APPLICATION OF SERVICE DESIGN TO PROMOTE SUCCESSFUL UNIVERSITY-INDUSTRY COLLABORATION IN FINLAND

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ABSTRACT

The aim of this research is to examine how service design can be used to promote university-industry collaboration in Finland, focusing on the Lapland region in the cities of Rovaniemi, Tornio and Kemi. This study is based on qualitative and quantitative research implemented as part of a research through design group project conducted during the Strategic Service Design course at University of Lapland and is included in this thesis as a case study. Through a survey and email interviews with industry professionals, the study investigates insights and understands current established approaches to industry involvement in product and service development working with university partners. The thesis presents a design solution and service blueprint to promote future partnerships.

As part of the research for this thesis, a survey of 40 respondents was conducted in English and Finnish. The survey revealed that industry representatives do recognize the benefits of leveraging university resources for research and fast prototyping of new ideas, concepts and innovations. Interview respondents recognized the opportunity for more closely structured partnerships to hedge issues related to intellectual property, talent management, employee training and career development, and resource allocation of budgets and investments.

The research revealed a need for more structured operational organization, leadership and management related to metrics and feedback for projects and collaborations unique to each project. Service design methodologies were the foundation used to prototype a digital solution and design the service blueprint. The practical solutions recommended in this thesis can serve as a resource for developing successful project partnerships.

Keywords: university-industry collaboration, service design, service blueprint, open innovation, higher education, industry collaboration, Finland, digital service design

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1.0. INTRODUCTION

1.1. Higher Education, Universities and Universities of Applied Sciences

This thesis refers to the modern higher-education institution (HEI) as a diverse institution of higher learning created to educate for life and for a profession and to grant academic degrees (Fellbaum, 2010). University credentials have been widely recognized worldwide as a minimum requirement for higher-level employment in industries, meeting the demand for in-depth expertise and professional accreditation for jobs that accord more responsibility.

As of this writing, higher education in Finland consists of 13 universities and 22 universities of applied sciences (UAS) under the remit of the Ministry of Education and Culture (MEC). Universities focus on research and offer doctoral (Ph.D.) level programs. Universities of applied sciences provide higher education on bachelor's and master's level that are career focused and have strong ties with working life and regional development. All universities and UAS receive almost all their funding from the state (MEC, 2009; MEC, 2014).

Finland's Universities Act (558/2009) contains the basic provisions on the universities' duties, administration, degrees and teaching for the 13 universities. The UAS is governed under The Universities of Applied Sciences Act (932/2014).

According to the Universities Act (558/2009):

> The mission of the universities is to promote independent academic research as well as academic and artistic education, to provide research-based higher education and to educate students to serve their country and humanity at large. In carrying out their mission, the universities shall promote lifelong learning, interact with the surrounding society and promote the social impact of university research findings and artistic activities. (MEC, 2009, Section 2: 1-2)

According to The Universities of Applied Sciences Act 932/2014:

> The mission of universities of applied sciences is to provide higher education for professional expert jobs based on the requirements of working life and its development and on the premises of academic research and academic and artistic education and to support the professional growth of students. They shall also carry out applied research, development and innovation activities and artistic activities that serve education in universities of applied sciences, promote industry, business and regional development and regenerate the industrial structure of the region. In

> carrying out their mission, universities of applied sciences shall promote lifelong learning. (MEC, 2014, Section 4)

Since achieving independence in 1917, the development of higher education in Finland was characterized by powerful central state intervention, in terms of regulation and the centralized allocation of resources (Kivinen & Rinne, 1992). Post-war Finnish educational policy was dominated by a strong faith in the benefits of schooling and the belief that promotion of educational democracy would enhance democracy in society at large (Kivinen & Rinne, 1996). Kivinen and Rinne's (1996) research examines the relationship between higher education expansion and social mobility, and Finland's commitment to providing equal educational opportunities for all citizens is a key feature of its education system. Their research shows the correlation between a child's potential to pursue further education and the level of education of their parents also serves as a measure of status and social mobility (Kivinen & Rinne, 1996).

In traditional forms of university education students often acquire inert knowledge which is knowledge that can be used in instructional settings but cannot be transferred into complex problems of working life (Mandl, Gruber & Renkl, 1996). University advances knowledge by original and critical investigation; teaching based on the disinterested search for truth, and students should participate at every level (Mandl, Gruber & Renkl, 1996). Hence the classic view that the university was a 'community of scholars and students' engaged on a common task (Anderson, 2010). Anderson noted that universities of today are accessible as institutions to diverse populations of privileged eminent scholars; as university accessibility has become more widespread, many jobs require a minimum bachelor's level degree of competence and socialization. UNESCO Higher education figures report that global enrolment in tertiary education more than doubled in the last two decades with the average world's gross enrolment ratio more than doubled increasing from 19 percent in 2000 to 42 percent in 2022 (UNESCO, 2024). The number of internationally mobile students tripled between 2000 to 2021, from 2.1 to 6.4 million worldwide with the global enrolment of international students rising steadily each year (UNESCO, 2024).

According to Statistics Finland (2023), 163,700 students in total attended university education that lead to a degree in 2022. Statistics Finland reported the number of students increased by 2.6 percent from the previous year with new students numbering 32,600 which remained unchanged from the previous year. A total of 30,800 degrees were completed in 2022 which was 1.7 percent lower than one year before (Statistics Finland, 2023). The differences between people who have completed university and university of applied sciences degrees are mainly seen in two characteristics: analytical ability and practical skills – University studies better prepare an employee for analytical

work, while university of applied sciences provides better skills to jump directly into practical tasks (Huttunen, 2019). University education once catered to the elite in providing education primarily for individuals pursuing religious, professional, or administrative careers; however, with the democratization of higher education, universities have expanded their potential to contribute significantly to societal progress (Fägerlind & Strömqvist, 2004). Acquiring professional expertise requires legitimate peripheral or guided participation within a community of practice (Baltes & Staudinger, 1996). University education is limited in preparing students for professional life, the key issue is how universities can facilitate the initial integration and enculturation into a community of practice (Mandl, Gruber and Renkl, 1996).

As Fägerlind and Strömqvist (2004) note, today, professionals such as educators, medical practitioners, and engineers seek advanced academic training at universities to enhance their skills and contribute meaningfully to their respective fields, thereby supporting societal advancement. Moreover, universities play a pivotal role in both fundamental and applied research across various disciplines, spanning sciences and humanities, thereby enriching our collective understanding of the world and fostering economic development and innovation (Fägerlind & Strömqvist, 2004).

1.2. Industry 4.0

Industries refer to the people or companies engaged in a particular kind of commercial enterprise and are crucial economic drivers that contribute to the growth and development of a country (Fellbaum, 2010). According to Goal 9 of the United Nations Sustainable Development Goals, Goal 9 seeks to build resilient infrastructure, promote sustainable industrialization and foster innovation (UNDESA, 2023). One can conclude that the goal of industry is to address societal challenges and shape the quality of life for the betterment of people and society, and that manufacturing, technology, healthcare, legal and financial industries represent some of the practical applications of ideas, inventions, strategies and innovations that create value in the form of profit from products, services and solutions.

Through rigorous academic programs students attend higher education institutions to gain disciplinary knowledge along with soft skills and socialization necessary to function in complex interdisciplinary work environments. Higher education institutions provide a structured educational environment and rigorous stimulating curricula where advanced concepts are developed and practiced.

The Fourth Industrial Revolution known as Industry 4.0 is seen as the integration of digital technologies and real-time automation of manufacturing systems (Uygun, 2021). These technologies include the Internet of Things (IoT), big data and analytics, cloud computing, and machine learning; the current trend of automation, artificial intelligence (AI), decentralized finance and the increasing development of the knowledge economy and services around technological infrastructure (Järvenpää, Salminen, & Kantola, 2021).

Overall, as a society, Finland has remained at the forefront of digitalization, which has also enabled Finnish industries to successfully adopt and develop Industry 4.0 solutions and new operating models (Khan et al., 2021).

In terms of Industry 4.0 ready professionals, the merger of University of Tampere and Tampere University of Technology was to create an environment for the synergy of technological and social sciences promoting science, technology, engineering and mathematics (STEM) professions (Jansons, & Rivza, 2019).

Globally, university education remains a good indicator of individual intelligence and higher lifetime earnings potential (Bouchrika, 2024). In Finland, according to the mission of the universities and UAS, continuous professional development and accumulation of education are important factors in lifelong learning for the workforce to remain flexible to adjust to the needs of the future-oriented labor market (Sutela, 2024).

In the climate of rapidly disrupting models, universities must engage in cutting-edge research and equip the talent pool of graduates with skills to handle the most complex challenges to become expert industry leaders. Many European Union member states are already reporting recruitment difficulties and skills shortages in high-tech and healthcare fields (Caprile, 2015). To conclude, with the rapid pace of innovation in a globalized economy, universities must keep pace with advancements in industry needs.

1.3. Service Design

In 2022, global services exports were valued at $7.1 trillion (UNCTAD, 2023). More than 75 percent of the global economy is now accounted for by services (45 percent in developing economies) (Ghani, 2010). The economies of industrial nations are changing dramatically from manufacturing to the provision of information and services (Mager, 2009). Mager notes that services now represent between 60 and 70 percent of the gross domestic product of developed nations – in countries such as Hong Kong this even amounts to more than 90 percent. Almost all new companies and jobs created are in this so-called tertiary sector (Mager, 2009). Mager (2009, p. 31) says, “In these changing

markets improvement and innovation of skills are of crucial importance to service providers in order to keep customers and in order to win new ones."

The primary sector mainly focuses on extracting raw materials from the environment, the secondary sector involves the transformation of raw materials into material products, and the tertiary sector includes services and the knowledge-intensive economy (Boden & Miles, 2019). Services are the fastest growing sector in global trade and services generate the most jobs in developed countries and in much of the developing world (Ghani, 2010). Companies are evolving their business models from solely product-focused manufacturing to offering a combination of products and services that deliver more value to customers in the form of "servitization" (Iriarte et al., 2016).

The rapid advancement of digital technology has accelerated innovation in business and industry. The COVID-19 pandemic further disrupted existing models from lifestyle to commerce that now need new frameworks to operate (Amankwah-Amoah et al., 2021). Traditional services such as retail, financial and passenger transport have moved to digital counterparts in e-commerce, fintech and platform apps handling ride-hailing and electronic ticketing. Consumers, merchants and service providers have relatively easier and more direct access to goods and services that are no longer limited by location or market size.

From a sample of 50 developing countries, growth in the services sector is correlated with poverty reduction than growth in agriculture or manufacturing (Ghani, 2010). The services sector has created jobs with high wages and given equal access and opportunity regardless of gender and social status (European Commission, 2021). Globalization in the late-20th century further led to the explosive expansion of service economies, and the modern revolution of Industry 4.0 with automation, artificial intelligence and digitalization will continue to drive even more possibilities (van Damme, 2021).

The shift from manufacturing economies to information and services in the last three decades now represents as much as 75 percent of GDP of Western industrial nations (Ghani, 2010). Ghani writes that research and development once concentrated on invention of products and processes of production are increasingly focused on the means and organization of the delivery of products. The importance of marketing was first identified and addressed as an independent topic in the United States in the 1970s, and service design began to be recognized as a discipline in the early 1990s (Gummesson, 1994). With the introduction of the Interaction Paradigm, Service Design started to build its own identity and legitimacy, as Sangiorgi (2004; 2009, p. 416) explains

> The Interaction Paradigm in Service Design refers to the set of concepts, values and tools that derive from the interpretation of services and of Service Design,

starting from the area and the moments of interaction between the user and the supply system.

Service Design as a discipline was brought to awareness by G. Lynn Shostack in 1977. Shostack broke away from technical product development and emphasized the need for design as the "key to market success, and more important, to growth" (Shostack, 1984, para. 10) of services as deliverables that incur high impact yet take on no material form (Shostack, 1984). "Service design is concerned with design activities using dedicated tools and techniques to specify or concretize the structure and infrastructure or concepts of a service" (Sangiorgi & Eun, 2014, p. 194; Goldstein et al., 2002; Johnson et al., 2000). "Service design is the design of the overall experience of a service as well as the design of the process and strategy to provide that service" (Moritz, 2005, p. 39). The goal of service design is to create service interfaces that are not only effective, efficient, and distinctive from the supplier's point of view, but also functional and aesthetically pleasing from the client's point of view (Mager & Evenson, 2008).

The goal is for solutions that are focused on customer and human experience to enhance value for users and increase engagement and innovation through knowledge development in the creation and delivery of services (Miettinen, 2017). The human- and customer-centric development methodology and practice holds a strategic (outside-in) development process – a process where analytical and creative reflections intellectually take turns (Korpikoski, 2023). As Korpikoski (2023, p. 30) explains, "People (customers and employees), front- and back-end of services, products, digital systems, and tools, processes, and practices are naturally the subjects of service design." Korpikoski (2023) further notes service design is seen to be relevant not only to the external design of services but also to the interior design of organizations, with the goal of developing and producing better performing organizations that will improve an organization's quality and risk management (Korpikoski, 2023). This thesis uses the application of 'Service Design as an approach' to study how existing design methods could be scaled and adapted for service system design and implementation (Sangiorgi & Eun, 2014).

1.4. Background of Research Problem

In Finland, unemployment among recent graduates is higher than other graduates at all levels of education (Erjansola, 2023). Erjansola's research in the Helsinki region showed that unemployment among recent graduates has become more common because in 2020, 28 percent of those who completed a basic degree at Helsinki's vocational educational institutions were unemployed in the year of graduation, compared to 14 percent of those who graduated the previous year. At the same time, Erjansola's (2023)

research shows the share of employed people among recent graduates was only 55 percent in the 2020 cohort.

Investigating the job search experiences of highly educated unemployed individuals from the perspective of the labor market mismatch issue, Romppanen (2022) provides a critical examination of the systemic problems in job markets that disproportionately affect highly educated individuals, emphasizing that despite their qualifications, they face significant obstacles in securing employment that matches their skills and education levels (Romppanen, 2022).

The key findings in Romppanen's (2022) research are that there is a mismatch between the supply of job seekers and the demand for jobs, with a lack of jobs that match the high education and skills of job seekers. Romppanen's (2022) research shows that inadequate labor markets experienced by highly educated individuals potentially indicate that raising the level of education was not linked to an increase in job skills requirements – the skills produced by university education were not perceived to meet the skills requirements of jobs available in the labor markets. Thus, the inadequate supply of jobs was linked to tightened job competition among highly educated individuals. Unrecognized skills based on education can be considered a problematic starting point for both universities and the labor markets. Romppanen's (2022) research also shows that the lack of work experience had an impact on the success and employment of highly educated individuals, and makes the recommendation that facilitating internships included in university studies might have an impact so that a university student could build work-life networks during their studies without taking resources away from completing their studies.

The choice to invest in university education often correlates to improving employability prospects and social standing (Isopahkala-Bouret, 2023). Higher education must prepare graduates with competencies that are adaptable to the cycles of expanding and tightening economic and industrial challenges. Considering the pace of technological development, the faltering economy due to crises such as the global COVID-19 pandemic, universities must provide skills and competency education to meet the right scope of the labor market.

The Finnish Government's innovation policy is built on the mission to develop the world's best innovation system with universities playing the leading role (Markkula, 2009). The Ministry of Economic Affairs and Employment (MEAE) is responsible for preparing and implementing Finland's innovation policy together with other ministries. In Finland, significant investments are made in R&D by both the public and private sectors. R&D expenditures totaled 6.4 billion euros in 2018, of which about two thirds

came from the commercial sector and one third from the state sector (MEC, 2023). The primary source of funding for universities and UASs is the government. Additionally, the growth of numerous disciplines in Finland has been greatly aided by support from private foundations (MEC, 2023).

This shows that, based on the missions of Finland's universities and innovation systems, tertiary education should constantly adapt to meet the ever-changing demands of innovation in Finland's economic and employment strategy.

1.5. Research Problem

It is widely accepted that university education and graduation are determining factors that lead to employment in industry. Higher education graduates can be expected to be skilled professionals in the knowledge society, who are "competent in at least the following five areas: professional expertise, functional flexibility, innovation and knowledge management, mobilization of human resources and international orientation" (Allen & Der Velden, 1989, p.3). Most higher education institutions agree that one of the main factors influencing and evaluating university results should be a graduate's employability (Clarke, 2018). The rigors of university education and graduation are followed by the journey of finding a job and navigating the processes of companies hiring to meet business requirements and talent acquisition. Finland is facing challenges in maintaining its competitive edge in terms of a highly educated workforce and innovation capacity. Furthermore, the internationalization of higher education is hindered by insufficient international staff and policies that do not retain educated foreigners. Additionally, the research sector is weakened by a fragmented R&D system, the absence of large-scale research infrastructures, and a lack of significant national research objectives necessary to achieve global excellence (Melin et al., 2015).

A few problems can be identified that pertain to themes of labor shortage, unemployment, skills training and recruitment difficulties that leave a considerable number of unemployed individuals while specific job sectors are experiencing labor shortages. Labor market convergence refers to the matching of labor supply and demand. Labor shortages occur when, despite attempts to hire, the needed workers remain unattainable (Larja & Peltonen, 2022).

Larja and Peltonen (2022) note that recruitment challenges may stem not only from a scarcity of local labor but also from deficiencies in the employer's recruitment capabilities, substandard working conditions, or factors like the demotivation of the unemployed in applying for jobs or problems with incentives. Furthermore, their

analysis of employment data shows that despite reported recruitment difficulties, a considerable number of unemployed individuals are still available in specific job sectors.

1.6. Research Questions

The research problem is about the gap between university graduation and employment in any industry. This thesis investigates how university-industry collaborations and successful partnerships can potentially create more employment opportunities for university graduates.

As government support for research decreases, university-industry alliances have provided universities with financing sources and businesses with more flexibility supporting their own R&D initiatives (Cyert & Goodman, 1997).

According to Romppanen (2022), a functioning education and labor policy requires mutual understanding of what kind of skills are produced in universities and how these skills can be utilized in the labor markets. Graduates from university should be equipped with the necessary knowledge and skills to be employed in their respective fields. The industries receiving these graduates must continue to innovate, expand and match positions with the best qualifications.

In analyzing the current body of research in University-Industry Collaboration, this thesis will approach the topic from a service design discipline and concentrate the research, models and frameworks using service design. The focus of the thesis is particularly adjusting for a post-pandemic time perspective, within the context of universities and industries in Finland. The application of service design principles and methodologies also presents a novel and unique approach on the already vast existing body of research in "University-Industry Collaboration."

Applying the Double Diamond design process model (Council, 2007) the first phase is Discover and research the current situation, then properly Define the problem before a solution can Develop, and finally to Deliver this master thesis (Figure 1).

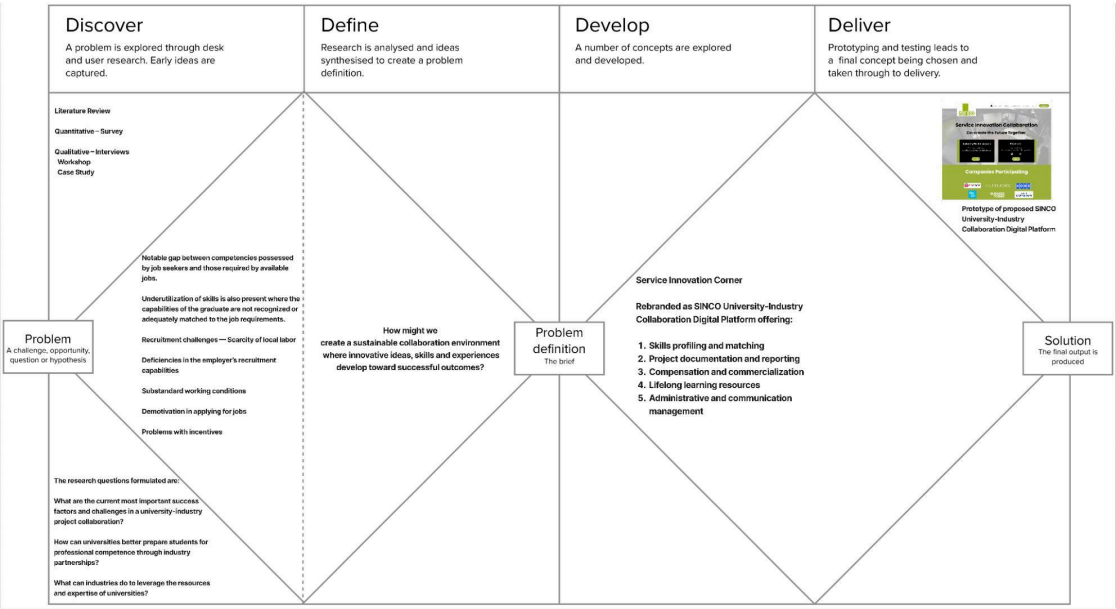

Figure 1. *Double Diamond representation of thesis process.*
Adapted by Su-Ai (2024). Source: Design Council (2023). The Double Diamond is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

The research questions formulated are:

1. What are the current most important success factors and challenges in a university-industry project collaboration?
2. How can universities better prepare students for professional competence through industry partnerships?
3. What can industries do to leverage the resources and expertise of universities?

The limitations of university education must be met by professional skills relevance to meet the demands of industry. The implication of this thesis presents opportunities in the wider context for knowledge-based societies and economies. The objective is to map the UIC landscape in Finland based on the most recent existing literature and update the research incorporating development trends in social media, artificial intelligence (AI), decentralization, all assessed within the context of service design methodology.

2.0. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The Global Innovation Index (GII) is an annual ranking of countries according to capabilities for and successes in innovation (Aubert et al., 2010). In 2023 Finland ranked 6th among the 132 economies featured in the Global Innovation Index (Index, 2023). For University-Industry Research and Development (R&D) Collaboration Finland ranked 14th.

In Finland, 13 public universities and 22 universities of applied sciences (UAS) steered by Finland's MEC offer Finnish and international students a diverse range of high-quality educational opportunities and enjoy a strong reputation internationally. The latest Universitas 21 report on national higher education systems ranked Finland eighth in the world, on a par with Australia and the Netherlands (OECD, 2023).

2.1. Ideological Foundation of *Sivistys*

A point of interest to note is that in defining the mission, both Acts use a specific term which is the word *sivistys*. In Finnish, Yliopistolaki 558/2009, Section 2 states: "Yliopistojen tehtävänä on edistää vapaata tutkimusta sekä tieteellistä ja taiteellista *sivistystä*, antaa tutkimukseen perustuvaa ylintä opetusta sekä kasvattaa opiskelijoita palvelemaan isänmaata ja ihmiskuntaa" (MEC, 2009).

The same sentence in English from the Universities Act 558/2009, Section 2 states: "The mission of the universities is to promote independent academic research as well as academic and artistic *education*, to provide research-based higher education and to educate students to serve their country and humanity at large" (MEC, 2009).

In the Finnish version, Ammattikorkeakoululaki 14.11.2014/932, Section 4 states: "Ammattikorkeakoulun tehtävänä on antaa työelämän ja sen kehittämisen vaatimuksiin sekä tutkimukseen, taiteellisiin ja *sivistyksellisiin* lähtökohtiin perustuvaa korkeakouluopetusta ammatillisiin asiantuntijatehtäviin ja tukea opiskelijan ammatillista kasvua" (MEC, 2014).

The same sentence in English from the Universities of Applied Sciences Act 932/2014, Section 4 states

> The mission of the university of applied sciences is to provide higher education for professional expert tasks based on the demands of working life and its development, as well as research, artistic and *cultural* starting points, and to support the student's professional growth (MEC, 2014).

The Finnish word *sivistys* encapsulates in the philosophy and concept for education notions of civilization, culture, cultivation and refinement that go beyond academic training or intellectualism. In 1820 Reinhold von Becker (1788-1858) invented the word "sivistys" in the Finnish language that means "civilization" (Hurme, 2019). Both "civilization" and "sivistys" define a holistic embodiment of moral, ethical and character awareness that means a sense of social responsibility in a complete person (Niemelä, 2011). Rapola (1991) says *sivistys* when described as "civilization" is more multidimensional. *Sivistys* becomes visible not only as an increase in the level of knowledge and art, but also as an aesthetic and material level, as well as a refinement of emotional life and social attitude, behavior (Rapola, 1991). It may be internal, fundamental to worldview and conviction, but it can be understood only externally, the regularization or refinement of forms and habits (Rapola, 1991). In the importance of hope-oriented social speech, *sivistys* is invoked to point the way towards a future worth striving for and sustaining hope (Oja, 2022).

In Finland, the term *sivistys* is used to describe the mission of the university (MEC 2009 & 2014). The ubiquity of *sivistys* in higher education illustrates how the civilizing mission of the modern Finnish university together with the prevailing market-oriented view of scholarly impact constructs an important ideological foundation for ways of understanding and conceptualizing what is considered truth and the appropriate applications of that knowledge in Finnish society (Smarika & Clarke, 2024).

Incidentally, the MEC has chosen "Sivistys" as the theme for 2024 (Sivistyksen, 2024). The theme year of education 2024 is inspired by the 150th anniversary of Finland's oldest educational work and The Lifelong Learning Foundation, the KVS Foundation, Kvs-säätiö (Kansanvalistusseura sr.).

2.2. Lifelong Learning

On a lifelong learning basis, universities affect social change through the inculcation of legitimate information, values, attitudes and lifestyles. Therefore, universities are often described as the "engines of growth" in how these institutions drive nation-building, national pride and shape cultural identity (Laursen & Salter, 2004).

As a mandate, the Universities Act 558/2009, Section 2 states, "In carrying out their mission, the universities shall promote lifelong learning, interact with the surrounding society and promote the social impact of university research findings and artistic activities" (MEC, 2009).

In 2016 the universities in Finland contributed an estimated EUR 14.2 billion Gross Value Added (GVA) and 136,000 jobs in Finland (Economics, 2017). This equates to more than six percent of Finnish economic output and more than five percent of Finnish employment (Economics, 2017). Core University activities of employing staff, purchasing supplies and investing in capital and infrastructure is worth EUR 4.0 billion GVA and 60,000 jobs in Finland (Economics, 2017).

Overall, given the almost EUR 20 billion added value of universities in the economy of Finland, the distinctive features of Finland's innovation environment, especially the strong ties between academic institutions and businesses that extend for the lifelong of learning, imply that the benefits of knowledge sharing initiatives exceed additive effects. This estimation emphasizes the significant impact of the university ecosystems.

2.3. Services, Service and Service Design

Nankervis et al. (2005, p. 6) attributed the definition of *services* to the American Marketing Association as "activities, benefits or satisfactions which are offered for sale, or are provided in connection with the sale of goods" (Cook, Goh & Chung, 1999 p. 319; Nankervis et al., 2005). Regan (1963, p. 57) distinguished the categories of services "as either intangibles yielding satisfactions directly (insurance), tangibles yielding satisfactions directly (transportation, housing), or intangibles yielding satisfactions jointly when purchased either with tangible commodities or other services (credit, delivery)." Regan (1963) also predicted that a desirable proliferation of services will emerge in the future that will cater to a wide variety of preferences in the same way that mass manufacturing in the industrial revolution led to diversified commodification of choice. Furthermore, services are intangible, perishable, heterogeneous and ubiquitous so a full comprehension of every available service is difficult to define (Regan, 1963).

Sangiorgi and Junginger (2015) make a distinction between plural 'services,' and 'service' as a singular concept because service is approached from a customer perspective (Edvardsson, 1998; Sangiorgi & Junginger, 2015). Service is described as a way of thinking and of doing business (Grönroos, 1990). In order to result in a 'planned' or 'designed' service, non-physical components such as processes, people skills, and materials must be properly integrated (Goldstein et al., 2002). Service concept is often used analogous to service design as the core element for new service development (NSD) (Johnson et al., 2000). In re-thinking the orientation from a goods-centered dominant logic, a service-centered dominant (S-D) logic is focused on the cocreation of value and relationships where intangible operant resources are perceived as primary producers of effects (Vargo & Lusch, 2004; Vargo, Maglio & Akaka, 2008).

Service Design as a discipline was brought to awareness by G. Lynn Shostack in 1977. Shostack broke away from technical product development and emphasized the need for the designing of services as deliverables that incur high impact yet take on no material form (Shostack, 1984). Bringing together the finest sensibilities of art, methodical scientific inquiry and the functional proliferation of digital technology in a modern framework, service design can be applied to a multitude of disciplines that produce impactful yet intangible results (Wetter Edman, 2011).

Shostack (1988) introduced the Service Blueprint as the main report of organization and communication. The main subprocesses that are crucial to the success of the service include: Beginning with Identifying the Processes that detail the service, taking the time to contemplate and observe, identify and define the service process is the first step to getting a visual representation of the service matrix (Shostack, 1988). The Service Blueprint diagrams every simple, clear-cut, difficult or complex myriad of decision points, courses of action and their alternatives, and the many variable methodologies that deliver the service. Identifying the Processes, considering all the parts of the service that go unseen, is especially necessary in supporting service delivery, with particular attention given to the backend operations of the service, and these unseen processes are important because changes can alter consumer perception of the service (Reason, Løvlie & Flu, 2015). Technology has increased efficiency and accessibility of service delivery, enabling businesses to deliver personalized service at scale (Smith & Johnson, 2020). The proliferation of mobile apps facilitating seamless transactions and AI-powered data analytics also mean businesses can connect with customers worldwide regardless of geographic location (Garcia & Calantone, 2002).

Another important aspect of the service blueprint is isolating Fail Points to show where possible lapses and “pain points” exist for the end user (Shostack, 1988). Fail points represent opportunities for improvement and is where the service designer can enact the most impact. Identifying fail points and designing fail-safe processes are critical as service failures can be greatly reduced and consequences mitigated by anticipating fail points at the design stage (Shostack, 1988). Shostack (1988) recommends designers and managers think through potential problems in process, implementation and execution. Shostack uses these narratives to explore how limitations can stimulate innovation by forcing thinkers and creators to find new paths around obstacles so the quality of service is invariably better (Shostack, 1994; Lynn Shostack, 1988).

Also in the recommendations of the service blueprint according to Shostack (1988) is measuring and establishing a time frame, the total amount of time expected to complete all the required steps to perform or deliver the service as stated in the service blueprint. Shostack (1988) explains how the complexity of service delivery determines

how much latitude is required in the time frame. Shostack (1988) instructs that after mapping the service profile, identifying processes and vulnerabilities, and building in fail-safe measures, all anticipated activities related to executing and delivering the service are then considered.

When delivering the service Shostack (1984) explains that implementation constantly evolves so the service designer continually looks for alternate means of execution, weighing productivity, cost analysis and profit margins against the end user's perception of quality. While costs and profits are tangible, perception is not, so the service blueprint raises analysis of cost-benefit trade-offs, what can be managed and controlled, duplicated and tested, the appeal of different designs and prototypes to prospective and existing end users (Shostack, 1984). Shostack (1988) argues that because service and experiences focus on intangible outcomes, designing a service should include a tangible product to maintain credibility in providing circumstantial evidence to verify the effectiveness of the service – The material representations and appearances of the service such as color schemes, graphics and stationery all must match the style the service is communicating and reinforce the experience.

Analyzing profitability is often where a tangible measure of the service is recorded. Profitability also takes into account the time frame or time-of-service-execution standard where productivity and profitability occur (Shostack, 1984). Shostack (1984) adds that defining performance and uniformity standards ensure the service is delivering the intended effective outcomes within the parameters and benefits of all stakeholders.

Finally, Shostack (1988) maintains that people are at the heart of the service experience and making people special is the primary consideration of every interaction between service provider and end user. All hiring, training and performance standards must be infused with attentiveness to match the service identity (Shostack, 1988). The element of human-centered design involves risk as quality often varies and indifference or surly execution can devalue the service. All service organizations exist with the same goal, which is to benefit end users and stakeholders involved (Shostack, 1988).

Using service design to map University-Industry Collaboration presents a unique methodology to develop services and solutions that facilitate UIC in innovative ways. Developing a framework and service blueprint is the objective of this thesis that can be used as a resource for both universities and industries to ease the transition of graduates into income streams and gainful employment.

2.4. Conceptual interrelationship of knowledge and service economy

The idea of a knowledge society is examined in the historical 1858 writings of Karl Marx where collective knowledge is generated, shared, and made available to all members of society and used to improve human conditions (Phillips , 2017).

A knowledge-based organization is distinguished by engaging extensively in problem-solving and the production of innovative and unique ideas, approaches, solutions, and recommendations. Individual capability upholds a high level of independence and integrity. Creativity is vital both at individual and organizational levels to effectively communicate outcomes to target audiences (Gummesson, 2000).

Knowledge-based expertise requires advanced levels of skills and training to plan, develop, deliver and maintain technological infrastructure that are labor intensive and depend on intangible value-creation such as branding and user experience (Nayyar et al., 2021). Knowledge-based industries include accounting, legal, internet and communications technology (ICT), finance, architecture, audio-visual creation, marketing, data analysis, research and development (R&D), health and education, among others (Miles et al., 1995; Zieba, 2013). Knowledge-based expertise requires advanced levels of skills and training to plan, develop, deliver and maintain technological infrastructure that are labor intensive and depend on intangible value-creation such as branding and user experience (Nayyar, 2021). These activities require developing processes and systems in place to provide structure to manage front-office operations, back-end systems, professional training and education, creative outlets and channels that constitute the entire network and ecosystems for these industries to operate.

Higher education, particularly universities, is at the heart of many policy developments pertaining to the concept of the knowledge economy (Peters & Humes, 2003). The various inter-relations among knowledge, innovation and services are central factors contributing to economic growth and prosperity (Andersen, 2000).

2.5. Mode 1, Mode 2 and Mode 3 Knowledge Production

Scientific, social and cultural knowledge production have been classified in specific ways described by Limoges et al. (1994). Mode 1 knowledge production refers to the generation of knowledge driven solely by scientific inquiry or basic research, without a primary focus on the practical application of its outcomes (Limoges et al., 1994). It operates on the premise of science being compartmentalized into distinct disciplines, where researchers within a specific field are primarily concerned with advancing

knowledge within that discipline, rather than integrating findings across other disciplines (Limoges et al., 1994).

Mode 2 knowledge production is characterized by five principles: (1) knowledge produced in the context of application; (2) transdisciplinarity; (3) heterogeneity and organizational diversity; (4) enhanced social accountability; (5) and quality control (Gibbons, 1997, p. 3). Mode 2 refers to a collaborative and interdisciplinary approach to generating knowledge that transcends traditional disciplinary boundaries (Baber, 1995).

Unlike Mode 1, which is driven by basic research and operates within distinct disciplines, Mode 2 emphasizes practical problem-solving and the integration of diverse perspectives from academia, industry, and society (Limoges et al., 1994). This mode of knowledge production prioritizes real-world applicability, encourages stakeholder involvement, and fosters dynamic interactions between researchers and end-users, leading to more responsive and contextually relevant outcomes (Limoges et al., 1994).

Carayannis and Campbell (2009) introduce the concept of Mode 3 knowledge, which underscores the simultaneous existence and mutual development of various knowledge and innovation approaches. This mode highlights interdisciplinary and transdisciplinary knowledge exchange through various mechanisms. At the micro level, it involves fostering creative environments and supporting entrepreneurs and employees (Gibbons et al., 1994). At the meso level, it encompasses the formation of knowledge clusters, innovation networks, entrepreneurial universities, and academic-industry partnerships (Lundvall et al, 2002). At the macro level, it includes frameworks like the quadruple and quintuple innovation helix, as well as the concepts of “democracy of knowledge" and “democratic capitalism” emphasizing the integration of knowledge within democratic systems and capitalist economies (Carayannis & Campbell 2009).

2.6. Triple Helix Model of Innovation

Henry Etzkowitz and Loet Leydesdorff (1998) introduced the concept of the triple helix in 1995, highlighting the importance of tripartite collaborations and hybrid entities involving universities, industries, and governments.

The Triple Helix Model of Innovation explains the interactions among universities, industries, and governments as crucial roles, each with its initial function: universities focus on basic research, industries on commercial production, and governments on market regulation, and the interdependency of these three organizations is the secret behind innovation ecosystems such venture capital firms, incubators, accelerators, and science parks (Etzkowitz & Leydesdorff, 1998; Etzkowitz & Zhou, 2017). The Triple Helix

model also emphasizes bilateral two-way interactions with legal, economic, administrative, political and cognitive implications in the relationships among the independent yet shared interests between University and Industry, Industry-Government interactions, and Government-University interactions (Cooke, 2005; Zhang & Vonortas, 2012; Ranga & Etzkowitz, 2013). As interactions increase within this framework, each entity begins to incorporate traits from the others, leading to the emergence of hybrid institutions that can lead to change, or even improvement of existing systems on a global level (Etzkowitz & Leydesdorff, 1998; Perkmann & Walsh, 2007; Lee, 2013).

Overall, the Triple Helix Model strongly emphasizes research and technology in collaborations that aim to establish the essential framework for fostering innovation and driving economic development. The Triple Helix Framework offers a structural perspective on the historical progression from Mode 1 to Mode 2 knowledge production.

The Triple Helix Framework highlights the pivotal role of knowledge-producing institutions within the web of interactions among three main entities: Universities (representing Science), Industry (representing Business), and Government (representing Governance), where the purpose and operational boundaries among these entities are increasingly blurred (Etzkowitz & Leydesdorff, 1998). Furthermore, this model assumes that the primary engine of economic growth in the post-industrial era is moving away from traditional manufacturing and focusing more on the creation and spread of knowledge organized by society. This creation and spread of knowledge are seen in universities being venues not only for education and research but are also engaging more in business activities by providing facilities and resources to prototype and launch innovative startups (OECD, 2009; Cuntz & Peuckert, 2023). Economically progressive objectives in skills training prepare students for employment in the industry after graduation (Reichert, 2019). Similarly, industrial firms are utilizing academic infrastructure for research and development (R&D), and this allows companies to transfer some costs to the government, the primary financier of public universities (Bakker, 2013; Berbegal-Mirabent, Garcia & Ribeiro-Soriano, 2015).

Governments foster the growth of innovative small businesses by selectively funding certain universities and through policy measures, encouraging the industrial sector to adopt and advance new technologies (Farinha & Ferreira, 2013). A national government is the key dimension to stability of interactions between the networks of Academia and Industry. As the system's main roles in economic and social spheres, the government sets the foundation of ensuring cooperation, partnerships and institutional support (Farinha & Ferreira, 2013; Reichert, 2019).

The new Triple Helix Triangulation model leverages dynamics present in the triple helix and focuses on local innovation and entrepreneurship as catalyzers of a region's global competitiveness based upon a networked management rooted in the three pillars of sustainability: environmental, economic and social (Etzkowitz & Leydesdorff, 1998). The triangulation model suggests that universities and industrial sectors create innovation ecosystems and infrastructures that are traditionally a role of the state and are now assumed by intermediaries (Ketikidis, 2014). In this context, the thesis research seeks to create a conceptual model that triangulates the triple helix, emphasizing the critical role of innovation and entrepreneurship within the interactive dynamics of the triple helix as key elements for enhancing competitiveness and advancing service development.

2.7. Quadruple and Quintuple Innovation Helix Framework

The global landscape is witnessing a dramatic shift both in the institutional context of knowledge production and in the kind of knowledge that is being produced (Baber, 1995). The Quadruple and Quintuple Innovation Helix framework was developed by Carayannis and Campbell in 2010, extending the traditional Triple Helix model of university-industry-government collaboration to include additional stakeholders and dimensions. According to Carayannis and Campbell (2010), the Quadruple Helix adds a fourth element, often represented by civil society or the broader public, alongside universities, industries, and governments. They surmise that the Quadruple Helix acknowledges the importance of societal engagement and participatory innovation in the innovation ecosystem. Carayannis and Campbell (2010) add the Quintuple Helix further expanding the model by incorporating a fifth helix, typically represented by the natural environment or sustainability considerations. This addition underscores the growing recognition of the need for environmentally sustainable innovation practices and the integration of ecological concerns into the innovation process (Carayannis & Campbell, 2010). In summary, the Quadruple Helix emphasizes the perspective of the knowledge society and of knowledge democracy. The Quintuple Helix highlights socio-ecological perspectives of the natural environments of society (Carayannis & Campbell, 2010).

In Finland, research institutions hold good reputations for responsibility in research and innovations among companies (Păunescu, Lepik & Spencer, 2022). One example is how the Tampere region's social innovation process in the energy sector demonstrates various stakeholder interpretations of the concepts "innovation" and "responsible" within the framework of the quadruple helix (Mehari et al., 2022).

2.8. Knowledge Transfer

Nielsen and Cappelen (2014) argue that knowledge creation is nothing without knowledge transfer, which is defined as the mechanisms and processes through which academic research and expertise are made available to industry for practical application. In UIC knowledge transfer includes patents, licensing, publications, and the mobility of skilled personnel. Knowledge transfer goes beyond exchanging physical documents and reports and encompasses all interactions and performances that contribute to attainment of knowledge (Nielsen & Cappelen, 2014).

Nielsen's and Cappelen's (2014) research conclusion is that ongoing knowledge sharing during the project is more highly valued by participants than a final report. Continuous knowledge sharing involves regular meetings among stakeholders where time and space are given to examine existing knowledge (Nielsen & Cappelen, 2014). Nielsen and Cappelen (2014) add that new knowledge is the implied outcome of knowledge sharing that is not a zero-sum game because all participants contribute and benefit from the outcome. Nielsen and Cappelen (2014) further note that where different levels of expertise are involved, it is important that participants view one another as equal partners with trust and mutual interest for common goals and objectives. Furthermore, outlining roles and competencies, tasks and responsibilities, intentions and expectations are important in establishing respect and boundaries for transparency and common benefit (Nielsen and Cappelen, 2014). Nielsen and Cappelen (2014) also note that obligations and commitments can be reassessed as necessary and frequent feedback and evaluation takes place with adjustments made as needed.

Nielsen and Cappelen (2014) add that regular feedback and predefined milestones, status update reports and constant clarification and addressing of ongoing issues and obstacles go a long way to more satisfying end results and positive experience with the overall process. They highlight confidentiality and integrity as paramount importance for organizations to decide which knowledge is to be shared openly and how participants can engage with the information and utilize it for their own purposes (Nielsen and Cappelen (2024). Curiosity and experimentation are encouraged to bring ideas and concepts to the forefront to be discussed and explored (Nielsen and Cappelen, 2014). In summary, Nielsen and Cappelen (2014) argue that protecting the competitive advantages of all knowledge and discoveries as valuable assets and intellectual property must be upheld by all parties.

Based on the article, from the university perspective, providing incentives encourage interaction and collaboration with companies to include student input on on-going research (Bjursell & Engström, 2019). Neither Nielsen and Cappelen nor Bjursell and

Engström offer examples of such incentives, only to say that at present such agreements are often missing. Also, the rigidness of student project periods and deadlines could be loosened up because industry runs on a different schedule and often needs a lot of time to process and develop (Nielsen & Cappelen, 2014). This article also says from the industry perspective, knowledge transfer is reflected in revenues, profits, equity, and market performance that are the direct result of innovation and patents whether developed within the enterprise or in partnerships with external stakeholders (Nielsen & Cappelen, 2014). The dissemination and exchange of practical expertise, technical know-how, and consumer insights are specific and often exclusive to industry entities and shared sparingly and confidentially with other stakeholders, including academic institutions (Nielsen & Cappelen, 2014).

University-Industry Collaborations facilitate this transfer by creating structured mechanisms for engagement such as research projects, joint ventures, internships, and technology licensing agreements. Industry partners gain access to cutting-edge data, specialized skills, and emerging technologies developed within academic institutions (Bentur et al., 2019). In return, academia benefits from industry insights, real-world challenges, and opportunities for applied research, enhancing the relevance and impact of academic research (Steiner & Posch, 2006; Bikard, Vakili & Teodoridis, 2019). This reciprocal flow of knowledge fosters innovation, drives economic growth, and strengthens the competitiveness of both academic and industrial sectors (D'Este & Patel, 2007; Rothaermel , 2007).

2.9. Open Innovation

Introduced by Henry Chesbrough (2003), Open Innovation suggests companies should advance their technology by using external ideas, internal ideas along with internal and external paths to market. Chesbrough (2003) emphasizes practice-oriented teaching methods such as entrepreneurial pedagogy to drive engagement levels of students and bring real life situations to the classroom. Using networked open innovation to identify business opportunities, joint development of product and service offerings with partnerships and anticipation of key future trends and developments can assist companies with important strategic insights that cannot otherwise be gained alone (Valkokari, 2023). Modalities such as ideathons and hackathons that feature co-creation activities in addressing given challenges. Promoting creative and collective organizing processes and activities that materialize in some form of a venture is a normative practice linking theory and practice of open innovation (Castanedo-García, 2023).

Close engagement between university and industry can involve entrepreneurship education and entrepreneurial activities with the open innovation model encouraging learning by doing (Perkmann & Walsh, 2007). The open innovation model sees the creation of small companies and ecosystems to give the learner a glimpse into industry activities and allows the learner to personally engage with the industry on a level that large companies do not (Hannon et al., 2019; Rho, Lee & Makkonen, 2020).

2.10. Absorptive Capacity

Absorptive Capacity describes a company's ability to process and assimilate new external information for commercial benefit (Cohen & Levinthal, 1990; Bayrak, 2021). Being able to apply new information toward commercialization underscores the importance of a company's internal capabilities to effectively benefit from collaborations with universities (Cohen, 1990). Value creation, appropriation and extraction activities in UIC must be balanced for partnerships to mutually succeed (Hamel, 1991). Research capturing is often an activity by the university and value creation is a collaborative effort (Ritala, 2009). Value appropriation such as pricing and negotiation strategies where individual participants in a collaboration project reap the benefits from a successful innovation deployment is one of the crucial factors in UIC (Lavie, 2007; Lascaux, 2019).

According to Lascaux (2019), 'an absorptive capacity gap' (p. 5) in UIC exists when the ability to obtain, integrate and apply the knowledge derived from the collaboration is unbalanced among participants. Lascaux (2019) shows that increases in the absorptive capacity gap between organizations in any collaborative alliance translates into growing discrepancies of collective benefits in learning outcomes. Lascaux (2019) also notes that the organization with a greater absorptive capacity can appropriate more value and derive more benefits while the participant with a low level of relative absorptive capacity in the collaboration has been observed to result in a contentious relationship thus affecting the perceived incentives to collaborate, and this differential greatly affects the usefulness and effectiveness of UIC (Lascaux, 2019).

Apa et al. (2021) adds that finding good matches in partnerships engenders mutual trust and influences innovation performance by creating positive levels of satisfaction in the partnership, with an increased probability of continued ongoing collaborative interactions. Factors such as the existence of prior relationships, especially positive ties; social capital defined as access to broader sources of knowledge and networks, high relevance, reputation; cultural compatibility in similarity of values, norms, beliefs and expectations, all reduce the potential for dysfunctional conflicts and misunderstandings

and improve knowledge sharing and integration decreasing the absorptive capacity gap and increasing success of each collaboration (Lascaux, 2019).

2.11. Academic Entrepreneurship

Academic Entrepreneurship refers to the process by which inventions or innovations developed within the university setting are transformed into marketable products or services such as the creation of spin-offs and startups by academics (Laine, 2008; Carayannis, 2020). The key distinction between academic entrepreneurship and other entrepreneurial activities is the research and products involved also aid in the progression of the academic field (Laine, 2008; Erdős & Varga, 2012).

In addition to traditional research and teaching responsibilities, academic entrepreneurship is part of the Third Mission of universities (Karlsdottir, 2022; Fuchs, Bombaerts & Reymen, 2023), and can be understood as a knowledge-based income-oriented profession that is centered around technology and innovation and the benefits derived from the latest research (Balazs, 1996; Karlsdottir, 2022).

In Finland universities are increasingly expected to perform a third mission as regional engines of innovation and economic growth, in addition to research and teaching (Laukkanen, 2003). Laukkanen's (2003) research shows that the active promotion of AE-activities by university seems a complex issue and discusses some notions and aspects of an entrepreneurial university. Entrepreneurial universities emphasize economic development as a university's academic function along with teaching and research (Etzkowitz, 1998). In Finland the biggest obstacles to academic entrepreneurship are a combination of Finnish risk avoidance, low entrepreneurial self-assurance, a lack of residual incentives and high taxation (Saarela, 2016). In the United States, academic entrepreneurs are primarily employed by the universities and the universities retain the titles of inventions, including the patenting and licensing of innovations (AUTM, 2002; Erdős & Varga, 2012). This has benefited universities and placed greater impact and importance on scientific research (Åstebro et al., 2019).

2.11.1. Entrepreneurial University

The concept of the entrepreneurial university is based on the Triple-Helix model where academia, industry and government collaborate (Etzkowitz, 2003). Etzkowitz et al. (2008) link the outcomes of an entrepreneurial university with the missions of teaching, research, and entrepreneurial activities. Among the fundamental components of a

national innovation system where a wide range of interactions may occur, entrepreneurial universities are engaged in partnerships, networks, and other connections with public and private entities that serve as an umbrella for interaction, collaboration, and cooperation (Inzelt, 2004). This means that the entrepreneurial university must implement several strategies of new institutional configurations to collaborate with government and industries and leverage and exploit knowledge and technology (Leydesdorff and Meyer 2003). Entrepreneurial universities actively cultivate UIC by facilitating knowledge exchange and driving economic development through joint ventures, research collaborations, and business incubators supporting student ventures (Clark, 1998; Hasche & Linton, 2021).

In Finland, Aalto University is the prime example of an entrepreneurial university. Aalto University was established in 2010 from the merger of the Helsinki School of Economics, the University of Art and Design Helsinki, and Helsinki University of Technology. The founding idea was to create a university that fosters innovation and entrepreneurship (Aalto University, 2020). Aalto University focuses on innovation and entrepreneurship in the Aalto Ventures Program offering tools, mentoring, and support for those who want to start businesses (Aalto Ventures Program, 2023). Aalto University also operates the Aalto Design Factory & Aalto Startup Center which houses facilities that promote product development and business incubation (Kuukka, 2022). In addition, Aalto University has strong Industry Links: The university collaborates closely with industry leaders, often allowing students to work on real-life projects with companies (Aalto University, 2018). This is shown in companies being invited to partner or as a mentor for students as thesis advisor to work closely with the university on research, gain visibility on projects and negotiate for intellectual property rights (Aalto University, 2024).

2.12. Boundary Spanning

Boundary Spanning involves individuals or units within organizations that facilitate innovation and knowledge transfer by operating at the interface of the university and industry (Tushman, 1977). Communication is fundamental to reduce uncertainty and achieve understanding when transferring technology among government, industry, and academic environments (Dearing et al., 1994; Booz & Lewis, 1997). Boundary spanning has been observed in sectors such as research-practice partnerships (RPPs) in education and where universities serve as anchor institutions to bridge, support and nurture research communities (Goodrich et al., 2020). Boundary Spanning is a field of knowledge management involving the collection and codification of tacit knowledge that is then shared as explicit knowledge (Chan, 2022; Mell et al., 2022). Tacit knowledge is personal

context-specific insights, intuitions, hunches acquired through experience and difficult to formalize and communicate (Polanyi, 1966). Polanyi (1966) explains this kind of knowledge is deeply embedded in individual experience of intangible factors including personal beliefs, perspectives, and value systems. Where tacit knowledge is continuous and embodies an analog quality, explicit knowledge is captured in libraries, databases, archives for easy communication to the outside world accessed on a sequential basis and embodying a digital quality (Nonaka, 1994).

Service design serves as a boundary spanner where both tacit and explicit knowledge play crucial roles; tacit knowledge can drive intuitive decisions in service development helping designers create solutions tailored to specific cultural or contextual nuances that are not readily apparent, and explicit knowledge provides a shared, accessible base of information that team members and stakeholders can utilize for more structured planning and implementation (Stickdorn & Schneider, 2010; Needham, Mastracci & Mangan, 2017). This promotes absorptive capacity of the organization and prevents knowledge silos in closed specialties (Ze et al., 2018).

2.13. Innovation Ecosystems

Innovation Ecosystems is a critical component of UIC in Finland as the country envisions transforming regions and cities into innovation ecosystems and creative hubs that foster top-level research, a skilled labor force, cooperation among companies and global networking (Oksanen & Hautamäki, 2014; Lappalainen, Markkula & Kune, 2015). Orchestrating regional innovation ecosystems require top-level universities and research institutions, accessible financing for new ventures and research plans, large established companies working symbiotically with new startups, specialized service companies meeting the needs of local communities and a market for new innovative products and services (Oksanen & Hautamäki, 2014; Lappalainen, Markkula & Kune, 2015).

Importantly, successful ecosystems have a “community of fate,” where the success of the main influencers of the region is dependent on the success of the whole region (Hautamäki, 2010; Oksanen & Hautamäki, 2014; Markit, 2019). Oksanen and Hautamäki (2014) add that innovation ecosystems are made alive and renewable by risk-taking entrepreneurial culture and continuous movement of idea and people; embracing a risk-taking entrepreneurial spirit is not only crucial but also a driver of innovation, growth, and overall economic development (Oksanen & Hautamäki, 2014).

The most famous example of a regional city innovation ecosystem is Silicon Valley in California, USA, with its highly entrepreneurial, radical-thinking and risk-taking culture

network of supporting services and intermediaries such as policy makers, enterprise incubators, consumers and interest groups to facilitate the transfer and commercialization of technology and talent (Osano, 2017).

In Finland, Nokia's dominance in Finland's innovative capacity was responsible for 40 percent of total R&D spending in Finland in 2002 (Sabel & Saxenian, 2008; Oksanen & Hautamäki, 2014). The primary hubs of Nokia's innovation ecosystem were located across Finland where Helsinki housed the Nokia Research Headquarters, Espoo was the site of Nokia's main headquarters and its network products division, while Turku and Tampere hosted Nokia Research Center units (Oksanen & Hautamäki, 2014). In the north of Finland, Oulu was noted for its focus on Nokia Network products (Oksanen & Hautamäki, 2014). Additionally, towards the end of the 1990s, a new Nokia Research Center was established in Jyväskylä, significantly boosting the region's innovative capacity. This shift highlights a broader trend where a region's success increasingly depends not on natural geographical features like forests, but on knowledge and the capacity for innovation and renewal (Oksanen & Hautamäki, 2014).

2.14. Intellectual Property Rights

According to Ranga et al. (2016), Intellectual Property Rights (IPR) issues are central to UIC, as they govern the ownership, use, and commercialization of innovations and research outcomes. Effective management of IPR is crucial for fostering collaboration while protecting the interests of both universities and industry partners (Ranga et al., 2016). In discussing IPR, Kulkov et al. (2020) found that ownership of intellectual property rights (IPRs) promotes regional entrepreneurship by facilitating the transfer of research findings and researchers to industry, which in turn enhances the creation of university spin-offs (USOs) and bolsters collaboration between universities and businesses (Kulkov et al., 2020).

Legal issues, specifically those related to proprietary intellectual or *omaisuudelliset immateriaalioikeudet*.which is the ownership of the immaterial, indicating legal entitlements associated with something owned or controlled as property in the context of intellectual or immaterial assets such as ideas, "creations of the mind" that produce "inventions, literary and artistic works, designs, symbols, names, and images used in commerce" (WIPO, n.d.).

In 2023, Finnish companies filed 2,336 European Patent applications with the European Patent Office (EPO) representing an increase of 9.2 percent (Patentti- ja rekisterihallituksen, 2024).

institutional policies and contractual mechanisms are the main factors in IPR management, along with flexible or inflexible university policies governing financing, patents, and licenses and contractual mechanisms (Siegel et al., 2004). Negotiation and strategic management with multiple stakeholders regarding treatment of confidential proprietary information, trade secrets, non-disclosure agreements and non-compete clauses, all heavily impact UIC (Ankrah & Omar, 2015; Bruneel, D'Este & Salter, 2010).

According to Ranga et al. (2016) Jyväskylä University (JYU) was established in 1863 and has a longstanding tradition as a research institution. JYU has significantly contributed to education and workforce development in Finland. The university's engagement with university-business collaboration (UBC) began in 2005, primarily through three entities: the Jyväskylä University School of Business and Economics (JSBE), the Research and Innovation Office, which was founded in 2003 to manage technology transfer, intellectual property rights, business consulting, and startup funding; and the Agora Centre, established in 2002 to focus on research and entrepreneurship that benefit both society and businesses (Ranga et al., 2016).

2.15. Collaborative Networks and Clusters

Collaborative Networks and Clusters focus on the geographical and strategic aggregation of companies, universities, and other entities around fields or technologies (Forsman, 2009). Such clusters can enhance innovation through shared resources, facilities and knowledge, exemplifying the benefits of proximity in UIC (Franco, Esteves & Rodrigues, 2020). Franco et al. (2020) add that cluster strategy as a tool to improve innovation capabilities of small enterprises are suitable for innovation generation during the front-end phase and mostly focused on connecting local companies in various events and local development programs with local partners. In this way Franco et al. (2020) add that collaborative networks are usually built around a shared intent with a specific theme or industry domain and attract talent, venture capital and researchers. These can be micro enterprises with new-to-market products or initial phases of innovation (Roper & Hewitt-Dundas, 2017).

Practical governmental policies, education programs and financial support for social initiatives are drivers of collaborative networks and clusters and engagement of stakeholders (Reypens, Lievens & Blazevic, 2016). Development of regional clusters can also be considered as a knowledge management (KM) task and forms the basis for organization before boundary spanning (Laine, 2008).

2.16. Knowledge Management Model

Technology transfer is a subset of knowledge management (KM), the key priorities of the KM model are (Laine, 2008):

- Identifying knowledge and technology needs;
- Producing knowledge and technology through networking;
- Identifying created knowledge;
- Reflecting for learning;
- Sharing best practices;
- Increasing the ability of partners to adopt new knowledge;
- Adapting knowledge to target and context; and
- Producing new knowledge for society

The role of directors, managers, educators, those who set strategic goals based on a clear understanding of customer needs, who are empowered to make important decisions based on their internal and external knowledge stand at the intersection of where vertical and lateral information flows (Laine, 2008). These representatives are pivotal in linking collaborative networks and clusters to a common mission of knowledge sharing and are an important basis for UIC (Rasmussen & Gulbrandsen, 2012).

Overall, these concepts provide the theoretical knowledge framework for understanding the dynamics, challenges, and benefits of university-industry collaboration used interchangeably with the term university-business collaboration in this thesis research. The concepts highlight the importance of strategic alignment, mutual benefit, and effective management of relationships and intellectual property to the success of university-industry collaborations. In addition, these main frameworks address the shift towards understanding innovation as a systemic phenomenon involving multiple facets; where the importance of clusters, scope of activities, and the roles universities, industry, government, public and environment play successfully drive national economies (Schofield, 2013; Burnside & Witkin, 2008; Ćudić, Alešnik & Hazemali, 2022).

3.0. RESEARCH DESIGN

This study is based on integrative methods using qualitative and quantitative research implemented as research through a design project and combines various research data, both quantitative and qualitative, with additional methodologies such as a workshop and a case study. The qualitative and quantitative research complements the systematic approach to the literature review. A design project case study included in this thesis was conducted in the Strategic Service Design course at University of Lapland as part of the requirements of the Service Design Strategies and Innovations (SDSI) master's degree program. The case study involves a service design project that ran from October to December 2023. The project in the case study was done as a group of three SDSI students who developed a service solution for the New Business Project of Business Tornio. The aim of the project was to design a service operational model that would facilitate product development and collaboration among four different organizations.

3.1. Research Philosophy – Pragmatism

Since the data is based on the results of a conducted design project, the research design philosophy of this thesis is based on pragmatism. The philosophy of Pragmatism is thinking about the practical consequences of accepting a belief, centered on the pragmatic philosophy which holds that theories should be connected to real-world situations or practices (Rylander, 2012; Booth et al., 2021). Design thinking requires well-developed, coherent, logical expressions of issues that are central to Pragmatism, with practical ramifications of research findings that provide value to this theoretically important research perspective (Saunders & Tosey, 2013; Dalsgaard, 2014). Dalsgaard (2014) explains that Pragmatism may guide and advise real design projects and aid in understanding and orchestrating design processes on a practical level while also informing and inspiring the growth of the discourse on design on a theoretical level.

Pragmatism lays a foundation for theorizing about change by linking cognitive belief structures of human actors to their actions through a continuous learning process. (Wetter-Edman, Vink & Blomkvist, 2018; Heinonen & Strandvik, 2022). Heinonen and Strandvik (2022) show how incorporating fundamental pragmatist concepts into service management shifts focus toward the dynamics of the service market by examining customers' daily interactions through the lens of their experiences, knowledge and actions (Heinonen & Strandvik, 2022). Pragmatism can also help service providers explore new concepts by emphasizing the relationship between meaning and action, and address issues of agency and structure (Farjoun et al., 2015).

In designing the research needed to obtain relevant service design insights, the role of empathy as a human-centered and user-driven core value was emphasized. Empathy is an essential element of design thinking, service design and innovation (McDonagh & Thomas, 2010; Devecchi & Guerrini, 2017). An instinctive and emotional experience of empathy may be essential to cultivating creativity and innovation (Cross, 2023). As the project featured in the thesis' case study centered around the metals industry in a highly technical and industrial context, injecting the perspective of empathy humanized the experiential nature where all processes, functions and interactions take place. Persona Empathy Cards (Figures 2 and 6) are employed to illustrate the characteristics of the target research groups.

3.2. Research Methodology – Mixed Methods Research

Both qualitative and quantitative data collecting and analysis approaches are used in a mixed methods research design (Saunders & Tosey, 2013). Research methodological choices for this thesis include service design methodologies such as personas, observation, interviews, a workshop, and a mapping of the customer journey process to gain comprehensive insight into user experience, and identify interaction situations that take place during the service experience (Segelström, 2009; Stickdorn et al. 2018).

3.2.1. Quantitative Research Methods

Quantitative research in service design is useful in allowing the service designer to gather data pertaining to the research subject to determine the attitudes, beliefs, opinions, behaviors, expectations and features of the participants in the research group (Gürbüz, 2017).

To gather quantitative data, surveys were used in this research to map the characteristics of the human-centered interactions and relationships to the research topic. The self-completed web-based questionnaire is a low-cost way to gather data about the research sample (Stickdorn & Schneider, 2012). For the case study the project team conducted a survey with the purpose of gathering insights into the nature of Business Tornio's customer base and their product development processes. The survey was conducted live at the ROIHU2023 conference on 30 November 2023. Convincing people to respond to the survey proved rather difficult, being able to have participants fill out a survey during the event yielded far more responses than emailing the survey. 18 responses were received, mostly from education sector professionals.

One limitation of this survey was that it received few responses from business industry participants with the majority of respondents from the educational sector. This survey was also in English language and most, if not all, the respondents are Finnish.

A second survey was conducted individually by the author. This survey focused on industry professionals and was conducted live during the Mätsis recruitment fair on 30 January 2024. This survey received 22 responses with the majority of representatives (63 percent) from companies with 200 or more employees. This survey included both English and Finnish with respondents having the option to respond in either language.

3.2.2. Qualitative Research Methods

Qualitative research methods were conducted both by the group project and individually by the author. Knowledge production in service design has accelerated, with early research primarily focusing on relating service design to other design disciplines; the first researchers were originally trained in different fields then gradually transitioned into service design (Blomkvist, Holmlid & Segelström, 2010). Knowledge in and about service design can be deepened through case studies and ongoing reflections on the values inherited from other disciplines (Stickdorn & Schneider, 2012).

This thesis does its best to present a comprehensive literature review around the themes of service design applied to the study of university-industry collaboration in the Finnish higher education system. The theoretical frameworks provide the conceptual basis for the research and this thesis offers observations and analysis based on the gathered research.

For the case study, the student team conducted a total of six interviews with the contact partners for the project, three in online meetings and three in-person during a site visit. Interviewing is a very common qualitative method to provide holistic context of experiences, beliefs or identities related to the research topic (Alsaawi, 2014). The interview subjects were based on their leadership, knowledge and expertise of the research topic or provided as contacts in the project partnership. Four additional interviews were conducted by me via email to delve into the insights of university-industry collaborations in Finland (Appendix 1: Interview questions).

Service design methodologies were also used in the workshop featured in the case study. Workshops are helpful in qualitative research in the use of various activities to promote discussion about the influence of people's attitudes and perceptions regarding the research subject (Carrasco & Lucas, 2015; Stickdorn et al., 2018; Thoring, Mueller & Badke-Schaub, 2020).

3.3. Research Strategy – Case Study: SDSI and New Business Tornio "The Future of Product Development in Tornio"

As part of the requirements for the Strategic Service Design module in the Service Design Strategies and Innovations (SDSI) master's degree program, I was engaged in a class project that eventually developed into the research focus for this thesis. The other two SDSI students in the project team are Anastasiya Okhrushchak and Cilia Kafi and together we form the team ACEsolutions Finland.

While experimental design focuses on causation and explanation (if A, then B), case study research focuses on description, exploration, and understanding (Cousin, 2005). Case studies were one of the first types of qualitative research methodology based on the groundbreaking research approach of Sharan B. Merriam in the fields of education and psychology (Starman, 2013; Merriam, 1988). Tellis (1997) writes that case studies involve analyses from multi-perspectival where the researcher not only considers the perspective of stakeholders, but also of the relevant interactions among groups of actors and a potent feature in the characteristic of case studies is giving "a voice to the powerless and voiceless" (Tellis, 1997, p. 2).

Case study data collection and data analysis usually proceed at the same time, with intrinsic analysis attaching significance to first impressions and final compilations by the researcher who has an interest in the research subject (Stake, 1995; Cousin, 2005). The method of case study presented in this thesis is based on the explanatory model described by Yin (1998) which is applied to investigate complex causal links in a real-life intervention, review the real-life context where the intervention has occurred, explain the intervention itself, and then explore specific situations where the intervention being evaluated does not have a clear set of outcomes (Yin, 1998).

3.3.1. Workshop – ROIHU2023 Conference

This student team conducted a workshop used as a qualitative research strategy as part of the project featured in this case study. Workshops can offer a platform for discussing, defining and designing a common good to understand complex issues that involve many perspectives and dimensions (Kuure, 2018). Workshops serve as an effective service design tool for co-creating community-based participatory research, focusing on identifying solutions to problems and fostering collaborative and social actions that build trust among participants, the community, researchers, and stakeholders (Leavy, 2015; Rautiainen, Van Wyk & Miettinen, 2021). Workshops involve participatory exchange of

ideas and active discussion in co-creation that engages a wider group of stakeholders and maintains a sense of co-ownership beyond their direct involvement (Stickdorn et al., 2018). This workshop was a personal and professional milestone for the author as a first workshop conducted in Finland. The workshop was conducted in English and as facilitator, included the opportunity to present and speak basic Finnish language.

The team conducted a workshop for 20 participants on 30 November 2023 during the ROIHU2023 Conference organized by Business Tornio. The workshop received a total of 26 participants, mostly representing the educational institutions, small to medium enterprises and other industry stakeholders. Through various activities, the workshop facilitated an open group discussion for participants to voice their ideas and concerns and showcase new plans for the continued development of the region, particularly in the cities of Tornio (including the neighboring Haparanda municipality located in Sweden), Rovaniemi and Kemi.

3.4. Research Time Horizon – Cross-Sectional

Saunders and Tosey (2013, p. 59) note that research conducted to respond to a specific question or resolve an issue at a certain point in time takes the form of a 'cross-sectional' snapshot, typically employing methodologies like surveys or case studies (Saunders & Tosey, 2013). The project ran for approximately 10 weeks during which all the research and information were gathered, a solution designed and presented as part of the SDSI on-site week at ULapland.

3.5. Data Collection and Analysis

This thesis is based on a cross-sectional (Saunders & Tosey, 2013) study of data collected in Tornio and Rovaniemi over six months from October 2023 to April 2024. The final data set is composed of 40 survey responses, six online interviews conducted by the project team in the case study, and four email interviews conducted by me. The thesis was submitted on 5 May 2024.

For the case study the student project team designed a survey to gauge the views and perceptions of the respondents regarding the current practices in new product development. The Likert scale was used to ask respondents to specify their level of agreement or disagreement on a scale of 5 agree-disagree options for a series of statements. The Likert scale method was chosen because it allows for a quantitative approach to assessing qualitative data, providing a spectrum of attitudes and feelings

toward the issues in question (Boone & Boone, 2012). The respondents were given time to fill out the questionnaire in person during their participation in the ROIHU2023 workshop. The English survey was on Google Forms that respondents filled out on their mobile device. This survey yielded 18 responses out of 26 total workshop participants. Google analytics tallied and collated the responses.

Another in-person survey was conducted during the Mätsis recruitment fair in Rovaniemi on 30 January, 2024. The same Google Forms questionnaire was used and this time the questions were in Finnish and English. Respondents were personally approached by me and asked to fill out the questionnaire using my phone. A special note that I was at the event walking with crutches due to an ankle injury. The effort yielded 22 responses.

The case study interviews by the student project team ACEsolutions Finland was conducted over Google Meet and Microsoft Teams, and in-person during the site visit at the ROIHU2023 conference in Tornio.

Another semi-structured interview was conducted by me and the questions in Finnish and English (Appendix 1) were emailed to six people. Four respondents consented to be referenced in this thesis. Their responses have been copied and pasted in this text without edits. This final thesis Google Doc has also been shared with the respondents who have the opportunity to edit and finalize their statements. All translation has been done using Google Translate, ChatGPT-4, and the help of native Finnish speakers. Responses are quoted in English.

Conventional content analysis is generally used with a study design aimed at describing a phenomenon in order to develop new concepts or models, or phenomena, and not to create new theories (Hsieh & Shannon, 2005). In this thesis the use of service design to develop new concepts in UIC and models for collaboration presents emerging ideas that can be used in innovative ways. Conventional content analysis is used in analyzing the qualitative data from both interviews and the workshop through interpreting meaning from the content of responses and extracting insights from narratives (Hsieh & Shannon, 2005; Schreier, 2012). Content analysis as a research method is commonly applied to identify pain points and opportunities for innovation within existing service frameworks (Neuendorf, 2016; Krippendorff, 2018). The systematic approach of content analysis ensures that the findings are both reliable and meaningful, aiding in the iterative process of service design where user feedback continually shapes service improvements (Stickdorn et al., 2018; Polaine et al., 2013; Hanington & Martin, 2012).

3.6. Ethical Considerations and Limitations

The research gathered information in accordance with the governing rules of the General Data Protection Regulation (GDPR) (European Union, 2016), and guidelines issued by the Finnish Advisory Board on Research Integrity (2023) and the Finnish National Board on Research Integrity (2019).

All participants were provided informed consent and the survey and interviews clearly stated the purpose of the research, the type of data collected, how it will be used, and participants' rights regarding data protection before they participated. The data have been used solely for the declared purpose of this research in service design and UIC, and have been anonymized or pseudonymized where possible to protect participant identities. At all times participants were given the option to be able to withdraw from the study at any time without any disadvantage. All data have been gathered with consent and agreeability from participants to participate and be quoted in this research.

Original Finnish text has been quoted in English based on the official translated websites or with translation using Google Translate, and with the help of native Finnish speakers. Since many terms in Finnish do not translate directly into English, for example, "ammattikorkeakoulu" directly translates as "profession high school" and is used as the official term for "university of applied sciences," this thesis is also based on my current basic understanding of the Finnish language. Positivist generalizations with a focus on data without influence of human bias leading to research findings is combined with the interpretivist paradigm to gain further depth through seeking the experiences and perceptions of the particular social contexts of service design, university and industry and Finland (Raddon, 2010; Scotland, 2012; Alharahsheh & Pius, 2020).

4.0. DESIGN PROJECT

4.1. Description of Research Context – The New Business Project

Through meeting learning objectives of the SDSI course, the case study presents a written reflection of the project entitled “The Future of Product Development in Tornio.” The case study focuses on specific service design methodologies that were employed to create a solution and present a viable model of collaboration that can be applicable across similar industries in the Tornio municipality of the Lapland region in Finland. The case study offers an example of how companies can create dynamic collaboration with university programs in a structured conducive mutually beneficial partnership.

The project design brief for the New Business initiative consisted of four organizations – Business Tornio, Ammattiopisto Lappia or Vocational School Lappia henceforth referred to as “Lappia,” Lapin ammattikorkeakoulu or Lapland University of Applied Sciences henceforth referred to as “LapinAMK” and Lapin yliopisto or University of Lapland henceforth referred to as “ULapland.” The SDSI program and students are from ULapland and are not associated with any of the other three organizations.

The goals of the New Business project are to improve the know-how, innovation and business activities of the metal and industrial sectors in the Tornio region, as well as provide entrepreneurship coaching, assistance with marketing, product development activities and network cooperation (Lappia, 2021). The turnover of Tornio businesses totaled EUR 5 billion in 2022 (House of Lapland , 2022).

According to The Confederation of Lapland website, from 2020 to 2023 there were 53 projects receiving a total of EUR 4,086,238 financed by the Autonomous Development of the Province of Lapland (AKKE) funding. A quick calculation shows the average amount of approximately EUR 77,000. The New Business Project received the largest amount of EUR 776,000 (Lapin Liitto, 2023). The total cost estimate of the project is EUR 970,000, of which EUR 776,000 is financed by AKKE, Business Tornio’s share is EUR 323,347 and the Lappia financed share is EUR 103,579 euros. Lapland’s contribution is EUR 123,600, of which EUR 30,653 is self-financing (Lappia, 2021). For Business Tornio the aim is to re-employ 230 people and develop 100 new product concepts with funding from AKKE funds (Business Tornio, 2022).

According to the Business Tornio website The New Business project is implemented mainly by Business Tornio who is the main implementer of the partnership with Lappia, LapinAMK and ULapland. Business Tornio is a development company owned by the City of Tornio and local Small Medium Enterprises (SME). The New Business project was headed by Miikka Laitinen whose main responsibility is driving activities to promote and

introduce good practices to the field between different developers and stakeholders both nationally and internationally. “The benefit of cooperation between educational institutions starts from small actions and especially from networking” (Laitinen, 2023, para. 9). According to the website, the New Business project is a multifaceted entity whose goals are to improve everything from know-how in the metal and industrial sectors, marketing, network cooperation and product development activities. New Business Tornio offers support for local businesses that include funding opportunities for R&D activities, benchmarking trips, development of business cooperation, current production equipment and machinery, training packages, communications and information. Business Tornio offers support for local businesses also in strategies such as Exit Koronasta project where funding is available to assist businesses in recovering from the coronavirus pandemic by redesigning sales and marketing efforts. As of this update in January 2024 Miikka Laitinen has moved on to a business development role at Business Tornio with a shared capacity in the New Business project with a newly (as of 1 August 2024) appointed CEO of Business Tornio.

Ammattiopisto Lappia is one of the sub-implementers of the New Business project under Business Tornio and houses the site where Jaloterässtudio Protolab, henceforth known as “Protolab,” is located. Protolab is an industrial workshop space featuring a range of equipment used for teaching and prototyping metal fabrication and manufacturing. Services offered to companies include material research, technology reviews, product design, prototype manufacturing, expert and training services, as well as dissemination of the latest research information (Setälä, 2014). One of the specialized equipment available at Protolab is the hydroforming plant (high-pressure forming plant). This specialized equipment is available in Tornio and can be employed in research projects for molding and the creation of industrial prototypes. Such testing equipment is rare globally. The availability of this equipment in Tornio has positioned both Lappia vocational college and LapinAMK as notable entities in the field (Ruoppa, 2020). According to the same article, the largest forces employed in tests to date have only reached a quarter of the machine’s maximum 3,000-ton capacity, indicating potential for testing thicker and stronger steels. Applied research cooperation has also focused on Outokumpu’s Tornio Research Center and Ruukki’s Raahe Research Center has focused especially on finding out the usability of Outokumpu’s ferritic stainless steels and Ruukki’s ultra-high wear and structural steels in real applications in the project’s participating companies, which currently number several dozen (Ruoppa, 2020). The plan was for Lappia to offer service packages to serve metal industry companies in training and product development needs. In non-critical assignments, students could be used as resources for large assignments in the form of projects, special projects and theses (Kauppi, 2010).

Lappia has a strong focus on Industry 4.0, offering support in entrepreneurship coaching and production of prototypes in the New Business Project (Business Tornio, 2022). As part of the development needs of companies for Industry 4.0, the education partnership is based on common division of labor based on intelligent specialization and a service model based on value chains, the sharing of expertise and the wiser use of resources (Lappia, 2022). Lappia's aim is to intensify cross-national cooperation between vocational schools and universities so that they can better support the competitiveness of Lapland companies who can make extensive use of educational institutions' development environments. This is a mark of university-industry collaboration where development work is done in a user-oriented way, so that companies and educational institutions can take over technologies with the help of joint agile experiments. In this way, new skills based on Industry 4.0 thinking can be identified, innovative technologies and related application opportunities can be found.

In 2015 Lapin ammattikorkeakoulu Oy and the Kemi-Tornionlaakso educational community association Lapland agreed on the joint use of laboratories and learning environments in Kemi, Tornio and Tervola's Loue (LapinAMK, 2015). According to the article, although there has been some shared use of facilities in Kemi-Tornio before, records outlining principles for use and shared use of facilities such as the responsibilities for maintaining laboratories, liability insurance and organizing external quality audits have been now officially recorded to clear the way for synergistic advantages in favor of joint use.

Around the years 2010 to 2014 before the finalization of this agreement, the facilities at Protolab were underutilized and were not generating enough revenue to meet upkeep and maintenance costs, and the goal to create 200 jobs was not met (Knihtilä, 2010). The article states that efforts were shifted to a concentration that can support product development of companies in the region, both from Tornio's stainless steel and from Ruukki's ultra-strong carbon steels. Ruukki is a construction company based in Helsinki. LapinAMK is now one of the leading providers of high level of stainless-steel training in the Lapland region, if not in the whole of Finland, with extensive expertise in product design and production.

Lapin yliopisto University of Lapland has one of the premier Industrial Design programs and includes service design as part of competitiveness and product development. With the new Erasmus Mundus program Service Design Strategies and Innovations (SDSI), many students from all over the world can come to ULapland to study service design methodology in broad integrated fields. Subsequent years in SDSI ULapland will receive new cohorts of numerous students. Procuring and maintaining a network of partnerships for project collaborations is vital to the continued learning development of

SDSI. Making sure partnerships bring the most value and benefit will require extensive organization and management. University-Industry collaboration in this area and context is ripe for development and innovation.

4.2. Persona Empathy Cards

In crafting a strategy to foster collaboration among the different organizations, the team distilled the research findings to create two personas based on the target demographics. Personas in service design offer a way to cluster the needs, goals, habits, and attitudes of existing and potential users to better understand the problem and predict user behavior when designing an interaction (Blomkvist, 2002). Personas are critical to user-centered design in human-computer interaction as it considers the user's personality when participating in interaction tasks in the center of all goal-directed design decisions (Cooper, 1999; Blomkvist, 2002; Hjalmarsson, Gustafsson & Cronholm, 2015). Interactions shape user experience, "perceptions and responses that result from the use of a product, system or service" (ISO 9241-210:2019, p. 24)

In this project two distinct personas were identified (Figure 2). The first is as an industry professional as a composite of all the attendees in the ROIHU2023 Conference. The industry professional persona, nicknamed "Liidja," is advanced in her career and looking for ways to streamline the human resources processes of the company where she works. The second user persona is "Saara" who owns her small interior design firm and is looking for ways to market her services on social media. The persona empathy cards highlight the human-centered element of the challenges the industry was facing.

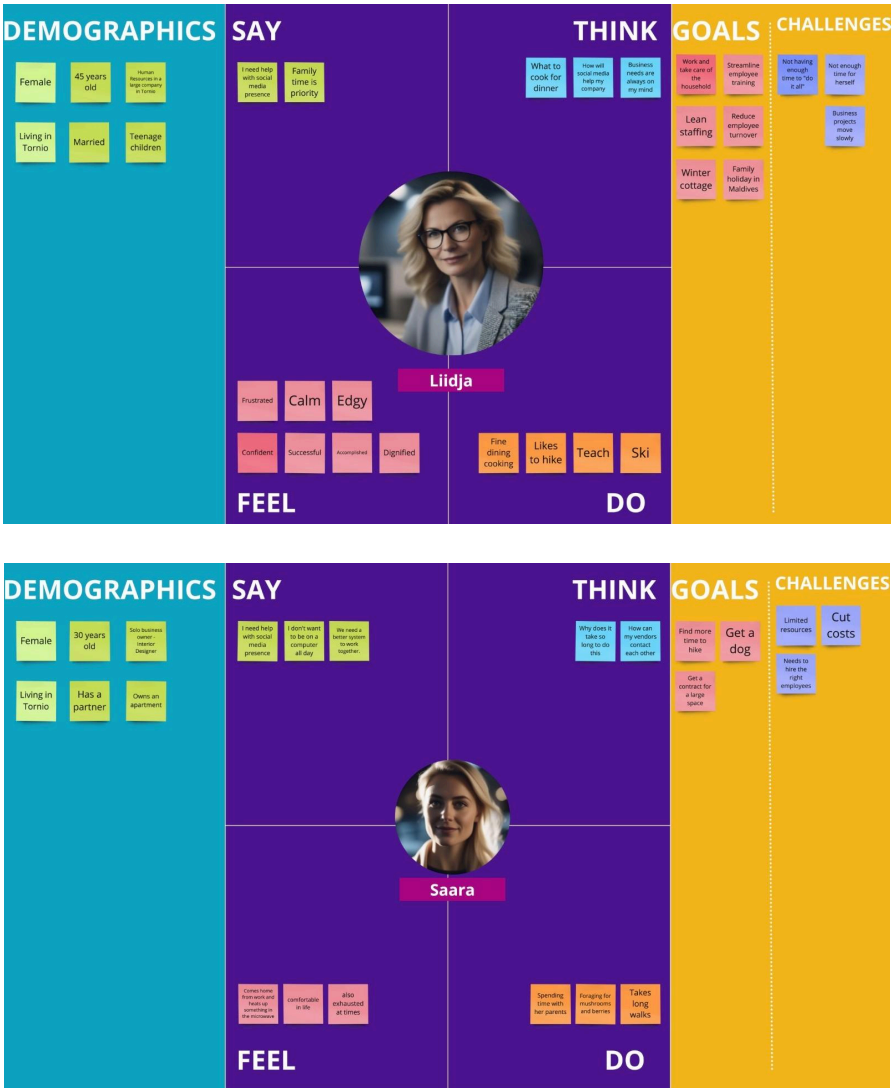

Figure 2. *Persona Empathy Cards of "Liidja" and "Saara"*
Source: Adapted by Su-Ai (2024) according to template found at https://miro.com

4.3. Customer Journey Map

The next step was to make a customer journey map of the hypothetical processes involved in a typical scenario that would involve the interaction of the personas with the service offered. The Customer Journey Map (CJM) or user journey map offers a visual depiction of the sequence of events and touchpoints customers may encounter in their experience with a service organization during the entire purchase, delivery and implementation (Rosenbaum, Otalora & Ramírez, 2017). A CJM facilitates innovation by proposing new or improved services (Heuchert, 2019). Many companies have been using this method to discover and identify pain points, gaps, and opportunities that exist in

their customer interactions (Holmlid & Evenson, 2008; Moon et al., 2016). By identifying the specific individual touchpoints, and the people, information, products and spaces encountered in the entire user experience, links or gaps will reveal themselves as the map is developed (Council, 2015).

In this scenario the team mapped the hypothetical process of the persona “Liidja” who is the head of human resources in a large company looking to hire an intern or trainee (Figure 3). The journey map revealed a time-consuming, often uncertain process of intern recruitment. The same journey map when applied to the scenario of "Saara” the owner of the SME, produces similar pain points and gap areas that can be improved. This CJM can apply to almost any intern hiring scenario anywhere in the world.

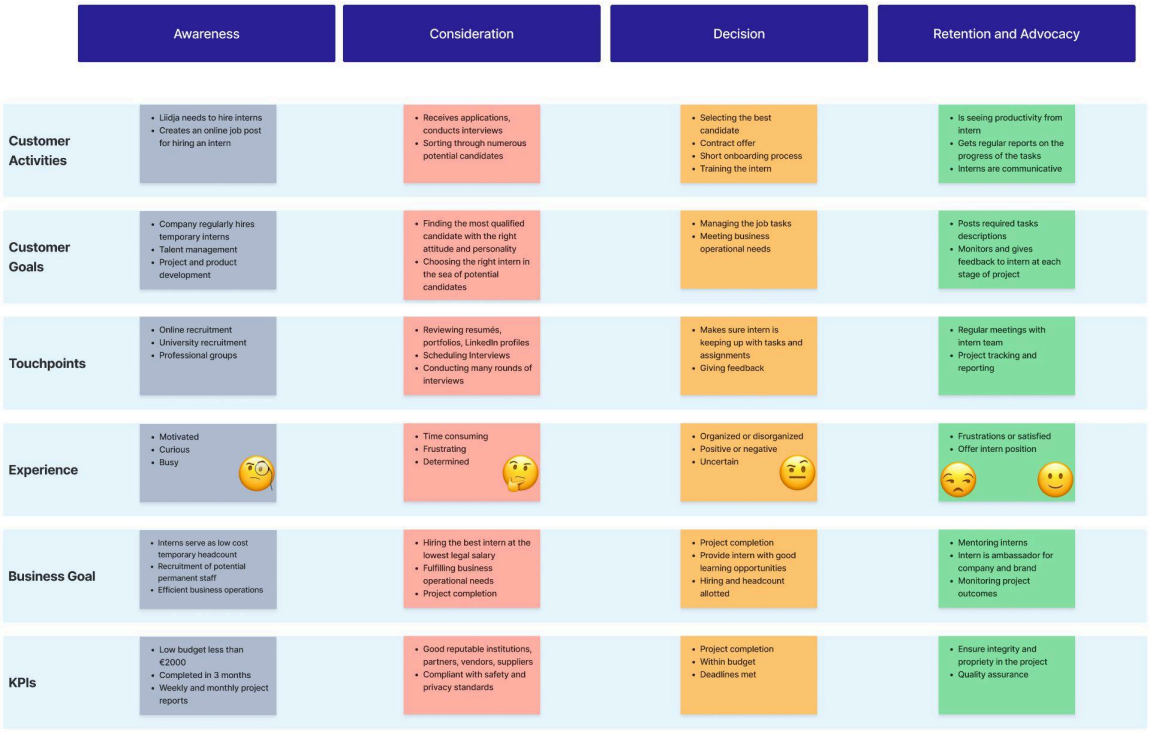

Figure 3. *Customer Journey Map of Persona Liidja – Hiring an Intern*
Source: Adapted by Su-Ai (2024) from Customer Alliance (2022)

4.4. Design Project Solution – An Innovation Collaboration Digital Portal

Based on the research, the team mapped the customer journey which yielded a major insight that was key in creating the digital solution.

In mapping the typical scenario journey an HR director (See: Persona Empathy Cards) would take to manage headcount and hiring of interns, the SDSI team embarked on an alternative model by innovating the way industry can partner with universities using a digital platform. The solution lies in companies regularly engaging in active partnerships with students enrolled in universities and higher education institutions on collaborative project basis thereby lessening the need to hire interns while giving students much needed real-world experience. The team developed a digital platform prototype that facilitates project management and serves as the central hub where everyone gathers to corroborate on project ideas. What was once employers and employees becomes a dynamic environment where everyone participates, learns and develops according to their own capacity. Regular status updates and scheduled activities and events will bring structure and community to an online project space.

Current resources available such as the Kuntarekry (kuntarekry.fi) web portal is for employers advertising job vacancies, a national public sector job search service and recruitments for municipal employers, and wellbeing services counties. LapinAMK and ULapland have a web portal through the Tuudo app dedicated to companies and cooperations as an issuer of thesis work or student development projects (LapinAMK, 2021). Companies are invited to develop their own operations through students as a thesis work, or developing a student project involving research conducted based on an assignment in which students apply the theory and methodology of their field of study to practice with the goal of producing new information that can help the company solve practical challenges or develop new solutions. Companies can also post advertisements for practical training or job vacancies, a theme for a thesis or an idea for a development project for the students to the Tuudo app or contact persons in charge directly via the email and phone numbers listed.

The value-added proposition in the new model is the co-creation of a community of industry professionals and students who are involved in problem solving, design, quality assurance, entrepreneurship, coaching, branding, customer service management and content creation. Through the web portal interested parties can manage workflows on a temporary or short-term basis on projects while enjoying quality learning and development resources, mentoring and interaction across multidisciplinary fields and knowledge bases (Figure 4). All participants are engaged as freelance contributors based on skills while offering expertise, mentoring, guidance and supervision of the project

outcomes. The scalable web interface prototype offers the level of a minimum viable service with an implementation plan and proposals for expansion and adaptation to a variety of industries and uses.

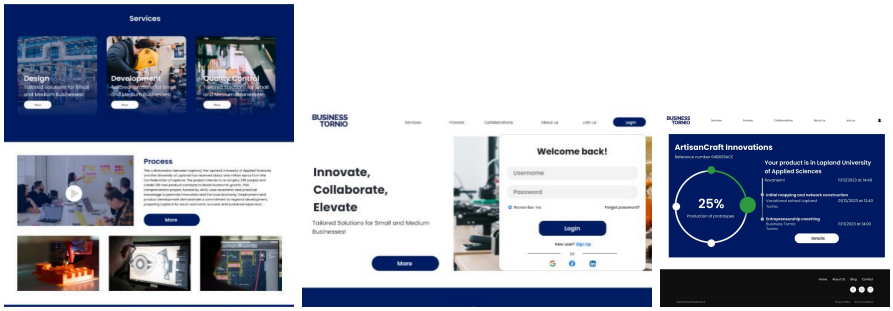

Figure 4. *Prototype of Business Tornio Innovation Collaboration Web Portal Source: Digital strategy Figma prototype designed by Kafi et al. (2023).*

The resulting solution incorporates concepts such as a start-up incubator, entrepreneurship / solopreneurship, community jams, events and challenges, freelancing opportunities and expert resources on one web portal. The many conditions that would arise in a successful collaboration program will have different objectives for every participant and further research and development can lead to wider possibilities. The innovation collaboration digital portal shifts the hiring process to a co-creative lifelong learning model.

5.0. RESULTS

5.1. Results of Quantitative and Qualitative Research

The basis of this thesis is the investigation of existing ways universities and companies work together on projects. The thesis features data collected from the following sources and explains how the data was analyzed:

5.1.1. ROIHU2023 Survey Results

Getting participants to fill out the survey as an activity of the workshop was productive yet comes with the risk of losing workshop participants to disinterest. The survey results were tallied and collated on Google Forms. Eighteen respondents revealed general demographic profiles of Business Tornio's customer base and their product development processes. The data shows the workshop participants were mostly from small-medium enterprises (33%) and education sector representatives (27.8%). This information is valuable because it shows the potential for more industry events being organized in Tornio. The survey shows Business Tornio might immediately see an impact by organizing more networking events for professional groups. More than half (56%) also said they are interested in assistance for training employees. Participants rated their interest on a likert scale of "not interested" to "totally interested" and 61 percent said they attend events to learn about trends.

This is important because Business Tornio maintains Facebook and LinkedIn social media platforms. As of this writing in May 2024, the Business Tornio Facebook page was created on September 2, 2015 and has 991 followers, and the LinkedIn page has 1,228 followers (Figure 5). Business Tornio or the New Business project does not maintain other social media or content creation presence such as podcasts or vlogs on any other platforms such as YouTube, Instagram, X or TikTok. In the past Protolab has not been able to generate enough revenues to break even with the maintenance costs and upkeep of the facility (Knihtilä, 2010). The article cited the lack of online marketing content as one of the reasons Protolab was not able to be utilized enough in the development of local companies (Heikinmatti, 2014).

Figure 5. *Screenshots of Business Tornio Facebook and LinkedIn. Source: www.facebook.com/businesstornio and www.linkedin.com/company/business-tornio as on 5 May, 2024.*

The survey also showed that a majority (more than 50 percent) of Business Tornio's client base has not participated in events that are oriented toward product development and entrepreneurship such as design sprints and hackathons, bootcamps and corporate retreats. There is a great opportunity here for organizing events that cultivate community around the culture of ideas and creativity to develop products that can be marketed to a wider audience and generate alternative streams of engagement.

5.1.2. Mätsis Recruitment Fair Survey Results

The results of this survey are necessary as this survey captures insights from industry representatives. Their views differ from the demographic of the education section representatives. The survey shows industry representatives mostly (77%) gather information about local industry activities from partners, customers and friends; and only 45 percent find out from social media, compared to 56 percent of education sector representatives. Only six respondents (27%) said they attend industry/cross-industry events to learn about trends, compared to 61 percent of education sector representatives. Most industry sector respondents (74%) attend events to find and meet new partners and customers.

5.1.3. Jaloterässtudio Protolab Onsite Visit

Visiting the Jaloterässtudio Protolab premises was a good experience where two in-person semi-structured interviews were conducted. During the site visit we learned about Protolab's extensive opportunities in product development in addition to research and education. Specifically in the area of manufacturing prototypes Protolab service packages offers metal industry companies in training and product development needs, and the site has room to scale and expand, and one key area is to provide resources for large assignments in the form of projects, special projects and theses (Kauppi, 2010).

5.1.4. ROIHU2023 Workshop Insights

Many issues, needs and challenges were raised from the workshop, and this workshop was one of the few times that a large group of stakeholders and interested parties were gathered in the same place to discuss their vision and aspirations for the future of their community, to listen and present feedback as well as ideas for creating new or improving on existing services and collaborations. The workshop enabled the participants to engage in open dialogue and reflection about their roles and responsibilities. Although most of the workshop participants represented the educational sector, participants agreed the biggest need is for a clear concept and organization with strong energizing leadership and coordination among all stakeholders and industry networks.

5.1.5. Interviews

Likert-scale questionnaires are best used with other methods of data collection (Nemoto & Beglar, 2014). To gain a deeper understanding, this thesis conducted a total of 10 interviews. Six interviews were conducted by the student project team and four email interviews were conducted by me. The interviews were conducted either in person or online through email.

The interviews provided insights into the operational capabilities of Protolab at Lappia and the scope of responsibilities of each person interviewed. The biggest insight was that there is currently no central project management or key performance indicators (KPIs) to track the usage metrics of Protolab and project status of ongoing projects; or any feedback, testimonials, case studies or follow-up system to allow for future improvements. Communication among the project stakeholders is done through meetings, email and phone calls on a frequency of semi-monthly updates. Without formal marketing campaigns, anyone seeking the services of Protolab comes through word-of-mouth referrals and information is provided through the websites of LapinAMK and Lappia.

5.2. Insights from Interviews on University-Industry Collaboration

For the purposes of understanding current practices of university-industry collaboration in Finland, the author of this thesis conducted an email interview in Finnish and English (Appendix 1). The reason for conducting the interview using direct email was to be able to reference the answers directly in this thesis. The preference to have respondents answer in email also gave the option to answer in Finnish or English in a personable candid perspective.

In the context of service design, content analysis facilitates the extraction of critical insights from research interviews and customer interactions to directly inform and improve service strategies and design decisions (Stickdorn & Schneider, 2011). Identifying recurring themes in interview data can lead to the effective development of service blueprints, refining touchpoints while ensuring that design solutions are closely tailored to meet user needs (Clatworthy, 2011).

The interviews are analyzed using thematic analysis, a form of content analysis often used in service design to identify themes and actionable insights from raw data that can reveal users' deep-seated emotions and attitudes towards a service experience (Braun, Clarke & Weate, 2016; Silverman, 2016).

Four respondents have agreed to be featured in this thesis:

- Satu Miettinen – Dean, Faculty of Art and Design, University of Lapland
- Paula Kassinen – Startup and Innovation Specialist, University of Lapland and Lapland University of Applied Sciences
- Katri Kuusela – Training Manager and Team Leader (Service and Product Development team, and International team), Education and Development Services Unit, University of Lapland
- Miikka Laitinen – Business Developer / Project Manager, Business Tornio

According to Miettinen (Email interview, 28 March, 2024):

> For me, University-Industry Collaboration stands for joint projects where university staff and students work together with industry to solve industry-driven challenges to offer their expertise to create new and innovative solutions. This can be organized through various ways:
>
> - Through Business Finland/EU funded co-innovation research projects
> - Through a frame agreement (x amount of money) between an industry and university for longer period of time for industry-driven projects

- With short contract to sell services such as facilitation, demo or proto making etc. Integrating industry collaboration within studies

The responses are in favor of a structured approach to collaborations. Miettinen added:

> I think that important learning is to understand what is the right type of collaboration that would benefit the company. When collaboration is integrated in learning the student's learning goals should always come first. There it's very important to agree on the suitable contents of the project. It would be a good idea to develop a tool for this to match company needs with suitable type of collaboration.
>
> The value is versatile. It creates a great learning platform for both staff and students and in best case helps keeping them up to date. It can be a source of funding to create additional resources. In very optimal case it would create some innovation or novelty.
>
> University's third mission is to service surrounding society. UIC responds very well to university strategy though it could be articulated better and even acknowledged in KPI's. University, surrounding companies and research institutes create innovations clusters.

According to Kassinen (Email interview, 27 March, 2024):

> I understand the concept as something that benefits both universities and industry. For universities, collaboration with industry provides staff and students opportunities to engage in applied research and design projects that have relevance to real-world challenges. This can enhance the practical impact of the work done at universities. For students this is especially important; practical training and internships with industry partners can enhance their industry knowledge, skills and employability, for example, and give them the skills and courage to start their own companies. Industry collaboration can also provide universities with funding.
>
> For industry, collaboration with universities gives them a way to access the latest research and expertise, as well as emerging talent, in academia. University collaboration can give industry the fresh perspectives of students and staff, and new ideas and approaches to complex challenges.
>
> There needs to be a better understanding between university and industry. I've heard university staff members express hesitation about UIC and I've also talked to entrepreneurs who don't see universities as potential partners at

all. This is okay, UIC is not for every researcher or staff member or every business. But I think there is potential, and if universities want to explore it, they should allocate resources for it.

5.2.1. Feedback

In this thesis feedback is used as one of the ways to validate a service experience. One key feature of co-creation is working closely with customers. Regular exchange of feedback helps ensure that the services are meeting the needs of all parties and reduces the risk of creating features that do not benefit the value chain (Olsson Holmström & Bosch, 2015).

For the case study, the author used the same email interview questions for feedback on the New Business Project collaboration.

> The experience was positive. The student group eagerly embraced the topic and conducted thorough background research and active fieldwork. Interaction with the student group went well. I believe it is always beneficial to have external perspectives, as they can provide insights that those at the core of the operation might not notice. I was impressed by the comprehensive summary and conclusions drawn from the UIC (Kuusela).
>
> The workshop's task could have been clarified further for the participants or perhaps better contextualized (Kuusela).
>
> How the University learning process goes and how big potential there is between university and companies. Great potential, company can have ideas from the outside to the company's everyday work (Laitinen).
>
> More these kind of projects to get the process familiar to companies (Laitinen).

Based on the feedback and insights received from key stakeholder experiences in previous UIC projects, the design challenge for this thesis focuses on integrating the research and information gathered to design a practical service solution.

5.3. How Might We

How might we create a sustainable collaboration environment where innovative ideas, skills and experiences develop toward successful outcomes?

5.4. Design Solution

This thesis discusses the new realities of the relationship between university and industry. The need for students to gain real world experience in practical skills and social intelligence continues long after graduation and employment. Creating value and competitive advantage are common missions of both university and industry, built on an interdependent relationship that develops beneficial outcomes for society and individuals fulfilling needs and goals. Value is co-created by learning from experience within a dynamic social framework where stakeholders engage intellectually (knowledge-based), physically (performance-based), and emotionally (value and meaning-based) (Ippolito, 2009).

In the context of the Finnish higher education system, designing course offerings that help develop innovation skills in work-integrated learning (WIL) and creating suitable contexts in which innovation can flourish are gaining attention (Rampersad & Jarvis, 2013). Universities that are situated outside the economic clusters and innovation ecosystems mostly located in southern Finland, face increased necessity to develop in the third mission of community engagement and knowledge transfer (Montonen & Eriksson, 2013). Montonen and Eriksson (2013) demonstrate how to teach and learn innovation through experiential and real-life projects with companies and other organizations in their case study in higher education institutions.

A Persona Empathy Card was created to represent university stakeholders (Figure 6).

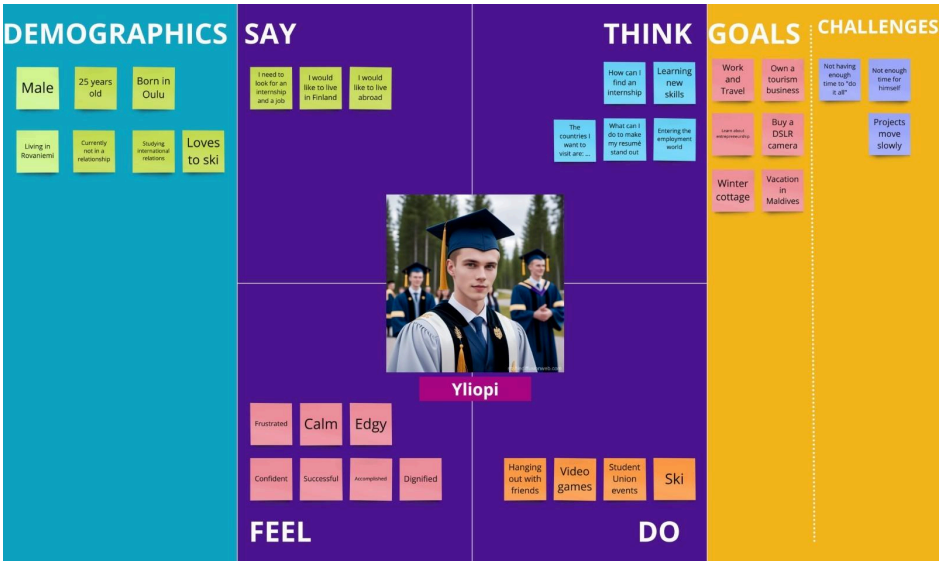

Figure 6. *Persona Empathy Card "Yliopi" representing university stakeholders. Source: Adapted by Su-Ai (2024) according to template found at https://miro.com/miroverse/niching-down-online-course-persona-empathy-map*

This thesis presents a solution designed according to the research and builds upon the prototype in the case study. The digital solution is based on existing principles applied in service design to promote successful university-industry collaboration.

5.5. Prototype of The University-Industry Collaboration Digital Platform

The University-Industry Collaboration Digital Platform acts as an online ecosystem where industry professionals can connect with faculty and student teams to develop specific projects. The platform features an advanced matching service that intelligently pairs industry needs with student profiles possessing the requisite skills, academic focus and project objectives. Through a user-friendly interface, industry representatives can post project concepts and proposals, browse knowledge resources, evaluate student portfolios, and initiate collaboration agreements. A key component of the platform is the secure transaction interface and integrated payment gateway to ensure straightforward and secure financial transactions. Industry partners compensate student teams directly through the platform, which holds funds in escrow until project milestones are met, thereby safeguarding all parties involved. This setup not only provides real-world experience for students but also offers industries access to fresh ideas and emerging talent, strengthening relationships between academia and industry.

5.5.1. SINCO Concept Platform

The Service Innovation Corner, or SINCO, located at the University of Lapland serves as a cutting-edge prototype hub and workspace dedicated to facilitation activities. Located within the Faculty of Art and Design, SINCO specializes in offering a dynamic environment where students, researchers, and industry professionals can collaborate on service design projects (Service Innovation Corner, 2018). The lab is equipped with a variety of tools and technologies designed to simulate real-world service interactions and environments, enabling participants to create, test, and refine their concepts in a controlled yet creative setting. SINCO's focus on experiential learning and practical application makes it an invaluable resource in the region dedicated to developing solutions that address complex service challenges in diverse sectors.

For the purposes of this thesis, the presented prototype is based on a concept rebranding of SINCO and a redesign of the web portal. At the time of this writing, the website sinco.fi has not been updated since 2018 and is running on WordPress. The

proposed rebranding as an innovation space, web portal and app positions SINCO as an ecosystem and community.

At the core of the value proposition of the SINCO web platform is the iOS and Android SINCO app, a digital wallet, transaction and payment gateway that securely stores and tracks all user earnings and payments from completed project work and allows for direct expenditure of these funds at participating merchants and service providers (Figure 7).

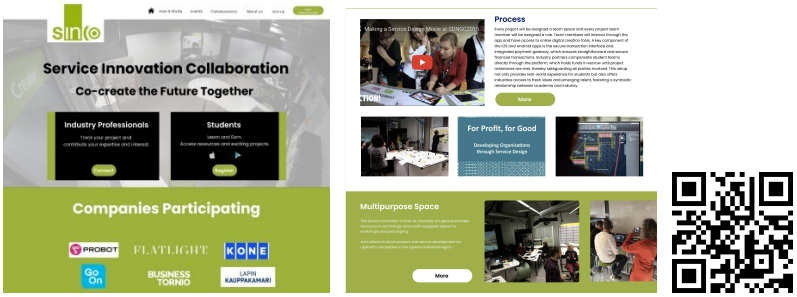

Figure 7. *Prototype of Proposed SINCO University-Industry Collaboration Digital Platform (UICDP). Source: Designed by Su-Ai (2024). Figma prototype available at https://tinyurl.com/sincofi or use the QR code.*

5.6. Service Model Overview

In designing a new solution to innovate the relationship between university and industry, collaboration bridges the gap between graduation and employment in the form of a digital platform (Figure 8). Used as a tool for project collaboration, management and communication, the platform can be established on any existing organization websites that will also serve as a personalized account to track project stages, traceability, compensation and reporting to ensure continuous updates and transparency. As a tool to measure the exchange of knowledge and services, the platform can serve as a hub for showcase ongoing projects, case studies, available facilities, events, workshops and other engaging content.

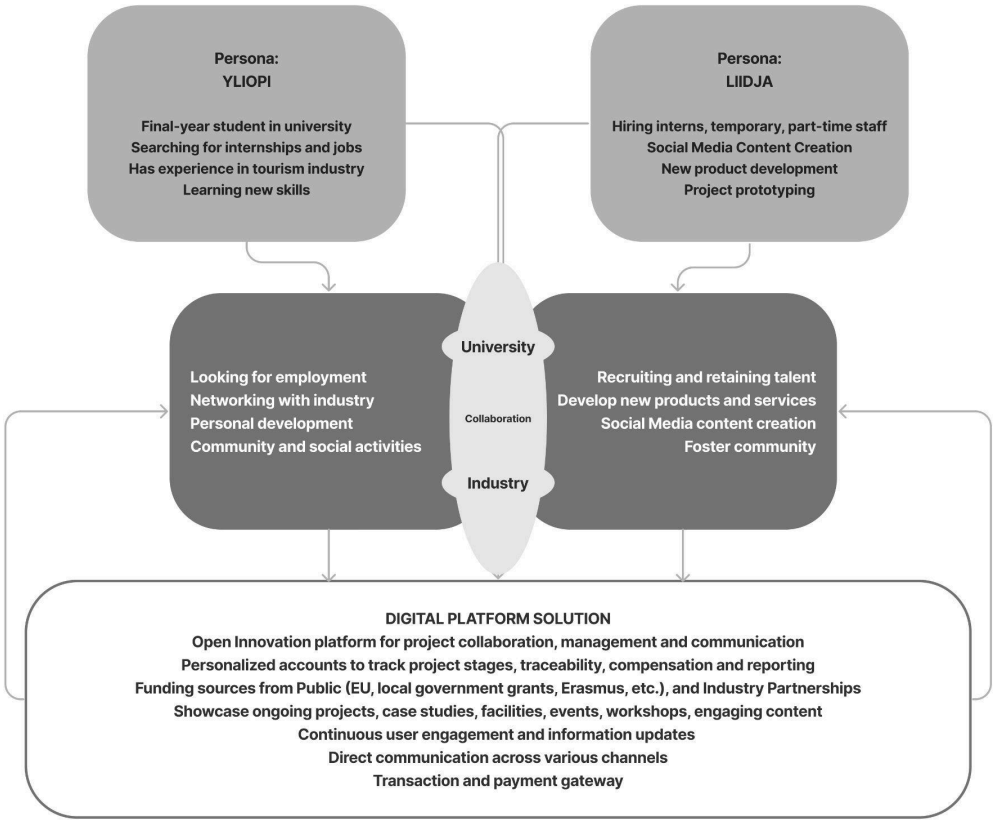

Figure 8. *University-Industry Collaboration Platform Service Model Overview. Source: Designed by Su-Ai (2024).*

5.6.1. Metrics and Key Performance Indicators

Since a service is an invisible, intangible concept, service experience can be validated through metrics and key performance indicators. Metrics are essential for assessing the quality of service design, allowing the comparison of various design strategies and the evaluation of their impact (Feuerlicht, 2011). Existing research highlights the importance of utilizing metrics for evaluating and improving the efficiency of the service design process (Chehade et al., 2023).

Service-oriented design requires organizations to assess business models, employ service-oriented analysis; and design techniques, devise deployment and support plans, and meticulously use methods such as service level agreements (SLA) to evaluate partner, customer, and supplier relationships (Papazoglou & Van Den Heuvel, 2006). Chehade et al. (2023) advocates for the comprehensive integration of metrics across all

stages of service design to assess service interventions, facilitate interdisciplinary collaboration, and achieve outcomes that harmonize with stakeholder objectives (Chehade et al., 2023). For best results, service metrics should be designed when the service itself is designed, with well-defined

Critical Success Factors (CSFs) and Key Performance Indicators (KPIs) measured for availability, reliability, and performance from the perspective of the user (Brooks, 1970). In what has been described as the "outcome-impact gap," discrepancy can occur between the intended results of a collaboration and the actual impact on industry and academia (Pertuze et al., 2010). Pertuze et al. (2010) explains the gap arises due to several factors such as misaligned objectives, differences in operational academic research and industrial application, or insufficient integration of new knowledge or innovation into practical industry setting (Pertuze et al., 2010).

In the context of the SINCO platform, establishing metrics and KPIs are crucial for assessing the effectiveness of projects, and for monitoring and managing compensation and expenditures. Project Effectiveness Metrics can be measured in quality of deliverables against a predefined criteria established at the project's onset. Feedback and ratings can also be used to track project outcomes and satisfaction scores.

5.7. Service Blueprint of University-Industry Collaboration Digital Platform

The service blueprint is a comprehensive diagram that maps out the visible customer interactions and backstage processes involved in the service implementation and delivery (Moritz, 2005; Stickdorn et al., 2018).

The main highlights of the service blueprint of the UIC Digital Platform are (Figure 9):

Identifying the Need / Acknowledgment

- ➢ Universities and industry partners identify new research opportunities.
- ➢ Platform displays available projects and research areas.
- ➢ Provides tutorials on how to use the platform.
- ➢ Analysis of user activity to improve service offerings.
- ➢ Customer service available for registration help and to answer initial queries.

Demand – Project Matching Process

- ➢ Users post new projects; Apply / join a project team.
- ➢ Create profiles detailing their expertise and needs.

- ➢ Seamless and intuitive interface for onboarding participants and initiating projects.
- ➢ GPDR (yleinen tietosuoja-asetus) and KYC (asiakkaan tunteminen) compliance.

After the Project – Compensation

- ➢ Process digital payments or funding receipts.
- ➢ Interface for account and transactions, funding disbursal and recipients.
- ➢ Transparency in payment and invoicing.
- ➢ Escrow funds release.
- ➢ Finance structuring, audit and reporting.
- ➢ Compliance with financial regulations.
- ➢ Metrics and Feedback, ratings system.

The service blueprint provides a comprehensive view of each phase of service delivery for the proposed UIC platform, detailing the customer journey, interaction points, and the supporting actions needed to ensure a successful experience.

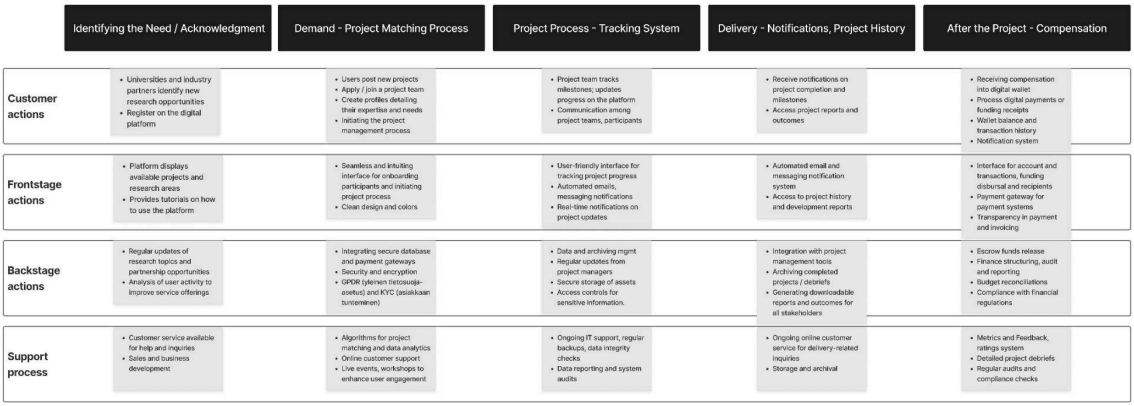

Figure 9. *Service Blueprint of University-Industry Collaboration Digital Platform. Source: Designed by Su-Ai (2024) adapted from servicedesigntools (2019).*

6.0. DISCUSSIONS

This thesis research investigates the development of skills and professional competencies, applied to the ways in which industries can leverage university resources and expertise. In answering the research questions through a literature review, in-person surveys, email interviews and a workshop, this thesis has explored these questions:

Successful University-Industry collaborations is more about establishing the How to measure success and milestones. Success factors are unique to every collaboration. Most important success factors and challenges in any UIC project can be defined through common metrics, KPIs and feedback such as testimonials and reviews. Success factors can be collectively measured on a scale according to the goals of each project. Challenges can be discussed in a workshop properly facilitated to allow authentic sharing. Success can follow failure so outcomes are dynamic and difficult to define. This thesis leaves the measurement and scale of Success open-ended for participants in each collaboration to decide.

University and Industry are just places and resources if not for the official designations. A typical construction site can be called a university. The differences are in the services that are offered and performed by service providers. True professional competence needs both knowledge and practice continuing over a period of time, with few shortcuts. University provides the structure for learning to take place. Lifelong learning ensures the rapidly changing Industry continues to innovate and evolve. Learning and doing are both tacit and explicit ways of expressing knowledge.

6.1. University-Industry Collaboration Digital Platform Conceptual Framework

This thesis presents a UIC framework for the design platform solution based on the combination of theories, concepts and frameworks of knowledge transfer.

Effective human and institutional connections are critical for transferring tacit knowledge between universities and commercial firms, thereby facilitating technology transfer (Lee, 2020). In applying the Nonaka, Toyama and Konno (2000) unified model of dynamic knowledge creation to UIC and service design, knowledge conversion involve:

Socialization (Tacit to Tacit) – Where sharing tacit knowledge involves direct interaction and observation, such as learning from apprenticeships and mentors or through hands-on experiences. Activities and engagements foster a shared understanding both within and between organizations.

Externalization (Tacit to Explicit) – Where the learned tacit knowledge is articulated and expressed in the form of documents or inventions that can become useful and understood by others.

Combination (Explicit to Explicit) – Where the integrating and incorporation of information and knowledge from various sources creates new knowledge such as new prototypes or networks to produce innovative solutions. This affective quality of organizational practices to create recognition and regard for the 'other' and to promote collaboration are orchestrated to create positive affective experiences that create a sense of belonging and willingness to participate (Keevers & Sykes, 2016; Katila et al., 2021). "The power of affect rests in its social nature; it is contagious and moves from body to body with the potential to influence a large number of people simultaneously" (Gherardi, 2017; Katila et al., 2021, p. 68).

Internalization (Explicit to Tacit) – Where the new knowledge is integrated in the form of continuous use, regular connections and affiliations demonstrating the assimilation of the knowledge in skills and assets that lead to transformative insights. The value of service design is the focus on human- and customer-centricity, where service design brings co-creative, outside-in development strategies, which are iterative in nature and increase organizational competitiveness (Korpikoski, 2023). Korpikoski (2023) shows how learning through explicit to tacit "development strategies can lead to mindset changes and trust-building among stakeholders regarding human- and customer-centricity" (Korpikoski, 2023, p. 88).

The flow and exchange of knowledge is represented as a continuous SECI spiral, tacit-explicit, then explicit to explicit, and explicit to tacit, tacIt-tacIt, as in the journey shared by university and industry (Nonaka, Toyama & Konno, 2000; Kutvonen et al., 2013). The University-Industry Collaboration Digital Platform (UICDP) brings the goals of knowledge creation in the form of a web portal to facilitate knowledge exchange. The conceptual framework (Figure 10) shows the flow of tacit knowledge attributes of university and industry and how the UIC digital platform can facilitate the transfer of explicit knowledge.

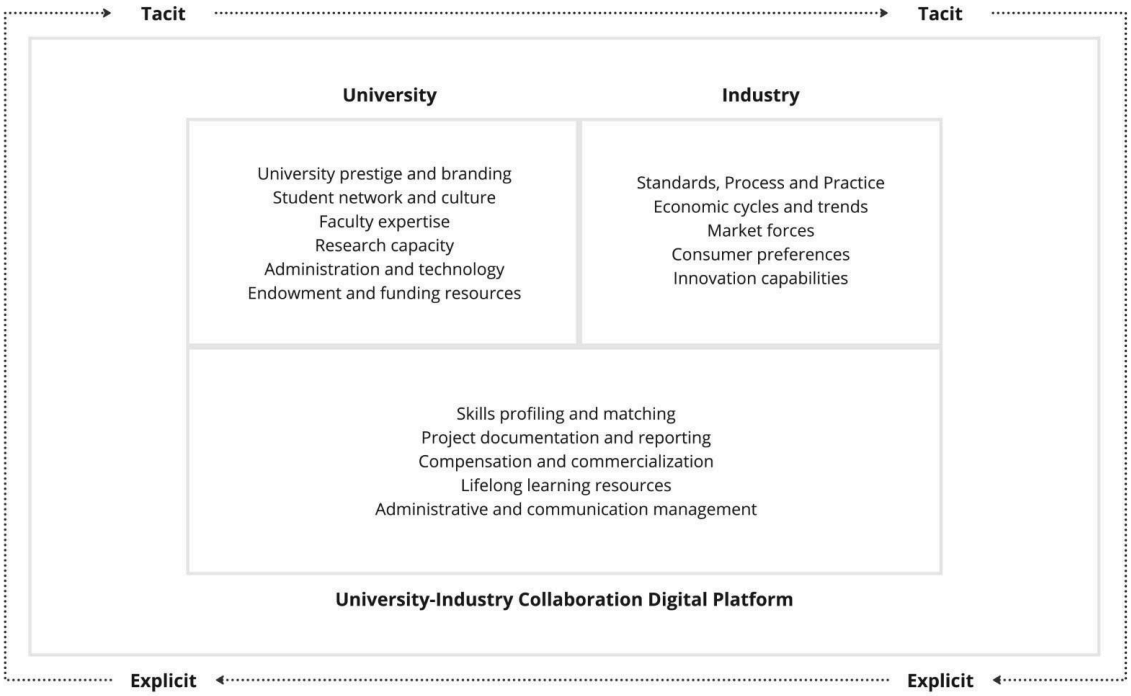

Figure 10. *Conceptual Framework of University-Industry Collaboration Digital Platform (UICDP). Source: Designed by Su-Ai (2024).*

The support from industries cannot be emphasized enough. Industry can better leverage the facilities, resources and expertise of universities by funding and allocating resources toward innovation and knowledge creation. Universities could design curricula around industry projects to bridge the gap between academic theory and professional training. University and Industry are always two separate entities operating under different models. Partnerships narrow the gap and collaborations bridge the gap.

This thesis applies service design methods to develop a new service concept to innovate higher education and industry collaborations. Both Education and Service must be experienced to become tangible in the form of diplomas, photos, and other artifacts of the shared memory.

A prototype digital platform solution serves as a concept for negotiating the process. The proposed UIC web portal and mobile phone app are built on the web engine of an online marketplace for services. By incentivizing the platform with the opportunity to receive compensation for completed project work, the platform also includes a transaction and payment gateway to allow for dynamic flow and exchange of services.

SINCO: The University-Industry Collaboration Digital Platform is the proposed prototype for mediating the exchange and transaction of services and compensation. This platform serves as a bridge for collaboration between universities and industries, seamlessly facilitating projects with the goal of enhancing education and industry outcomes. The measure of success will be upon implementation. The current sinco.fi site is ripe for redesign and how the brand identity continues to shape will bring fresh concepts and novel ideas. This thesis prototypes the SINCO brand concept of a digital platform that serves as a marketplace for services, service and service design. The integration of a transaction gateway serves as a tool to create value of services. Development of the SINCO payment gateway would be a good starting point, along with app, web platform and social media content.

7.0. CONCLUSIONS

This thesis presents the learnings of all the intricacies behind the concepts of Service Design, Strategies, Innovations, University, Industry, Collaboration. and proposes a solution to bridge the gap between university and industry.

The case study shows how the collaboration of New Business Project with a student project team at ULapland was able to present a viable solution involving practical application of classroom instruction toward real world scenarios. Of all the methodologies employed during the project the Workshop, Persona Empathy Cards and Customer Journey Map are highlighted as the distinguishing service design methodologies that had the most effect on the solution.

In this way University-Industry Collaboration has been represented as a model for higher education to innovate according to competencies, skills and experience for practical learning. Based on the theoretical frameworks discussed in the literature review, the design challenge is to create an operational service model to promote wider opportunities for collaborations. Defining the Service Model for the collaboration is a matter of drawing up suitable terms and conditions for every partner to receive a stake in the results and outcome (OECD, 2016). Successful cooperation between university and industry, with the support of government, for the culture and civilization of society toward a sustainable environment and knowledge economy, is essential (OECD, 2020).

In reviewing the research questions this thesis applied service design methodology to answer the following:

What are the current most important success factors and challenges in a university-industry project collaboration?

This thesis presents a solution for University-Industry Collaboration as a proposed application of innovation methods for multidisciplinary teams. Successful UIC projects are usually obvious and transparent, challenges are to be examined and features improved, failures are neutralized by the learning and transformational outcomes of each experience. More importantly, collaborations must establish metrics and agreements of expectations with proper fail-safe measures in place. The proposed digital platform can be an effective way to navigate the many components of a collaboration based on already existing models. The Finnish philosophy of Sivistys serves as an inspirational guideline to foster the design of all services, infusing processes and developments that impart real value. Cultivating sivistys requires holistic personal and collective commitment to living in harmony with the wider society, the preservation of

communities and a sustainable environment, cultures, nature, and most of all, with one another as human beings.

How can universities better prepare students for professional competence through industry partnerships?

The key here is lifelong learning to remain relevant to the needs of Industry and society. While decentralization and artificial intelligence can disrupt Industry on a major scale fairly quickly, University still remains a consistent institution of education and research. This thesis explores opportunities around the topic of University-Industry Collaboration (UIC), yliopisto-teollisuus yhteistyötä (YTY), where business, education and design combine to create tangible service experiences. Making sure partnerships bring the most value and benefit will require extensive organization and management.

The European policy agenda has placed a strong emphasis on research collaborations and strategic partnerships for innovation, which are closely associated with the increasing emphasis on employability across all cycles of higher education (Thune, 2011). Involvement in such cooperative alliances can benefit students by offering real world experience over the limitations of hypothetical simulations.

What can industries do to leverage the resources and expertise of universities?

The effects of business and university alliances have been widely studied in fields such as biotechnology, where companies with university linkages have lower research and development (R&D) expenses while having higher levels of innovative output (George, Zahra, Wood, 2002). Knowledge-based expertise requires advanced levels of skills and training to plan, develop, deliver and maintain technological infrastructure that are labor intensive and depend on intangible value-creation such as branding and user experience (Nayyar, 2021). Maintaining skills and constantly upgrading knowledge ensures employability and professional mastery. LIfelong learning is how universities help industry stay current and innovative.

Future research will attempt a national research of the 13 Universities and 22 UAS to find new projects. With a larger sample group and exponentially more raw data to management, a proper content management and coding system will implement organization and ensure proper cataloging treatment of data for analysis. The ideal timeline of developing SINCO will start with obtaining licenses and the regulatory approvals of the payment gateway. Developing the app and web platform can scale according to the number of users and to onboard as many users as possible within the first year after launch.

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APPENDIX 1

Interview Questions

This interview is for a Master thesis research into University-Industry Collaboration (UIC) at the University of Lapland in the Erasmus+ Scholarship program Service Design Strategies and Innovations.

The goal of this research is to investigate the value of University-Industry Collaboration, the factors that contribute to successful UIC projects, the contravening factors and how UIC can be improved. Factors such as overall experience of the participants, learning outcomes, key performance indicators (KPIs) and metrics need to be understood and discussed. Insights, hindsight, personal reflections and analyses are welcome and encouraged.

This interview is conducted in email, online and in person and the discussion is free and open to expression. Follow-up questions can be asked if necessary.

Interviewees appear anonymously in the thesis and no identification of the interviewees' role, representation or their organization will be implicated in this research.

1. Osa 1 – Haastateltavan tausta / Part 1 – Background of Interviewee

Koulutustaso ja koulutustausta / Education level and background of training

Ammattitausta ja kokemus / Professional background and experience

Nykyinen ammatti ja rooli organisaatiossa / Current occupation and role in organization

2. Osa 2 – YTY-kokemus ja konteksti / Part 2 – UIC Experience and Context

Mitä "yliopisto-teollisuusyhteistyön" käsite tarkoittaa sinulle, näkemyksesi ja käsityksesi.

What does the concept of "University-Industry Collaboration" mean to you, your perceptions and perspectives.

Millainen oli kokemuksesi YTYstä? Kuvaile yhden projektin / yhteistyön konteksti (luottamukselliset yksityiskohdat voidaan jättää pois).

What is your experience with UIC? Describe the context of one project / collaboration (confidential details can be omitted).

Kuinka sait tietää YTYstä / projektista. / How did you learn about UIC / project.

Mitkä asiat toimivat? / What were some things that worked?

Mitkä asiat eivät toimineet hyvin? / What were some things that did not work well?

Toteutuivatko YTYn tavoitteet, tarkoitukset, oppimistulokset? / Did the UIC meet the intended goals, objectives, learning outcomes?

3. Osa 3 – Mikä on YTYn arvo? / Part 3 – What is the value of UIC?

Kuinka YTY voi sopeutua Lapin yliopiston strategiaan. / How can UIC fit into the University of Lapland's strategy.

4. Osa 4 – Johtopäätökset YTY-kokemuksesta / Part 4 – Takeaways from the UIC experience

Positiiviset havainnot / Positive takeaways

Mitä voitaisiin tehdä toisin kokemuksen parantamiseksi kokonaisuutena? / What can be done differently to improve the overall experience?