated in a subsequent simulation whose results feed back into the development process, allowing the participants to enter upon a discussion of modified and enhanced concept ideas.

ServLab in Stuttgart (GER) is described in detail in the next chapter.

5. An Introduction to the “ServLab” at Fraunhofer IAO

The ServLab is a platform with extensive options for visualizing and testing new service concepts. It offers solutions for various important objectives and tasks in the field of service, thereby facilitating an integrated analysis of people, technology and organization as well as the customer focus. It offers a new approach to service engineering. It is a holistic platform of techniques for the development and design of innovative services: Collecting requirements for new services, Creation of service concepts, Simulation of servicescape, Simulation of interaction, Training of customer-contact staff.

In front of the stereo projection system is a stage for service theatre. The actors play on this stage, while bringing newly designed service processes into life. They perform not only the generic roles of customers and employees. They are also able to portray different characters whose functioning is important for the successful provision of services, such as a critical customer or an overstressed employee. The professionalism of the actors enables them to represent a broad range of different characters. They shift into these roles and, after playing such roles, provide feedback of their impressions to the audience. The frontal area is occupied by an auditorium. It is used for observation as well as for the direct integration of participating protagonists. This procedure is particularly well-proven for prototyping and concept detailing. [14]. Further evaluation can also be obtained by integrating real customers and service providers into the “performance”. Fig.5 shows a picture of the ServLab.

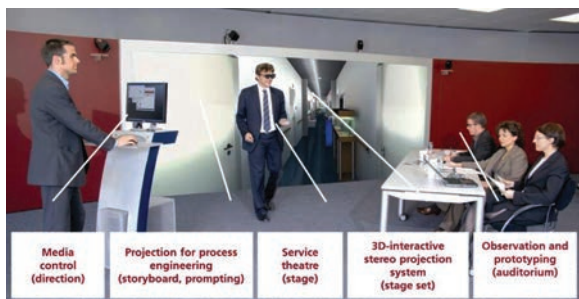


Fig.5. ServLab

Through the current realization of the ServLab the following fields of application have been developed and studied. [7, 14].

Developing new services: A growing number of service-based enterprises realize the opportunity not only safeguard and improve their own competitive position but to acquire entirely new business fields at home and abroad and thereby achieve long-term safeguarding of jobs. A structured approach ranging from initial idea to ready-to-market service product is provided, incorporating evaluation tools [21, 22] & real-time customer feedback [7].

Designing customer processes and interfaces using VR: Optimal design of the customer interface is a vital requirement for success – especially interpersonal aspects as well as the environment (“servicescape”). Virtual simulation makes it possible to compare different process ideas quickly and inexpensively; and employees can test their new work environment directly and undergo training in the same virtual environment.

Managing interactions: Communication and cooperation between customers and employees is a quality characteristic that is critical to success in many areas of services using for instance Product-Service Design Structure Matrix (DSM) [9, 20]. You can visualise the different processes or simulate the interactive scenarios in a close-to-reality environment. ServLab offers opportunities for designing such interactive situations and having employees acquire the necessary competencies.

Testing and optimising services: Enterprises must be sufficiently flexible to align with the requirements of competition in order to stand their ground in the dynamic competitive environment. The ServLab supports the complete process for optimisation. For example, the ServLab facilitates comparisons of the service to be improved with potential alternatives for redesigning services. Adjustments can be made before the market launch by identifying interdependencies and effects of modifications to the service concept at an early stage in the development process.

Coming back to the requirements of chapter 3 it can be stated that the ServLab offers a systematic approach for testing service [7] and at least in the future it is plan to support this approach by a software-toolset [21, 22]. Beside this there are still existing especially methods to design, visualising and optimize interactions [9, 20] in the service domain with the use of VR and without VR.

6. Summary

Approaches to resolve this grievance can be noticed with the increasing number of laboratories all over the world, which were founded in the last 10 to 15 years. These Service related labs try to find an amount of tools and methods that can support companies with developing and testing new or improved services. However, not all of the conducted labs are specialized on (innovative) services. There were 10 laboratories identified, that matched the criteria: “service

related”, “Methods & Tools” and “Best practice”. This is a good starting point to make a deeper analysis of the used test methods in the selected ten labs. A first analysis about the Fraunhofer ServLab was down. Next steps in the future are the analysis of the rest of 9 labs in order to get a sustainable amount of methods, tools and best practices.

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