Business Intelligence and Innovation: An European Digital Innovation Hub to Increase System Interaction and Value Co-creation within and among Service Systems

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Abstract: Due to limited resources (e.g. human, financial, knowledge, etc.), Small- and Medium sized Enterprises run the risk to miss the Digital Transformation of its systems. Especially the manufacturing industry – a strategic industry within the European Union that employs millions of workers and provide tremendous Gross Domestic Product to the partner countries – faces technology changes and increased challenges for implementation. As reaction to the challenges of the manufacturing industry, the European Union launched the Factory of the Future programme and the European Digital Innovation Hub programme. Within this article at hand, the literately and empirically endeavours towards the design and development of the Digital Innovation Hub: Business Intelligence & Innovation within the region of Vorarlberg are presented. In doing so, a narrative literature review about the academic discipline of Service Science – the guiding theory to innovate service systems – and an empirical research about the motivation, status quo, vision and strategy towards the Digital Transformation and Industry 4.0 paradigm of the manufacturing industry within the region of the Federal State of Vorarlberg are presented.

1 INTRODUCTION

European Digital Innovation Hubs (EDIH) is a program launched by the European Commission with the objective to support European business, industry and regions to succeed the Digital Transformation. It is an instrument of the European Commission's Smart Specialization Strategy to digitise European organizations (*considered as service systems within this article*) as well as to boost investment through strategic partnerships and networks within. The EDIH program provides a broad range of services towards digital challenges and organizational innovation that support the design and development of heterogenous Digital Innovation Hubs within the European regions. Considered from an academic perspective, services are about the service interaction and co-creation of value within and between systems.

Service interaction and value co-creation are the means of the academic discipline of Service Science, which was chosen as one of the breakthrough ideas for 2005 by the Harvard Business Review (Chesbrough, 2005). Service Science combines organizational and human understanding, related to Maglio & Spohrer (2013), with technological understanding to categorize and explain service systems: how they interact and evolve to co-create value.

Services systems are the main abstraction of Service Science. Service systems are both: providers and clients of service and can be made up of multiple independent service systems to interact and co-create value. Within this article, a Digital Innovation Hub is considered as a service system – mainly a provider of services coordinated by a single service system (single organization) and/or a group of service systems (two or more organizations) with complementary knowledge and expertise within the ongoing Digital Transformation in the manufacturing industry.

Although Service Science introduces concepts to foster service interaction and value co-creation mechanisms, these concepts between and among (vertical and horizontal) systems are less considered within the empirical field of manufacturing (organizations its internal and external business stakeholders). Many systems still act as organizational silos. As consequence, the systems face an enormous gap of knowledge combined with increased cost- and market pressure. Due to the knowledge gap and the complexity of technological innovations, opportunities, challenges and threats,

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service systems run at risk not to keep up the speed with the Digital Transformation.

This article at hand presents the activities and efforts to design and develop a Digital Innovation Hub – a service hub called Business Intelligence & Innovation for the long-term sustainability, survivability and success of the manufacturing industry within the Federal State of Vorarlberg (Austria). The objective is to highlight the endeavours about the first four steps about the European Commission's "Guide for a Digital Innovation Hub" (Rissola & Sörvik, 2018): (1) define regional needs, characteristics & specialisms, (2) develop a vision for the regional DIH: vision for digital transformation, (3) look at what is already available in region as basis and (4) define the services that the DIH should offer. In the center of this article is the research question "*how an European Innovation Hub within the region of the Federal State of Vorarlberg for Business Intelligence & Innovation can look like*?

This article is structured among five sections. Section one introduces the article at hand and presents the research motivation as well as the research question. Section two introduces the applied research methods about the research into Service Science literature, the European Digital Innovation Hub initiative and the empirical field of the manufacturing industry in the region of Vorarlberg. Section three presents the results of the narratively literature review into the academic field of Service Science and the European Digital Innovation Hub "community". Section four presents the empirically investigation into the needs, incl. the motivation, status quo, vision and strategy, of the manufacturing industry within the region of the Federal State of Vorarlberg towards an European Digital Innovation Hub: Business Intelligence & Innovation. Section five concludes the article and provides an outlook of the future strategies to design and develop the hub.

2 RESEARCH METHOD

Applied research method is case study research. Case study research is a research method to focus on contemporary events, especially when the boundaries between the phenomenon explored and the context may not clearly evident Yin (2014). The case study research method fits best to bring together the research endeavours: a) to narratively analyse the theoretical base of the academic field of Service Science and to narratively analyse the semi-theoretical base of Digital Innovation Hubs with the aim to build up of a sophisticated knowledge base about the field of interest and b) to empirically explore the needs of business and industry towards a digital service hub for business intelligence and innovation. Finally, case study research method captures a broad repertoire of tools to combine theoretically and empirically knowledge to formulate and develop new theory and artifacts about the investigated research question.

As depicted in figure 1, applied case study research method is complementary to the design and development guideline of the European Commission. Case study research augments and extends the guide by the integration of literature reviews to explore what is already known within the field and to develop more purposefully and tailored questions for empirical research.

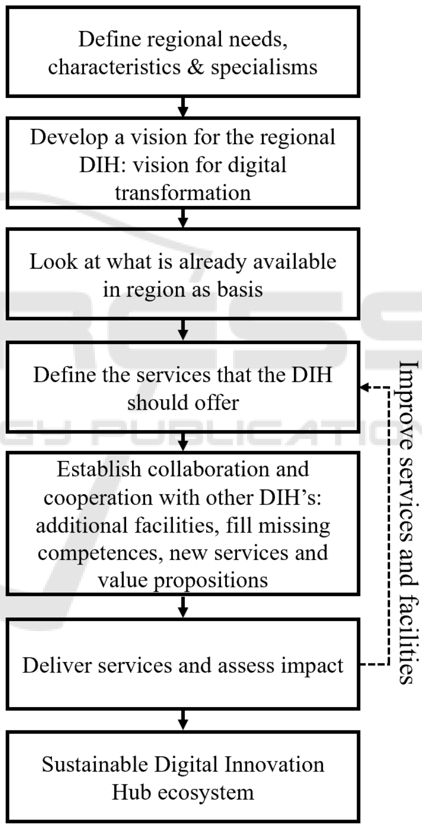

Figure 1: Structure of the research endeavour – a guide for a Digital Innovation Hub (adapted from the European Commission).

2.1 Analysis of Service Science Literature and the European Digital Innovation Hub Programme

The analysis of the Service Science literature bases on a narrative literature review (Baumeister & Leary, 1997). In doing so, the article database of the Service Science Worldwide Community for Service Science Education and Research is sighted. This article database consists of 306 scholarly articles, published in international scientific journals and conferences. The meta-data of all these articles were exported into a Microsoft Excel table. In this table, data got corrected (for example, the database hosts multiple entries for one and the same author, e.g. Spohrer, J. and Spohrer, J. C.), structured and codified for further analysis. Codified data were uploaded into a Microsoft Access SQL database, consisting of seven tables. Five tables provide meta/master-data (codes and information about authors, category, journal, title, year). Remaining two tables provide operational data (including information about articles and co-authors). Afterwards, Standard Query Language (SQL) select statements were executed to structurally explore these meta-data. The use of SQL allows to join and exclude data and enables to detect patterns that are not possible with conventional and/or not computer assisted methods.

The articles recommended by the Service Science Worldwide Community are (co-) authored by 543 unique authors. Most frequent listed authors are Spohrer, J. C. (31 publications), Maglio, P. P. (15), Vargo, S. L. (11), Alter, S. and Polese, F. (10 each). Taken together, 20,5 % or 63 unique articles out of this database are published by these authors. These 63 articles are the basis for the narrative literature review about the academic field of Service Science. In doing the review about European Digital Innovation Hubs programme, a more "pragmatically" method is chosen: the narrative analysis of the European Commission's homepages and its uploaded documents. The results of both reviews are presented in section 3 – contextual embedment: digital innovation hubs as service systems.

2.2 Empirically Research into the Manufacturing Industry within the Region of Vorarlberg

The investigation into the manufacturing industry within the region of Vorarlberg bases on a smart digital questionnaire accompanied with oral expert interviews. Experts, in this sense, are the managers and organizational decision makers from randomly chose organization within the field of manufacturing and accompanied sectors. For example, 14,81% of interviewees state that their organizations are active in the sector "computer programming, consultancy and related activities" (NACE). Following sectors in which integrated organizations are active are "machinery and equipment" (11,11%), "computer, electronic and optical products" (8,64%), "metal products, except machinery" (8,64%), "engineering and architectural activities" (7,41%) and "plastics materials" (7,41%).

The conduction of the empirical research was characterized by two phases: in the first phase, a smart digital questionnaire was we distributed to organizations within the Federal State of Vorarlberg and its neighbouring regions in Austria, Germany, Liechtenstein and Switzerland. However, due to low responses, in the second phase, bi-lateral interviews about business needs, strategies and technologies about the Digital Transformation with managers and decision makers (primarily within the region of Vorarlberg) were organized. An interview lasted 35-45 minutes in average.

3 CONTEXTUAL EMBEDMENT: DIGITAL INNOVATION HUBS AS SERVICE SYSTEMS

The academic discipline of Service Science act as guiding scientific theory of the research endeavours within this article at hand. In the centre of this Information System related theory are service systems. Service systems are considered as socio-technical systems (Böhmann et al., 2014) and thus service systems "dynamic value cocreation configurations of resources (people, technology, organizations, and shared information)" (Maglio & Spohrer (2007); including language, laws, measures, methods). Service systems are both: providers and clients of service that are connected by value propositions in service networks of value-creating systems. Value creation in service systems is enabled via the configuration of actors and resources (Böhmann et al., 2014) as well as the service interaction between. Service interaction are joint activities that depends on increased communication between the service systems (Maglio & Spohrer, 2013) to build up sustainable value propositions. Service interactions and value propositions are "not only data and physical components, but also layers of knowledge, communication channels and networked actors" (Böhmann et al., 2014). Service interactions and value propositions coordinate and motivate resource access across service system entities (Maglio & Spohrer, 2013).

Service systems are everywhere (Parbs et al., 2016): the smallest service system, related to Maglio & Spohrer (2007), "centres on an individual as he or she interacts with others, and the largest service system comprise the global economy […]". Digital Innovation Hubs, in the sense of this article, are a bundle of service systems – (vertical and horizontal) organizations and other stakeholders from business and industry – that interact, collaborate, cooperate and co-create to gain services: new knowledge and expertise.

Within the theory of Service Science, the Service-Dominant Logic, SSMED, Viable System Approach and the Work System Theory could be identified. As Maurer (2020) summarizes, Service-dominant logic increases value co-creation with and among service system stakeholders: clients, providers, suppliers, etc. Service-Dominant Logic aims to improve the potential to launch services and service innovation and is part of Marketing Theory. SSMED – an abbreviation for Service Science, Management, Engineering and Design – focuses on increased services, service systems and its service interaction mechanisms by continuous service system development, (re-) design and (re-) engineering. It is about innovation and evolution by use of knowledge gained from the service systems ecologies. Viable system approach focuses on the service system's viability, sustainability and survivability through dynamic stakeholder interaction and value co-creation mechanisms. It is closely related to Service-Dominant Logic. Work system theory, a core-intervention of Alter (2013), focus on the resources base of service systems to design and develop valuable, rare, inimitable and non-substitutable (VRIN) resources. As depicted in figure 2, in the centre of the Work System Theory is the Work System Framework – a framework and guide to execute service, service system and service ecosystem renewal and innovation. Central idea of the Work System Theory is to support service system thinking. Service systems are made of nine resources, best presented in the Work System Framework (cf. figure 2).

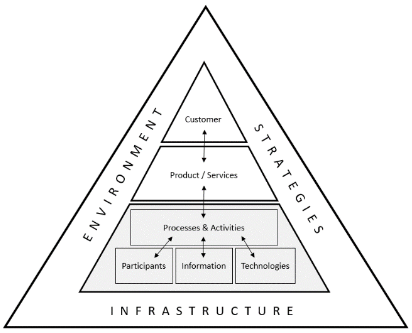

Figure 2: Work system framework.

The Work System Theory (*main protagonist: Seven Alter, e.g. Alter (2013)*) is a business process approach and focuses on service systems and its participants rather than on (information and communication) technologies. The Work System Theory and its Work System Framework are relevant for system analysis: analyzing, describing, designing, or evaluation of service systems (and its improvement) – towards both: planned and unplanned changes within and among service systems (internal & external). The Work System Theory supports system participants to develop new services and service systems as well as to improve and innovate the existing systems towards organizational challenges, opportunities and trends.

In the centre of SSMED are to launch productive service interactions, increase labour productivity and innovation measuring productivity. In accordance to Spohrer et al. (2010), measures to increase service interaction and productivity (such as: efficiency, effectiveness, performance and sustainability as well as renewal and innovation) include the (1) identification of all the stakeholder system entities in a network under study (e.g. a network ecology analysis), (2) examination of existing relationships and value cocreation mechanisms with the target to understand the challenges and opportunities the service system stakeholders have identified, (3) improve existing value cocreation mechanisms (that may include the freeing up of resources from existing service system entities and its redistribution), (4) creation of new service system entities to address them (if challenges and opportunities remain) (Spohrer et al., 2010). As depicted in table 1, SSMED makes use of four propositions that are:

Table 1: SSMED's four propositions.

Propositions		Source
1	Service system entities dynamically configure (transform) people, technology, organizations and shared information	Spohrer et al. (2012); Maglio & Spohrer (2013)
2	Service system entities compute and calculate value from multiple stakeholder perspectives	Spohrer et al. (2012); Maglio & Spohrer (2013)
3	Service system entities reconfigure access rights to resources by mutually agreed to value propositions resp. the access rights associated with entity resources are reconfigured by mutually agreed-to value propositions	Spohrer et al. (2012); Maglio & Spohrer (2013)

Table 1: SSMED's four propositions (cont.).

	Propositions	Source
4	Service system entities compute and coordinate actions with others through symbolic processes of valuing and symbolic processes of communicating	Maglio & Spohrer (2013)

However, the European Digital Innovation Hub is a research, innovation and investment programme of the European Commission. It can be considered as the supplement of the "Factory of the Future" (FoF; European Factories of the Future Research Association (2016)) programme, which was launched firstly in 2008 with the aim to develop a sustainable and competitive EU manufacturing. In first iteration, this initiative included the development of high added value manufacturing technologies, which additionally are clean, highly performing, environmentally friendly and social sustainable (e.g. European Commission; European Commission (Multi-Annual Roadmap). However, FoF is a narrative and under its roof, this term describes a factory as a fully integrated plant, incl. the use and application of smart cyber-physical systems. Especially in the German speaking countries Industry 4.0 approach is in close relation to FoF. It interlinks human resources, technology and information equally to establish more performant and more efficient but also more intelligent and self-managing service systems in overall value co-creation chains.

Related to the Draft Working Programme of the European Commission (2019), EDIH's are one-stop shops that help companies become more competitive with regard to their business/production processes, products or services using digital technologies, by providing access to technical expertise and experimentation. Organizations should be able to "test before invest". Further services assigned to EDIH's are, for example, provision of innovation services, incl. to better organise the innovation support system in the region, start-up support (assist start-ups who are based on digital technologies) and innovation in more established companies (support more mature companies with the development of new products and services that are not fully exploiting the digital opportunities yet), matchmaking and connection of actors and stakeholders, financing advice and training and skills development that are needed for a successful Digital Transformation of business, industry and/or the region. Actors and stakeholders of Digital Innovation Hubs are, for example, RTOs, universities, technological companies, governmental institutions, etc. (DIH, Smart Specialisation Platform, 2020) and their main service is to support the Digital Transformation of business and industry and the regional ecosystem (European Commission, 2016). It is a concept that builds upon previous experiences and organisations to digitalize business, industry and the regional ecosystem.

4 INDUSTRY NEEDS & VISION TOWARDS THE DIGITAL TRANSFORMATION

As highlighted in theory of Service Science, industry experiences a strong shift form Goods-Dominant Logic to the Service-Dominant Logic. This is true too for the investigated field of manufacturing industry within the Federal State of Vorarlberg: old processes and services get renewed, changed and adopted by new, technology-based processes and services to increase service interaction and value co-creation. The Digital Transformation, as observed in the field, additionally impacts and challenges the human resources and the requirements into them. A continuous qualification and upskilling of their competences are needed. The following chapters present the motivation for the Digital Transformation within investigated organizations, the status quo about the use of Industry 4.0 technology, a future prospection and the strategy towards this future. Anticipated, the removal of existing products because of the Digital Transformation is less expected by the interviewees – manufacturing get incentivized and augmented with services.

4.1 Motivation for the Digital Transformation

The general motivation for the Digital Transformation of managers within interviewed organizations is all about internal and external innovation (renewal, adaption and change of the manufacturing systems, its underlying technologies, processes and services) at almost all organizational levels. Core efforts are the implementation of new technologies, processes and services within their manufacturing systems. In doing so, most interviewed managers expect a reduction of material consumption within their organization. Further expectations of interviewed managers are the adaption, design and development of new products and services, increased managing quality and organizational robustness as well as changed business models. Additionally, by the Digital Transformation, managers expect to access to new markets and business areas as well as to attract and gain new customers.

The observed examples within the empirical field are manifold. For example, the managing director of an involved company specialized in injection moulding foster the motivation for the Digital Transformation of its employees by internal value services: increased transparency of manufacturing processes by use of a manufacturing info-board (c.f. figure 3). A further company equips its service employees with Virtual Reality Glasses to easily download construction plans during services processes at the customer. Additionally, by use of the VR Glasses, the service employees are able to get connected with the headquarter and to receive real-time support and advices.

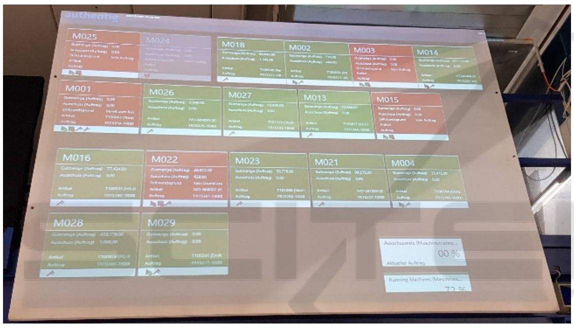

Figure 3: Organizational transparency by use of a manufacturing info-board.

4.2 Status Quo: Availability of Emergent Manufacturing Technologies in Industry and Its Usage

In analysing the status quo, interviewees had to evaluate applied Industry 4.0 technologies on a Likert Scale – ranging from 1 (= no usage at all) until 4 (= very intensive use). Based on the research of Schumacher et al. (2016 & 2019), these technologies are: autonomous robots, simulation, system integration, (industrial) internet of things, cybersecurity, cloud technologies, additive manufacturing, augmented reality and big data & analytics.

As depicted in table 2 & 3, from a "positive" perspective, the technologies simulation, system integration, (industrial) internet of things, cybersecurity, cloud technologies, additive manufacturing and big data & analysis passed the 50% hurdle (*summary of the results: few usage, good usage & intense usage, c.f. table 3*). This determines that most of the interviews affirm the use of these technologies. From a "negative" perspective, it seems that the technologies autonomous robots and augmented reality did not gain interest and did not enter the field of manufacturing yet. For example, any of the interviews stated that these technologies experience an intensive use in their organization. The results about the "positive" and "negative" perspective – the usage and no usage of Industry 4.0 technologies in investigated organizations – are depicted in table 2.

Table 2: Usage of manufacturing technologies.

Technology	No usage	Usage
Autonomous robots	58,06%	41,94%
Simulation	35,48%	64,52%
System integration	41,94%	58,06%
(Industrial) IoT	48,39%	51,61%
Cybersecurity	35,48%	64,52%
Cloud technologies	29,03%	70,97%
Additive manufacturing	48,39%	51,61%
Augmented reality	83,87%	16,13%
Big data & analysis	29.03%	70,97%

Focusing on the "positive" perspective (usage of manufacturing technologies), as depicted in table 3, an intense usage could be identified in cybersecurity, big data & analysis, simulation and (industrial) Internet of Things.

Table 3: Detailed visualization of the usage of manufacturing technologies.

	Usage		
Technology	Few	Good	Intense
Autonomous robots	22,58%	19,35%	
Simulation	35,48%	19,35%	9,68%
System integration	29,03%	29,03%	
(Industrial) IoT	29,03%	16,13%	6,45%
Cybersecurity	29,03%	22,58%	12,90%
Cloud technologies	25,81%	38,71%	6,45%
Additive manufacturing	35,48%	16,13%	
Augmented reality	12,90%	3,23%	
Big data & analysis	45,16%	16,13%	9,68%

Examples of the use of these technologies are, for example, the integration of external cloud platforms as Dropbox, SharePoint, etc., server decentralization, outsourcing of IT processes and IT service-oriented architectures. Major to the managers is to 'flexibilize' the organization and make it more agile to stakeholder requirements. But also, a few interviewees stated that they are working on their own cloud solutions that face increased security measures. The cloud technology, with respect to the academic field of Service Science as well as the interviews highlighted, is to boost cooperation, collaboration and to increase of organizational transparency. It enables to increase the interaction and value co-creation among system members on the digital way (e.g. exchange of documents, edition of documents at the same time, etc.). Big data & analysis technology, as observed in the interviews, is in close connection to simulation. The manufacturing processes and products, for example, are augmented with (industrial) internet of things technology: sensors, chips, etc. These IoT's are the basis for big data in manufacturing and its structured analysis at operational level (e.g. internal cycling times, speed, maintenance, etc.– as depicted in figure 3). At strategic level, the organizational supply chains get observed, forecasted and simulated. The make use of these (interconnected) big data and its analysis enables, as the interviewees stated, to identify patterns and structures for latter decision making. The use of simulation enables to design and develop scenarios and incidents, decision making, software tests, product development and process simulation.
The "organizational shut-down" of a well-known organization within the region due to a cyber-attack sits deep within the interviewees' minds. Probably for this and globally observed reasons, the technology cybersecurity is the most applied technology within . As observed, the protection of IT hard- and software is at high level and captures, for example, technological standards, legal protection for digital products and services, rules for employment in digital work environment, safety, security & resilience and control, reliability & robustness.

4.3 Vision for the Digital Transformation: Future Prospection

Related to a future estimation of the use of emergent manufacturing technologies that drive the Digital Transformation in systems, the interviewees highlighted a tremendous shift. As observed, all surveyed manufacturing technologies are on the agendas of the managers and a more intensive use in the future is expected by them in their organization. The comparison between present use, the future application and the change is depicted in table 4. For example, 87,10% of the interviewees (instead of 70,97% *(as in the status quo section)*) planning to make use of cloud technologies in the future. This is a shift of +16,13%. The technologies system integration, (industrial) internet of things and augmented reality, as the interviews highlight, will experience the most significant change: +25,81% each. Nevertheless, more than the half of the interviewees (58,06%) showed a negative attitude towards augmented reality.

Table 4: Prospected shift of the usage of manufacturing technologies.

	Prospected shift		
Technology	Present	Future	Change
Autonomous robots	41,94%	67,74%	+25,80%
Simulation	64,52%	67,74%	+3,22%
System integration	58,06%	83,87%	+25,81%
(Industrial) IoT	51,61%	77,42%	+25,81%
Cybersecurity	64,52%	77,42%	+12,90%
Cloud technologies	70,97%	87,10%	+16,13%
Additive manufacturing	51,61%	61,29%	+9,68%
Augmented reality	16,13%	41,94%	+25,81%
Big data & analysis	70,97%	80,65%	+9,68%

As observed, an intense usage of manufacturing technologies is to be expected in cybersecurity (ten interviewees highlighted the intense usage of this technology, cloud technologies (7), big data & analytics and simulation (6 each). The technology system integration will be used to increase the system's collaboration from human-to-human, human-to-machine and machine-to-human. Applied fields are manifold and capture, for example, interfaces (to internal/external ERP systems, MES systems, CAx systems, etc.), machines and sensors (to collect noise and additional data about the product and its cycle times) and -partly- robots and autonomous driving systems. Centre to the managers are increased service interaction: automated information exchange, customer and supplier integration and value co-creation in product/service development, utilization of customer and supplier related data and IT-collaboration for product development.

4.4 Strategies for the Digital Transformation

As observed within the surveyed organizations, the most promising strategy for the successful implementation of Industry 4.0 technologies and the continuous cope with the Digital Transformation are the developments of an Innovation Strategy and an Industry 4.0 Strategy. Almost 81% resp. 59% of the interviewees are positive towards the Innovation Strategy document and the Industry 4.0 Strategy document. A further important part, as observed, is the communication of these documents towards the system participants (e.g. managers, decision makers, employees, etc.) and the system stakeholders.

Nevertheless, the results out of the survey paints an ambiguous picture about the strategy for the Digital Transformation and the application of Industry 4.0 technologies. At the one hand, the willingness of mangers to pro-actively act manage and master the Digital Transformation within their organization is high. At the other hand, the most important resources' objectives to master the Digital Transformation are not captured sufficiently yet: less than 42% of the interviews confirmed that the employees' objectives are captured within their roadmap and innovation strategy towards the Digital Transformation. Related to the academic discipline of Service Science, it is a major pitfall of design, development and engineering (of products, services, processes, technologies, etc.) since value is always co-created.

Further possible sources of danger are the organizations central coordination of the activities and efforts of the Digital Transformation, its communication to become digitalized and the risk assessment. For example, only the half of interviewed managers stated that their endeavours of their Digital Transformation is centralized. This disables the capitalization of implemented technologies and decreases the organizations' ability to design, develop and (re-) engineer its processes and services accordingly as well as to disseminate the adaptions, changes and innovation to the system stakeholders (employees, suppliers, customers, etc.). Although the mangers are aware about the ongoing Digital Transformation, more than the half of interviewed managers stated that they did not make an assessment about future technologies. Currently, it seems that digital transformation in companies is based on a trial and error process instead of a structured innovation process.

5 CONTRIBUTIONS & FUTURE OUTLOOK

Digital Transformation and Industry 4.0 force proactive digital adaption, change and innovation of the system, its infrastructure, resources, processes, products and services. Considered from a service perspective – the perspective of the academic field of Service Science, Digital Transformation and Industry 4.0 not only is about the implementation of new technology within the organization but also its management, engineering and design. However, due to limited resources (e.g. human, financial, knowledge, etc.), especially Small- and Medium sized Enterprises run the risk to miss the successful innovation of its systems.

5.1 Contributions to Research and the Empirical Field of Manufacturing

From an academic perspective, this article at hand introduces the academic field of Service Science as engineering guide to response to and to cope with the Digital Transformation and Industry 4.0 in the manufacturing industry. Service Science supports to increase service system stakeholders abilities to think systems in services and thus to better design, develop and (re-) engineer service systems. Especially the SSMED and the Work System Theory provides guidelines and frameworks to adapt to, change and innovate within the Digital Transformation and Industry 4.0 paradigm. From an empirical perspective, this paper introduces the European Commission's Digital Innovation Hub programme. This programme is meant to support the European manufacturing business and industry to cope the Digital Transformation and Industry 4.0. Centre to the European Digital Innovation Hub programme is to establish Digital Innovation Hubs that boost innovation within business, industry and the European regions.

Both perspectives, Service Science (incl. SSMED and Work System Theory) and the European Digital Innovation Hub programme are key to establish the Business Intelligence & Innovation Hub within the region of Vorarlberg.

5.2 Future Outlook

After the analysis and evaluation of the motivation, status quo, vision and strategies within the empirical field, as demanded by the European Digital Innovation Hub programme, next step is to define the services that the intended Business Intelligence & Innovation Hub should offer. In doing so, it is important to analyse the resources, infrastructures, existing networks, etc. of the region to identify, for example, the relevant stakeholders within the field of manufacturing. Target then is to conceptualize the integration of identified stakeholders into the design and development processes for later dynamically configuration and transformation of people/human resources, technologies, organizations (incl. internal and external stakeholders) and shared information for a sustainable, survivable and profitable manufacturing industry within the region. At the one hand, it is centre to design and develop services that meet the needs, vision and strategies of the manufacturing industry. At the other hand, it is important to align with the overall strategy of the region. Thus, the services of the Business Intelligence & Innovation Hub not only re-combines infrastructure, technologies, products, services and production factors – it enables new alignments in the organizational culture and its management and contributes to the Smart Specialization Strategy "Intelligent Production" of the Government of the Federal State of Vorarlberg.

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