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Digital Transformation Leaders wanted: How to prepare students for the ever-changing demands of the labor market

Abstract: This article deals with the problem of emerging professions from two perspectives. At first, we focused on the problem of missing leaders of digital transformation; thus, we created, delivered, and assessed a novel course focusing on agile and strategic thinking. We incorporated two new features into the course that brought agility and strategic thinking into play – 1) shuffling of the project tasks within groups, and 2) changes in the size and composition of groups during the project. Within the second perspective, we broadened our view and developed the theoretical framework comprising the necessary steps to prepare courses and study programs that respect labor market requirements. This framework is based on action research and design thinking. Our results show that the Curriculum Development and Redesign Framework (CDRF) proved to be useful tool. Students' perception of task shuffling was overall positive. Only 5.3 % of students answered, "Handing over projects bothered me." Changes in the size and composition of groups also brought positive results. 43.2 % of students answered, "I am happy, I met new people," 54 % answered, "It went pretty well," and just 2.8 % answered, "I did not like it."

Keywords: *VUCA environment, digital transformation, technology innovation, digital transformation leader, higher education, emerging professions, agile digital mindset*

1 Introduction

Organizations across industries face volatility, uncertainty, complexity, and ambiguity, representing the VUCA environment (Scott, 2012; Johansen and Euchner, 2013). Although the US Army War College introduced this term to describe the world after the end of the Cold War, we can use it to describe today's business world. Organizations operating in a VUCA environment must be agile, adaptable, and responsive to navigate the challenges and opportunities it presents effectively. Different concepts have been proposed to describe organizations' characteristics, enabling them to survive in this environment. Organizational (enterprise) agility is one of them, being a broad concept from management theory, defined as the ability to detect and seize market opportunities with speed and surprise (Sambamurthy et al., 2003), the ability of firms to sense environmental change and to respond readily (Overby et al., 2006; Simonova, 2012), or the ability to detect and analyze opportunities and threats quickly, even in their latent state, and to respond to them effectively by adopting required changes and actions (Barlette and Baillette, 2020; Felipe et al., 2020). Different definitions imply similar logic; agile or flexible organizations are ready for change, seek new opportunities for improvement, and challenge traditional practices.

The rapid pace of technological changes makes it challenging for businesses to keep up with emerging trends, adapt their strategies, and predict the long-term implications of these innovations (Millar et al., 2018; Pandit, 2020). Technological innovations require new skills and capabilities that current employees lack. Uncertainty regarding the market acceptance, scalability, and profitability of these innovations further adds to the complexity and ambiguity faced by businesses (Erbay and Yildirim, 2019; Agrawal et al., 2020; Butt, 2020).

New technologies are also practical tools for solving problems in this complex environment. Although technologies generate vast amounts of data, they enable organizations to collect, process, and analyze these data. Advanced analytics tools and algorithms can identify patterns, trends, and anomalies, helping managers in decision-making (Mohanta et al., 2020; Eden et al., 2021). Cloud computing provides secure data storage, backup, and disaster recovery solutions, ensuring business continuity in uncertain circumstances (Tamimi et al., 2019; Awan and Abbas, 2022). Artificial Intelligence (AI) and Machine Learning (ML) algorithms allow organizations to automate tasks, optimize processes, and make accurate predictions (Hansen and Bøgh, 2021; Zdravković et al., 2022).

The previous text showed that the role of technology in the business environment could be either positive or negative, depending on the innovative capacity and readiness of the organization (McGrath, 2001; Koc and Ceylan, 2007). Organizations that actively cultivate a culture of innovation and invest in research and development are more likely to utilize technology positively; on the other hand, organizations that are hesitant to adopt new technologies or fail to adapt to rapidly evolving trends may find themselves at a disadvantage. The mentioned requirements place enormous demands on top management that define the strategy and outlook for the future.

1.1 Missing Digital Transformation Leaders

Individuals responsible for digital transformation in organizations must possess a blend of digital competencies and business domain knowledge complemented by essential soft skills. These people have insight into new

technologies while creating an environment encouraging experimentation, risk-taking, and continuous learning (Schiuma et al., 2022). This new profession has different titles – a digital transformation leader, chief digital officer (CDO), transformation manager (CTO), etc. In this article, we use the title Digital Transformation Leader (DTL), applicable either in big companies with thousands of employees or in the context of entrepreneurship and small and medium enterprises (SMEs). The DTL is a versatile person who understands the core of the business but also has insight into technology. They monitor technological trends and opportunities concerning competition, customers, and business processes. In the case of an SME, it can be the owner, while in a big company, the role is mainly held by the CDO, CTO, or designated manager (Singh and Hess, 2020; Firk et al., 2021).

If organizations cannot find people with all the necessary skills and the right mindset, it can result in different consequences. At first, the company exposes itself to the danger of choosing one of two extreme positions - rejecting technologies or, on the contrary, uncritically accepting all innovations without assessment of effectiveness and efficiency (Höflinger et al., 2018; O'Hara, 2020). Low innovativeness is typical for small and medium enterprises outside the IT field because their management feel new technologies are unnecessary or do not understand them. Specific challenges appear in big companies if the business and technological views are separated. In that case, the chosen technologies may not correspond to business processes and do not bring added value to customers. Organizations facing the challenge of missing qualified DTLs often resort to two leading solutions: retraining existing employees or hiring new talent.

1.2 Structural changes in the labor market induced by digital transformation

The problem of missing DTLs is just the tip of the iceberg; the labor market has experienced significant changes due to advancements in digital technologies and automation. Many mundane and repetitive tasks have been automated, reducing demand for low-skilled jobs like data entry, assembly line work, and specific administrative roles (Bührer and Hagist, 2017). Conversely, the digital transformation has given rise to entirely new job roles that were previously non-existent (Allen, 2020; Sart and Yildiz, 2022). These emerging positions encompass data scientists, AI specialists, cybersecurity experts, app developers, digital marketers, and e-commerce professionals. Consequently, the demand for individuals possessing expertise in these fields has skyrocketed, leading to a high demand for such skilled workers.

University study programs are slow to respond to labor market demands and often struggle with curriculum development: selecting appropriate content and choosing the relevant approach(es), methods, and teaching and learning techniques. Although the labor market is evolving at an unprecedented pace due to technological advancements and economic shifts, universities often have lengthy bureaucratic processes and curriculum development cycles that make it difficult for them to keep up with the rapidly changing demands of the job market (Bardhan et al., 2013; Okolie et al., 2019; Al-Hattami, 2021). Insufficient university-industry collaboration causes a lack of information about the needs of the labor market, while a lack of incentives for faculty members to adapt or update their courses causes low personal motivation to stay current with industry trends. Universities also face resource constraints and regulatory barriers. To address these issues, universities need to foster closer ties with industries, encourage faculty development, embrace appropriate (innovative) approaches to teaching and learning, and be more agile in updating their curricula to meet the evolving needs of the workforce.

1.3 Revising the higher education curriculum

The process of curriculum innovation can follow different paths, methods, and frameworks. To develop curriculum appropriately, decisions on what to teach (content or input) or what the learner should be able to do at the end of the course (such as objectives, knowledge, skills), how to teach it (process, or methodology: learning activities, procedures and techniques employed in the course, plus principles underlying the process: the roles of teachers and students, assumptions and beliefs about how students should learn, instructional materials), and how to assess what was learned (output, or learning outcomes) are necessary to make (Richards, 2013; Richards and Rodgers, 2014; Wiggins and McTighe, 2005).

According to these authors, three approaches to curriculum development can be implemented: forward, central, and backward design (Figure 1). In the forward approach, the decisions about content are made at the beginning, then the process is determined, and finally, the learning outcomes are assessed, i.e., what is learned is the result of what and how well it is taught. In the central curriculum approach, teaching processes determine content and outcomes, and finally, in the backward design, learning outcomes control the process and content of the course. In the backward curriculum design, which is well-established in formal and national education, curriculum development starts with identifying the needs of the labor market, universities (DTL educators), and students' needs. The analysis then allows curriculum designers to formulate the objectives of a course, select and organize content and learning experiences, and determine what to evaluate and how to do it (Taba, 1962).

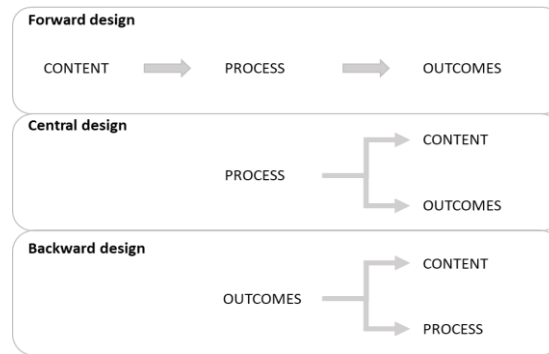


Figure 1: Curriculum design process (adopted from Richards and Rodgers, 2014)

Richards (2013) claims that the one approach to curriculum design does not exist and that the designs might work concurrently in some circumstances to facilitate learning. Table 1 summarizes the typical features of the three approaches.

Table 1: Features of forward, central, and backward design (collected and summarized by Allen, 2020; Kaputa et al., 2022; Richards, 2013; Richards and Rodgers, 2014; Wiggins and McTighe, 2005)

Forward design	Central design	Backward design
content-oriented	evolves during the course	needs analysis
task-based	experiential learning	competency-based
problem-based learning	collaborative learning	strategy-based instruction
flipped classroom	research and evidence-based (e.g., case studies)	self-/peer-assessment
		action research

In more detail, this article presents two specific approaches applicable to course development from diverse subject domains. Kurt Lewin, in the mid-1940s, constructed a theory of action research (AR), which described action research as “proceeding in a spiral of steps, each of which is composed of planning, action and the evaluation of the result of action” (Lewin, 1947; Kemmis and McTaggart, 1988). In the 1950s and 1960s, John E. Arnold and his colleagues at Stanford University laid the foundations of the approach that is now called design thinking (DT) – “a design philosophy and practice that focused on creativity and invention” (Arnold, 1962). Despite some differences, these approaches share a common characteristic: a strong focus on iterative and non-linear courses of action.

Action research has become a powerful tool in education because it promotes continuous improvement and fosters innovation. One of the primary advantages of action research in course development may be its responsiveness to learner needs, allowing for addressing diverse learning styles and learning gaps. By reflecting on the outcomes, educators can make informed decisions to modify and enhance their courses. Action research typically follows a cyclical process with several main steps guiding research and implementation. The basic structure includes three steps (see Figure 2), but the exact steps may vary depending on the context and the specific research approach. Widely accepted structures (Lewin, 1947; Tomal, 2010; Barker and Misawa, 2020) contain stages as follows: 1) Identify the problem, 2) Collect information to understand the problem, 3) Analysis and feedback, 4) Create the action plan, 5) Action (teaching), 6) Evaluation and follow-up, 7) Move to next cycle. The action research encourages educators to experiment with new learning and teaching strategies, and collaborate with peers, ultimately elevating the overall quality of teaching. The knowledge generated from action research can be shared with the academic community, influencing best practices and shaping educational policy.

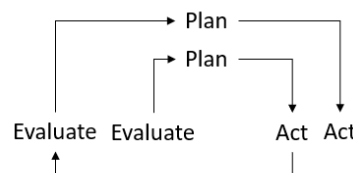


Figure 2: The basic structure of action research methodology

Design thinking is a human-centered problem-solving approach that involves understanding users' needs, generating creative solutions, and prototyping and testing ideas. Therefore, this approach suits designing or redesigning university courses and study programs. We can find different modifications and mutations; however,

three are the most popular models used by practitioners and academia. The d.school (Hasso Plattner Institute of Design) at Stanford University is one of the pioneering institutions in design thinking (D. School, 2008). Their approach involves a five-stage process: 1) Empathize, 2) Define, 3) Ideate, 4) Prototype, and 5) Test. Nonprofit organization IDEO.org applies design thinking principles to address complex global challenges (IDEO.org, 2015). Their design process consists of three key phases: 1) Inspiration, 2) Ideation, and 3) Implementation. The UK's Design Council promotes design thinking to drive innovation and economic growth (Design Council, 2003). Their approach encompasses four key stages: 1) Discover, 2) Define, 3) Develop, 4) Deliver. These three approaches to design thinking emphasize human-centricity, iterative and non-linear problem-solving, and interdisciplinarity. Regardless of the model, each phase of the design thinking process has its methods and tools. By following these structured processes, designers can create innovative and meaningful solutions that address real-world challenges.

1.4 Scaling the problem

The previous text revealed a prevalent issue concerning the scarcity of workers in emerging professions stemming from labor market structural changes and technological innovation boom amplified by the slow adaptation of curricula in universities to meet the demand for these evolving job roles. Although this problem is well known, state-of-the-art research shows only a few tried-and-tested paths (Kremel and Wetter Edman, 2019; Hinck et al., 2021; Barker and Misawa, 2020).

This article addresses two gaps in current research. At first, it is missing specification of DTL competencies and the ways to teach them. Second gap features the need for straightforward visual tools to guide educational institutions in the innovation of curricula based on labor market requirements.

The aim of the article can be divided into five steps:

1. Conduct a comprehensive literature review focused on curriculum/course development or redesign using either action research (AR) or design thinking (DT) methodologies.
2. Develop a theoretical framework for curriculum development and redesign based on AR and DT methodologies.
3. Create, deliver, and assess a novel course, "Digitalization of Business and Society," to prepare future Digital Transformation Leaders (DTL) for agile thinking.
4. Evaluate the effectiveness of the theoretical framework based on the experience gained from designing and implementing the new course.
5. Refine and finalize the curriculum development/redesign theoretical framework based on insights and lessons learned during the course preparation process.

The rest of the article is organized as follows. Chapter 2 shows the research methods designed and applied to developing the new theoretical framework, including a subsequent case study to verify and evaluate the framework. The following extensive chapter 3 presents the outputs achieved within the individual parts of the presented development process. The following two chapters, 4 and 5, discuss the results, show the study limitations and the possibility of future research. Finally, the conclusion closes the paper, highlights the importance of the developed framework, and summarizes the presented methods used to strengthen students' agile digital thinking, i.e., future leaders of digital transformation.

2 Research methods

The research methodology describes the setting of the whole project divided into three parts: systematic literature review, formulation of the theoretical framework, and setting of the case study. The initial phase of this research involved conducting a comprehensive systematic literature review utilizing the Web of Science database. The objective was to ascertain the current relevance of the curriculum/course development or redesign topic and to identify the predominant methodologies employed in higher education. Our inquiry encompassed the innovation of entire study programs and the enhancement of specific courses within the curriculum. The keywords search and the entire review procedure are illustrated in Figure 3. The comprehensive knowledge base after the initial cleansing encompassed a total of 3166 documents. Given our approach that combines action research and design thinking, we proceeded to filter the abstracts of papers with a specific focus in this direction. The findings indicate a noticeable prevalence of action research compared to design thinking. However, a more in-depth examination of the data is necessary to understand the evolution of the topic and its categorization within various research domains. The results section presents the findings.

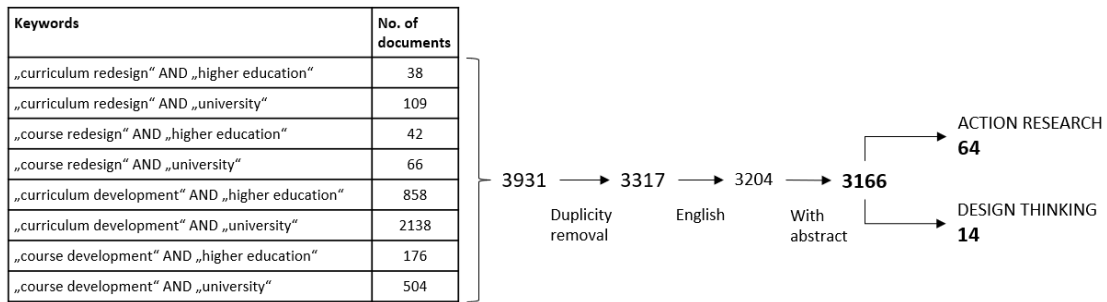


Figure 3: Process steps in the systematic literature review

The second step in our research was preparing the initial design of the framework because we wanted to avoid proceeding ad hoc when preparing the course. At the same time, we did not find a suitable concept in the literature. While the design thinking approach provides a rich array of tools and methodologies primarily focused on the development phase, the action research methodology addresses the ongoing change process and the indispensable aspect of evaluation. Design thinking excels in sparking creative ideation, encouraging diverse perspectives, and guiding the crafting of innovative solutions during the development stage. Its emphasis on empathy, prototyping, and iterative refinement equips designers with a toolkit to navigate the problem-solving journey. However, the journey does not end with the creation of a solution. Action research's strength lies in its iterative planning, action, observation, and reflection cycle. As solutions are put into practice, action research facilitates a systematic monitoring and evaluation of their effectiveness. This adaptive approach ensures that the implemented changes remain aligned with the desired outcomes and adapt to unforeseen challenges or shifting priorities. Table 2 depicts the systematization of both selected approaches.

Table 2: Systematization of design thinking and action research approaches – starting point for the framework

Plan	Act	Evaluate	Source
Inspiration, Ideation	Implementation		Design thinking: IDEO.org
Discover, Define	Develop, Deliver		Design thinking: Design Council
Empathize, Define, Ideate	Prototype, Test		Design thinking: d.School
Identify the problem, Collect information, Analysis and feedback, Create the action plan	Action (teaching)	Evaluation and follow-up	Action research: Barker and Misawa, 2020

Based on the given comparison, we created a new framework, which showed us how to develop our new course (see Figure 4). The spiral element emphasizes the implemented curriculum is dynamic and subject to continuous change. We divided the whole process into four parts: preparation, planning, acting, and evaluation. The first step in the preparation cycle encompasses three activities derived from the approaches (Discover, Empathize, and Be inspired). The planning phase consists of two activities, Define and Develop, varying in detail. The act phase consists of delivering the course, i.e., teaching and learning activities, while the evaluation phase is more complex and comprises Gather, Compare, and Formulate activities. This framework was used to prepare an innovative course Digitalization of Business and Society.

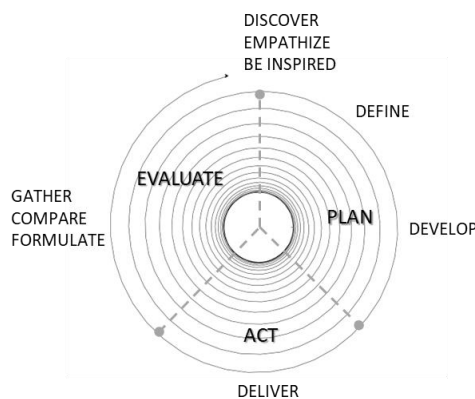


Figure 4: Curriculum Development and Redesign Framework (CDRF) – initial proposal

The setting of the case study mainly involved the selection of team members and the determination of the schedule. Initially, the team responsible for developing the new course had two members, both from the IT domain (first and second author). During the preparation phase, we needed an in-depth pedagogy insight in the course; therefore, we expanded the team to three persons. The first author and the second author work at the Faculty of Economics and Administration of the xxx. The third author works at the same university but at the Faculty of Arts and Philosophy. The first author has 20+ years of experience in educating and training students in the courses of information and communication technology (ICT) (management information systems, e-government, theory of systems, system dynamics, business process modeling) and was responsible for the course preparation and delivery. The second author has 30+ years of experience in educating and training students in the ICT courses (databases, big data, business process management, business intelligence) and acted as a mentor in the digitalization team. The third author has 20+ years of experience in pre-service and in-service teacher education and training, giving her adequate expert pedagogy knowledge and skills. She acted as a pedagogy consultant in the course curriculum development. The planned schedule of the course development cycle was as follows: September – November 2022 > planning the course (literature review, analysis of study plans of innovative universities), December - January 2023 > designing the course – its aims, topics, sequence and gradability of content, assessment of students; learning and teaching approaches, methods, techniques, January 2023 > development of the course instructional materials, February – May 2023 > implementation and delivery of the course, June – July 2023 > reflection and evaluation of results.

3 Results

A systematic literature review revealed that most research papers do not specify a particular curriculum/course development or redesign methodology. However, a keyword search inside the abstract revealed some patterns. Initially, our investigation revealed that the digitalization of education remains a prominently discussed subject, with 630 papers incorporating keywords related to this theme (blended 73, online 340, virtual 92, digital 130). Subsequently, our inquiry extended to keywords related to innovative teaching methodologies. Collaborative learning emerged as the most widely explored concept, featured in 240 papers. Interactive teaching methods were discussed in 89 papers, the flipped classroom concept in 20 papers, and project-based learning in 12 papers. Notably, our analysis of publication years indicated a steady increase in interest surrounding this subject over the past two decades (see Figure 5).

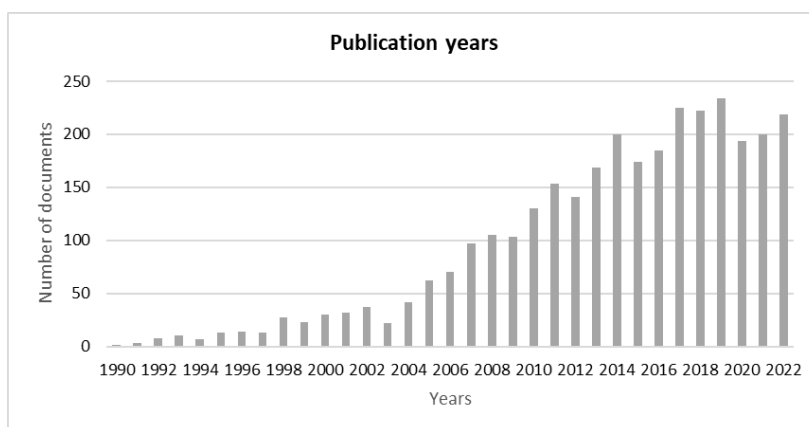


Figure 5: Number of documents in the corpus published in each year

The outcomes of the systematic literature review also spotlighted specific sections within the body of literature comprising documents that utilized action research or design thinking in the context of refining study plans. Given our strategic intent to employ these two approaches as the basis for shaping a theoretical framework, our curiosity was fueled by a trio of questions:

- the frequency of utilization of these approaches,
- their prevalence across different nations,
- and the variations in their application across diverse research domains.

We have found that Action research is more prevalent in literature yielding 64 documents, while design thinking is represented by 14 documents. We also found that both topics are the subject of research in the USA, Australia, Sweden, Turkey, Finland, and Cyprus. Interestingly, the UK is the largest producer of documents on action research, but no document on design thinking was produced here. On the contrary, 2 out of 14 design thinking documents are from Japan with no presence of action research.

Examining the publication activity through the lens of publication dates, it becomes evident that design thinking is quite a new concept in the field of study plan innovation, with the first paper published in 2012. However, the popularity has been steadily gaining momentum. In contrast, the evolution of action research over time does not follow a linear path. Instead, there is a relatively long history behind this concept, featuring the first paper in 1995.

The last part of the review results featured the differences in research areas between action research and Design thinking after excluding the education area. Action research is mainly employed in Environmental and green studies, Psychology, Social sciences, and Computer sciences. On the other side, design thinking is prevalently the domain of Art.

3.1 Case study – context of the study

The case study described in this paper is based on the development of a new course, "Digitalization of Business and Society," at the Faculty of Economics and Administration of the xxx. Before describing the entire course creation, instruction, and assessment process, we would like to present more detailed information about the conditions that preceded the decision to develop this particular course. Our faculty has been providing education in business administration, public economy, and public administration for over three decades. At the same time, it also offers systems engineering and information science studies.

The dean of the faculty orchestrates regular meetings with industry practitioners and experts, often taking the form of roundtable discussions. Moreover, the dean has established an advisory body comprising 19 distinguished representatives from private and public sectors. This channel transfers external expertise, ensuring a symbiotic relationship between academia and the professional sphere. These recurring dialogues and consultations with external stakeholders have provided faculty management insight into future employers' expectations and what our graduates should be prepared for.

One initiative that emerged from these discussions was creating a new interdisciplinary study program, "Digital Entrepreneurship," combining business administration and information technology knowledge and skills. Graduates from this program could independently run a business or make qualified decisions about digitalization at the management level. The faculty offers study programs in both domains, so most courses were adopted from the existing study programs. However, none of the courses met the requirements articulated quite frequently: all the practitioners and experts emphasized that our graduates must be able to navigate the space of new technologies while estimating the impact of these technologies on the existing processes in the company. They also expected graduates to respond quickly when solving problems, to be able to provide and accept feedback, be communicative, and be prepared to work in teams that change their members frequently. These requirements have little overlap with existing courses. Therefore, we decided to create an entirely new course covering all these requirements.

3.2 Case study – preparation

The preparation process of our new course is divided into two distinguishable periods: 1) pre-accreditation and 2) post-accreditation. The first period covers the preparation of the accreditation application. At this stage, we prioritized the requirement that our graduates *must be able to navigate the space of new technologies while estimating the impact of these technologies on existing processes in the company*. We designed the course structure and instructional design and left the detailed design until the accreditation process was finished. In the initial phase, we incorporated mainly technology-oriented topics and the instruction we usually apply. However, we planned to elaborate on the instructional design to comply with all the requirements after successful accreditation. The aim of the course was for students to be able to understand new trends in the digitalization of business and society. Learning activities, procedures, and methods employed in the course encompass group projects and individual tasks, all designed to actively involve students in accomplishing these tasks. We selected topics that incorporated procedural and financial issues related to digitalization, Industry 4.0, e-government, digitalization of education, and blockchain technology.

The successful accreditation process finished in May 2022, followed by the admission process until August 2022. In September 2022, we knew that 62 students enrolled in the study program; therefore, we could begin working on the detailed course design and development. In the second period, we strived to embrace the additional requirements for our graduates: *quick responses when solving problems, the ability to provide and accept feedback, communication, and being prepared to work in teams that change their members frequently*. Putting all the requirements together, we formulated the expected outcome: "A student who has accomplished the course has developed an agile digital mindset and can lead digital transformation." We employed the backward design process by setting the learning outcome as the first step in the curriculum development. The key idea behind backward design is that the entire curriculum development process is driven by the desired learning outcomes followed by the design of instructional activities and assessments. This approach is particularly suitable when creating new

courses induced by new labor market requirements, as the requirements directly inform the expected outcomes. The next step followed the recommended activities from the proposed framework (DISCOVER, BE INSPIRED, and EMPATHIZE).

3.2.1 DISCOVER

Although the digital transformation theme is a relatively new topic, we gathered three comprehensive documents from various sources to gather a comprehensive overview of DTL competencies. Primarily, we used the European Norm (EN) 16234-1 European e-Competence Framework (e-CF), which provides a reference to 41 competencies with five levels of proficiency as applied at the ICT workplace, using a common language for competencies, skills, knowledge and proficiency levels that can be understood across Europe (ITPE, 2019). These competencies are mapped to 30 ICT Professional Role Profiles identified by the European Committee for Standardization (CEN), including the DTL's role profile with five competencies: Business Plan Development, Architecture Design, Innovating, Business Change Management, and Information System Government.

The second source is the article Digital Transformation Leadership Characteristics: A Literature Analysis (McCarthy et al., 2021). Based on the systematic literature review (87 research papers explicitly mentioning digital transformation and leadership, all scientifically peer-reviewed), the authors classified characteristics describing necessary activities and mapped them to the established C-Suite roles. They revealed eight characteristics that form the essence of digital leadership, showing that the DTL needs to be a Digital Strategist, Digital Architect, Organizational Agilist, Digital Culturalist, Customer Centrist, Data Advocate, Business Process Optimiser, and Digital Workplace Landscaper. The authors also emphasize the importance of shared leadership; rather than burdening one person by being the sole leader, they suggest a leadership team around a digital transformation program.

The third source is the article The Digital Transformation Leadership Framework: Conceptual and Empirical Insights into Leadership Roles in Technology-Driven Business Environments (Weber et al., 2022). This article aimed to identify leadership roles appropriate in digital transformation based on competing values framework (CVF). The authors conducted a qualitative study with 30 in-depth interviews in the identification phase, 42 expert reviews in the content validity evaluation phase, 263+294 employees for empirical evaluation, and 196 leaders for spatial arrangement of the digital transformation leadership roles. The authors, in accordance with the second source, emphasize the necessity for the DTL "to master a broad behavioral repertoire, even if it means exhibiting ambivalent roles." They revealed seven digital transformation leadership roles: Networker, Digital Pioneer, Innovator, Enabler, Mentor, Manager, and Digital Mentee.

The collected materials provided a complex insight into the issue of leadership in the field of digital transformation (see Table 3). Navigating the complexity of digital transformation leadership requires a unique blend of various skills, such as an understanding of technology, adaptability, strategic vision, and a people-centric approach. All three sources agree that at the heart of effective digital transformation leadership lies the ability to employ an agile and adaptive mindset that enables individuals and organizations to tackle complex challenges with creativity, flexibility, and a focus on continuous improvement. Such leadership involves a willingness to pivot and adjust strategies based on new information and insights. This adaptability allows quick responses to emerging opportunities and challenges, ensuring solutions remain relevant in a rapidly changing environment.

There is also agreement on formulating a clear strategic vision for the organization's digital journey. Strategic thinking in digitalization starts with a clear understanding of an organization's mission, vision, and strategic goals. It involves identifying how digital technologies can directly contribute to these objectives. Digital initiatives should not be pursued for the sake of technology itself but rather as enablers to drive specific outcomes such as revenue growth, cost reduction, or enhanced customer engagement. Strategic thinking in digitalization also extends beyond organizational boundaries. It involves identifying opportunities for collaboration within ecosystems of partners, suppliers, and even competitors.

The third attribute emphasized by all three sources is the necessity of accommodative communication. While technological advancements play a pivotal role in the digitalization journey, effective communication is a cornerstone that facilitates and accelerates the success of digitalization efforts. Effective communication helps manage expectations by explaining the potential impact on employees' duties and responsibilities and addressing any concerns or uncertainties. By clearly communicating the benefits of acquiring new competencies, organizations encourage a culture of continuous learning that supports digitalization efforts. Clear and strategic communication serves as a bridge that connects people, technology, and the broader organizational transformation required for successful digitalization.

ICT background knowledge with a data-driven mindset was mentioned in two sources (European e-Competence framework and McCarthy et al., 2021). Leaders with a robust ICT background are better positioned to drive successful initiatives. They should have a solid understanding of cybersecurity principles, risk management, and compliance with data protection regulations, and at the same time, understand the concepts of integration and interoperability to ensure that different technologies can seamlessly work together. A firm grasp

of data management principles and analytics is also essential, as they should understand how to collect, process, store, and analyze data to derive meaningful insights.

The attribute of qualified sourcing representing identification of reliable and valuable information sources appeared in two articles (McCarthy et al., 2021; Weber et al., 2022). As the consequences of relying on unverified or biased information can be fatal for the organization, qualified sourcing supported by a network of verified sources is a shield against misinformation. The accurate information about emerging technologies and their applicability in particular organizations can be hidden under buzzwords and embellished stories. Consistency and agreement among credible sources can reinforce the accuracy and validity of the information, reducing the risk of relying on isolated or biased perspectives. Customers are also invaluable sources of information that can shape the trajectory of businesses. By harnessing customer-centric insights, organizations can refine products, optimize strategies, and deliver experiences that resonate with their target audience. Customer behavior and their requirements can be a reasonable basis for decision-making about digitalization.

Implementation capability is the last missing piece in the picture of the DTL attributes mentioned in two sources (McCarthy et al., 2021; Weber et al., 2022). Leaders should be familiar with business process modeling and adaptation techniques to align processes with existing and new technologies. The DTL also needs to know agile methodologies, such as Scrum and Kanban, to facilitate flexibility and collaboration in project execution. This knowledge helps streamline processes, enhance team productivity, and accelerate time-to-market for digital initiatives. Solutions can be developed in smaller, manageable increments, allowing faster feedback loops and the ability to make course corrections as needed. This approach enhances problem-solving agility and reduces the risk of investing resources in solutions that may prove ineffective.

Table 3: Construction of DTL attributes (based on the European e-Competence framework, McCarthy et al., 2021, and Weber et al., 2022)

DTL attributes	European e-Competence framework	McCarthy et al., 2021	Weber et al., 2022
Agile Digital Mindset (DTL sets the mindset for changing environment and continuous learning to identify emerging trends)	Innovating	Organizational Agilist	Digital Mentee
Strategic Thinking (DTL sets and communicates digital strategy aligned with business goals)	Business Plan Development	Digital Strategist	Digital Pioneer
Accommodative Communication (DTL prepare appropriate environment for digital transformation)	Business Change Management	Digital Culturalist, Digital Workplace Landscaper	Enabler, Mentor
ICT Background Knowledge (DTL decide what technology is applicable together with existing systems)	Architecture Design, Information Systems Governance	Digital Architect, Data Advocate	
Qualified Sourcing (DTL identify reliable and valuable sources of information)		Customer Centrist	Networker
Implementation capability (DTL adapts business processes to implement digital strategy)		Business Process Optimizer	Innovator, Manager

The DISCOVER activity revealed all the attributes necessary to form the complete picture of the DTL job. Figure 6 depicts the division into two relatively isolated parts – intrinsic and transferable competencies. Agile digital mindset, strategic thinking, and accommodative communication represent the intrinsic DTL competencies that need to be incorporated into a high-level managerial or executive position, and these attributes are not time-bound. The second group of competencies can be transferred to IT professionals if the company is big enough to have an IT department. Of course, in the case of a small and medium-sized company, all the attributes can be concentrated in one person, usually the company's owner. Transferable competencies come into play in two time periods – during the selection of the appropriate technology and its implementation.

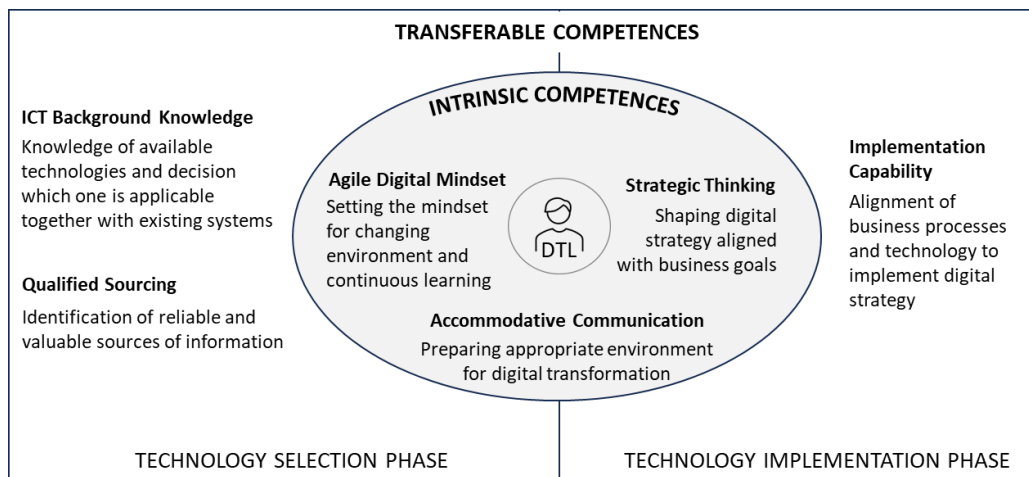


Figure 6: Decomposition of DTL attributes according to responsible person and period

Courses offered in our new study program already cover transferable competencies and partially accommodative communication. Therefore, in our new course we mainly focused on agile digital mindset, strategic thinking, and communicative skills.

3.2.2 BE INSPIRED

Continuing our path to course development, we embarked on the next phase, which involved a quest for inspiration on how to nurture best and cultivate students' agile digital mindset, foster their strategic thinking, and encourage them to be communicative. We hoped that by learning from the most innovative EU universities, we would move closer to crafting a transformative learning experience that would prepare our students for success in a dynamic and interconnected world. As the source of knowledge, we draw on the European Network of Innovative Higher Education Institutions (ENIHEI), comprising a dynamic forum dedicated to exchanging knowledge, ideas, and experiences on advancing a culture of innovation within higher education.

The network currently has 38 members: 28 members appointed by EU member states and 10 higher education institutions nominated by the European Commission. In our research, we searched for universities providing education in economics and closely related disciplines as we sought inspiration on how to prepare future managers and entrepreneurs with digital perspectives. Some schools are unilaterally oriented and do not teach economic subjects. However, the majority of the universities taking part host a faculty or school specializing in Economics or Business.

Two universities offer specialized study programs: Ca' Foscari University of Venice, Italy, and Zagreb University of Applied Sciences, Croatia. The Ca Foscari University of Venice offers a specialized study program in Digital management. They offer two consecutive courses, E-Business, Entrepreneurship, and Digital Transformation (I/II), with similar outcomes as we expect in our course. Therefore, we explored the courses for inspiration in instructional design; however, the information about learning activities, procedures, and techniques was quite brief: frontal lectures and lab activities in the form of group work on digital platforms and a final oral presentation. Zagreb University of Applied Sciences offers graduate professional study in Digital Economy. The course Digital Economy and New Economy Models introduces the impact of applying digital technology in various fields. The procedures covered traditional literature analysis, data mining and knowledge discovery on the web, essay writing, discussion, brainstorming, and interactive problem-solving.

Nine institutions offer courses focused on business digitalization, mainly Digital Marketing, Digital Transformation, Digital Disruption, or Digital Agility. Moreover, more than half of the participating institutions offered courses in which students acquire basic IT skills. The results suggest that the topic is up to date; however, we needed help finding specific learning (and teaching) procedures that would help us prepare our new course, except for the possibility of employing a living lab as proposed by the ENIHEI report.

Our search did not bring the expected results; therefore, we searched scientific and popular-scientific sources to learn how to help our students develop an agile mindset and strategic thinking. We obtained many articles about approaches to teaching agile methodologies such as Scrum or Canban to SW developers and explanations of strategic thinking. However, we needed examples of best practices that could help us to develop the course. Consequently, we approached a colleague from the Faculty of Philosophy and Arts for cooperation. As she prepares English language teachers, she is familiar with procedures facilitating students' learning. The whole team continued in the preparation phase and discussed appropriate and relevant learning and teaching procedures aligned with the scope of the course.

3.2.3 EMPATHIZE

When designing new courses, it is necessary to understand and analyze students' needs in the affective domain. Addressing the domain may enhance and foster a positive and meaningful learning environment by reflecting students' diverse needs (empathize with them), thus promoting students' achievements, and leading to successful completion of educational outcomes. As a result, our goal in preparing the course was to create an environment of positive mutual respect and collaboration in which students are deeply indulged in their professional learning and growth.

As this is a brand-new course, we had to draw on experience teaching other subjects and knowledge of Gen Z attributes. Gen Z is the first generation to grow up with widespread access to digital technology and the internet from a young age. This has shaped their communication, learning, and social interaction styles. Our previous experience has shown us that this generation can use technology effectively for everything they enjoy and are interested in (Kopackova, 2015; Lnenicka et al., 2020; Pospíšilová and Reimannová, 2013). However, when they have to search for specific information and formulate clear conclusions, the results do not often meet expectations. We decided to focus on this type of ability with selected tasks.

Due to the constant exposure to quick and engaging digital content, Gen Z generally has a shorter attention span. As the implication for our course, we decided to divide the content in terms of delivering information in concise and engaging ways. Gen Z also shows an interest in entrepreneurship and self-driven initiatives. They are more likely to seek out alternative paths to success and are comfortable creating their opportunities (Cilliers, 2017; Kopackova, 2014). Therefore, we planned to give our students enough space to select the topic of their interest.

Gen Z is accustomed to quick access to information and instant feedback due to social media exposure (Bilkova et al., 2023). It was obvious that regular feedback from the instructor and other students must be a coherent part of the course. Gen Z responds well to visual content, including videos, images, and interactive multimedia, so integrating visual elements into educational materials was necessary.

3.3 Case study – planning

According to the proposed framework, the planning phase distinguishes between DEFINE and DEVELOP activities. The DEFINE activity provides a high-level, comprehensive perspective or overview of a prepared course, abstracting from overwhelming details distracting attention. Just as a helicopter flying above provides a broad view of the landscape below, taking a "helicopter view" in planning involves stepping back from the details and intricacies to gain a broader understanding of the entire situation. This perspective allows planners and decision-makers to see larger patterns, connections, and implications that might be missed when focusing solely on the specifics. It is important to note that while the "helicopter view" is valuable for gaining perspective, it should be complemented by a balanced approach that also delves into specific details, the DEVELOP phase. Striking a balance between the broad view and the finer details is essential for effective planning and decision-making.

3.3.1 DEFINE

Our DEFINE activity comprised two steps: 1) a detailed decomposition of learning outcomes and 2) creating a graphic visualization of the whole semester with lectures and seminars. Learning outcomes with suitable tools are decomposed as follows:

- To develop strategic thinking for digital transformation – proposal of a business plan for digitization of a selected company with the incorporation of cost-benefit analysis and reasoned arguments supporting the selected strategy.
- To develop an agile digital mindset – division of the whole project into separate parts with a given time limit, changing requirements during the semester with graduate difficulty, regular feedback, changes in team structure, and prioritization tasks.
- To develop communicative skills – communication in teams of variable size, students had to agree on a structure in a large team and the role of leader, various types of presentation.

Visualization of the semester's structure helped formulate the distribution of the topics and periods for the project creation. During the semester, we had to plan seven two-lesson lectures once every two weeks together for all students. Seminars were planned for two lessons weekly, with students divided into three groups (20 persons each). Lectures were devoted to constructing an understanding of the agile approach, customer-centric solutions, process and financial issues related to digitalization, and introducing examples of company digitalization projects. Seminars were planned for the project and divided into three periods (sprints).

We also started to think about the possibility of exchanging partial results of the project among the groups to push our students outside their comfort zones by accepting the thoughts and proposals of other people. Students are used to project-based learning and working in teams, but by default, they usually develop their ideas from the beginning to the end and present them at the end of the semester. However, we wanted to facilitate the development of their agility and, simultaneously, simulate a real-life situation, when they are forced to take on the ideas of

others. An essential element of agility teaching is to become able to say goodbye to one's own idea, even though one may believe their idea is much better and should be developed. Working on a particular project and finding out all the invested effort and work done was useless is very stressful but quite common in the work environment. Therefore, preparing our students for this uncomfortable situation is helpful.

3.3.2 DEVELOP

Visualization of the semester and learning outcomes are used as a building block to proceed to the DEVELOP activity. We agreed on the sorting out the project tasks and exchanging partial results – project tasks, which meant that each project would be built by three separate groups. At the beginning of the semester, various modern technologies are introduced and discussed. Then, the project period is divided into three sprints. In the first sprint, students work four weeks in pairs to develop a stream of ideas (brainstorm) on how to employ new technologies in existing companies for either enhancing their business processes or making new products (10 projects per seminar group). These projects are then shuffled (from seminar groups A to B, from B to C, etc.) and introduced to different groups. Students vote (prioritize) on what projects should be developed further. Only five projects in each seminar group survive, and working groups grow to four members.

The second sprint takes three weeks, and students develop realistic expectations as they search for the costs of the solution and formulate benefits that can be calculated. Calculations of the payback period, rentability of investment, and net present value are summarized in an Excel sheet and again introduced to different groups.

At the beginning of the third sprint, students vote again for the best projects (now only two projects in each seminar group survive). Students work in big groups that need some form of structure; therefore, they need to agree on team roles: a leadership role and a division of the team into two parts: 1) backend – solve technical issues of the solution concerning customer, makes any changes in the solution or calculations which they consider necessary, 2) frontend – prepare visual style for presentation.

The next step is a project competition, in which all the students meet and see what projects survive. Students present their final projects and vote for the best. Each student and guest have the same number of votes as the number of projects in the finale, and they can choose what project to vote for on their free will. All votes can be given just to one project; or distributed according to participants' will. Students representing the winning project get a diploma. The last seminar is a feedback session.

3.4 Case study – course delivery

This chapter deals with the DELIVER activity, which describes the setting of the course, challenges, and discrepancies between expectations and real situations. The first challenge appeared even before the semester started when students enrolled in the course in the information system. We planned the course for about 60 first year students, representing three seminar groups (computer labs have a capacity of 20 people). However, 12 students could not proceed to the next semester as they did not achieve the minimum number of credits to continue their studies. Vacancies in the course were therefore filled by third-year students from various faculty study programs who needed extra credits. Another problem was that third-year students have a shorter semester to prepare for final exams. The length of their semester is 9, not 13 weeks, which means that they could not be present in the third sprint and complete the final presentation. To be fair in the assessment of all students, the third-year students individually prepared presentations on the topic of their bachelor thesis.

Two introductory weeks before the projects started proved helpful, as students can withdraw from a course during the first two semester weeks and change it for another without any problems. So, at the beginning of the first sprint, we knew that each seminar group had 18 students corresponding to 9 projects per seminar group (27 in total) at the end of the first sprint. Some other students abandoned the course during the semester because they quit school. The size of groups in the second sprint varied between three and four, meaning 15 projects. The size of groups in the third sprint varied between seven and ten (six final presentations). A visual representation of the whole process is depicted in Figure 7.

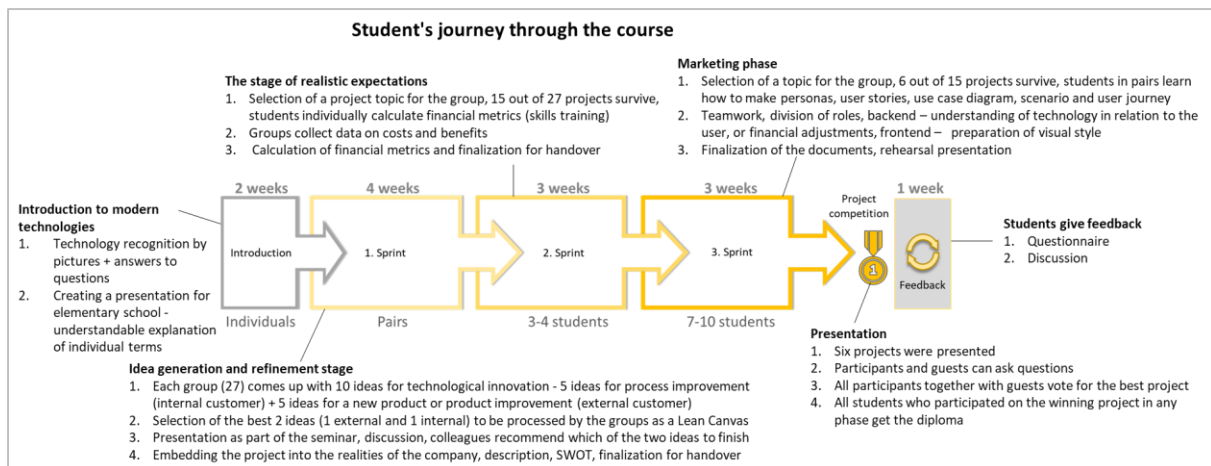


Figure 7: The flow of the course in the first year of application

The next challenge appeared due to strict timing. At the end of the sprint, the project tasks must be completed in order to pass them to the next group, which turned out to be problematic, especially in the first sprint when students work on the project in pairs, and both can be absent in the last week of the sprint. We solved the problem by direct communication between the instructor and these students; however, it was very stressful.

The last problem appeared while preparing for the final competition – project presentations. We wanted to make this experience as exciting and lively as possible. Therefore, we let students and guests decide about projects so no one would know which projects would win in advance. At the same time, we wanted to award the best project and present diplomas to its creators. This year, we solved this issue by preparing diplomas for all students before the project presentations and then used only those who won, but we know this strategy needs to be changed. The situation would become unsustainable if more students were enrolled in the course.

3.5 Case study – evaluation

Formal evaluation of the course started at the end of the semester; however, even before, the whole research team evaluated the progress and responded to the problems. As the source of information in the GATHER activity, we used observation notes, interim results of student works stored in LMS Moodle, final projects with the list of participating students, and feedback given in the last seminar. We also have an attendance sheet to check how often students were absent and the fulfillment of their assignments.

At the beginning of the preparation for the course, we had mixed feelings, balancing a high level of uncertainty on one side and many expectations on the other. If we COMPARE the results with expectations, we can state that the proposed concept works and is very positively received by the students. On the other hand, the time constraints and speed of the course place significant demands on the instructor. Giving feedback to all groups at each seminar is time-consuming, the instructor must be prepared for this situation and motivate students to submit the results of their work when they are done and not to wait until the end of the lesson. The tricky part is the end of each sprint and the beginning of another, as the instructor gathers all projects and prepares instructional materials.

Attendance of third-year students was a surprise initially, but in the end, we can evaluate it as very beneficial. These students were experienced in business thinking; they had a solid domain-specific knowledge of cost-benefit analysis. Two out of six final projects were based on the initial ideas of these students. It is one-third compared to the participation rate of the third-year students, 8 out of 50 who successfully finished the course. Based on observation, these students had quite reasonable thinking, focusing on feasible solutions. Adjusting study requirements for individual presentations to meet the student's needs was not a problem either for students, or the instructor.

At the beginning of the course, students did not have the right idea about Digital Transformation, as more students (59%) understood the term Digital Transformation to be only IT related, fewer students (41%) perceived it more comprehensively with opportunities for new processes and a focus on the customer. Students who became leaders in the third sprint were formed from the group which had complex and thorough insight, as 4 (out of 6) future leaders gave a more complex definition of the given term.

In the final questionnaire, we investigated students' perceptions of the project involvement process in the final questionnaire. In the first part, we were interested in whether they were comfortable working on multiple project tasks based on the shuffling of the project tasks within groups. Half of them answered, "It was interesting to try to develop someone else's topic." 44.7 % answered, "It was interesting, but I am sorry I could not process my idea." Only 5.3 % of students answered, "Handing over projects bothered me." As we intentionally incorporated this feature into our course to prepare students for disappointment, the result meets our expectations.

The second question targeted changes in the composition of groups during the project. 43.2 % answered, "I am happy, I met new people," 54 % answered, "It went pretty well," and just 2.8 % answered, "I did not like it." During observations, we found that the communication went well, and some students who seemed shy at the beginning opened up during the semester. Therefore, we expected a slightly more positive answer.

Students could also express themselves freely and comment on their thoughts and feelings. This part of the questionnaire was optional, and we explained to the students that we valued their opinions, but if they did not want to express themselves further, we would respect that. 47.4 % of students used the opportunity to make comments, some brief but very useful. We show the selected examples of quotes that helped the most in the next step, which is the formulation of improvements for the following year.

1. *The course was fine. It was great that everything was in the form of practice (exercise) and we had to process it ourselves (I might learn more that way). Some tasks took more work to understand - the task of persona processing, mainly use case and user journey. According to the template, there should have been a lot of it, and it was challenging, but after explaining that it was enough to grasp it, it was no longer a problem. Giving "easier" examples for this task would be nice.*
2. *I would rather choose the group myself, and it would be nice if the group were the same all the time.*
3. *For me, an exciting and beautifully crafted course. The skills I have acquired there have the potential to be used in everyday life. If the following course delivery is similar, I will happily go again.*
4. *I liked the form of working on the project because I have not experienced it in any other subjects. The only thing I am tired of is personas because I have done countless of them at this university. I also learned something new, for example, about RFID chips, which I had no idea about before.*

Based on the gathered information and our experience with the course, we decided to FORMULATE some adjustments in the content and the process of the course for the following year. At first, we saw that we needed to find a new tool to support students' customer-centric view of the solution. Students felt that the overuse of personas and the combination of various tools (use case, user journey, persona) was too demanding. In the next cycle, we continue with the project tasks shuffling and group members mixing as the feedback was overall positive, and we still see it as a powerful feature. Each year may bring different content to lectures introducing new technologies. However, the lectures on the digitalization process and financial topic may change only slightly.

4 Discussion

Creating a new course has revealed that translating the dynamic demands of the labor market into particular curricula and effectively implementing these plans within natural educational settings is a significant challenge. We did not want to reduce our course just to mere information presenting. Instead, we strived to foster critical thinking, problem-solving, and hands-on experience. At the same time, we wanted to document the creation of this course in order to spread a lesson learned that would help other scholars to innovate curricula based on the labor market requirements. We formulated an initial Curriculum Development and Redesign Framework (CDRF) to fulfill this goal and followed all the steps. During the process, we confirmed that the framework's logic was correct.

Nevertheless, we realized that the visual form of the framework should be modified to highlight some aspects that proved to be highly important in the course development process. The first aspect is the iterative nature of the pre-planning phase, which turned out to be more demanding than we expected. In this article, we describe the DISCOVER, BE INSPIRED, and EMPHATIZE activities as consecutive, but in reality, these phases were repeatedly intertwined. We often repeated two of these activities, then incorporated the third and repeated this process in many cycles until we came to the solid solution and proceeded to the DEFINE activity.

The second aspect is the difference in preparing the course in the first year and all the other consecutive years. The level of uncertainty and connectedness of all phases make the first year exceptional and demanding. As we wanted to alert our readers and prepare them for the complexity of the first-year experience, we made slight changes in the graphical representation of the framework. The intertwined pre-planning activities (a small cycle symbol) give rise to the burst of innovation (a deformed star symbol in the middle) that freely transitions from and to all phases – Plan, Act, and Evaluate. The final visual representation of the framework is depicted in Figure 8.

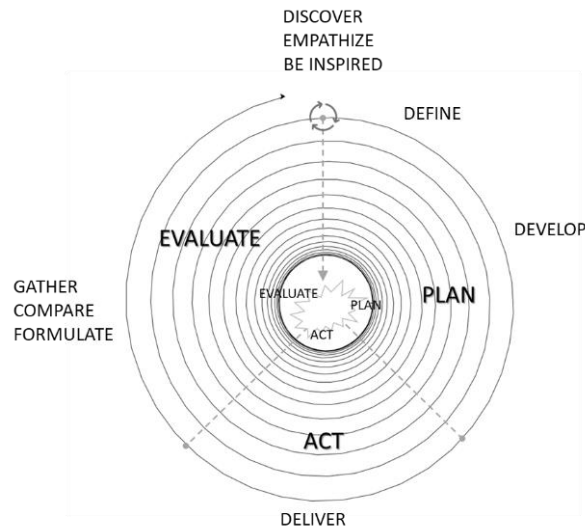


Figure 8: Curriculum Development and Redesign Framework (CDRF) – final version

5 Limitations of the research

There are several limitations of our study. The first limitation is the small sample size of 60 students, which might need more statistical power to detect significant effects or relationships. Moreover, the results can be influenced by the specifics of the Czech educational environment as there can be potential confounding variables that were not controlled for in the study but could influence the results. Further studies in various cultural settings are necessary to reveal hidden challenges. The subsequent limitations relate to data collection methods, as we used observations and questionnaires. These sources of information are biased in principle; however, they are standard research methods used in action research.

As the action research is meant to bring continuous improvement in the coming years, we can expect new limitations. For example, a considerable increase in the number of students in a course would burden the instructor significantly, so one instructor can only teach some groups. The advantage of the current setup, i.e., that one instructor leads all the seminars, resulted in a deep knowledge of all the projects and, mainly, understanding of the students. With more students in the course, instructors should meet during the semester to share their knowledge and experience so as to maintain the benefits of the setup.

6 Conclusion

This article opened the discussion about changes in labor markets that force education to evolve to meet the demands of the digital era with a specific question: "How to prepare future digital transformation leaders for their role?" We introduced and described new methods to enhance student's strategic thinking and agile digital mindset through active engagement, real-world relevance, experiential learning, critical thinking, and motivation. We revealed problems and challenges we encountered during our journey to formulate lessons learned and share our knowledge. We also proposed a novel Curriculum Development and Redesign Framework (CDRF) based on the unifying design thinking and action research approaches to develop our new course. We confirmed the framework's usability and offered it as a practical tool for other scholars.

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