

A MINI REVIEW TO DRAW ATTENTION OF PROFESSIONAL ON FUTURE COMPETENCES FOR DESIGNERS

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ABSTRACT

Higher education institutions that offer design education need to reassess their teaching content in light of societal changes and digitalization. As we transition into a post-digital era, higher education is undergoing significant transformations. Metacognitive skills and competencies relevant to the digitalized world are now essential components of modern curricula. Throughout the 21st century, design education has placed emphasis on design thinking, user-centered design, and the application of service design principles. Today's designers are expected to possess the ability to navigate complexity and tackle intricate problems. They are increasingly called upon to address complex challenges within diverse and interconnected development processes. It is impossible to develop a curriculum that can effectively forecast the future because the design sector and professional standards are evolving so quickly. The primary objective is to comprehend how the design profession will be perceived in the future and to pinpoint the critical skills that aspiring designers need to acquire in order to successfully traverse the digital workplace.

Keywords: Emerging Competencies, Digitization, Designers, Education

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INTRODUCTION

It is challenging to give a clear definition of design education because it comprises a vast range of degrees and programs. Although interior architecture and visual communication design are frequently linked to design education, it also encompasses areas like systemic design and service design. In response to the implications of Industry 5.0 on comprehending and creating complex processes, the research explicitly looks at design education and its possible relationship to relevant subject fields [1, 2].

Higher education in design faces numerous challenges due to digitalization, societal shifts, technological advancements, and global transformations. The most recent change that education must adapt to is the post-digital era, known as Industry 5.0, which is currently shaping contemporary Western society. These societal changes impact curriculum content and pedagogical approaches in design education. While technical skills, software proficiency, visual aesthetics, and design principles have historically been the focus of design

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education, the post-digital world, advanced artificial intelligence integration, and the rise of complex problems have significantly altered the opportunities available to designers and the nature of employment [3, 4].

The traditional concept of a lifelong employee within an industrial company has evolved into a more dynamic professional model, where individuals take on diverse roles and engagements throughout their careers. The required competencies for designers have rapidly changed, necessitating an exploratory mindset and a broad skill set that includes economic, environmental, social, and technical proficiencies. These multifaceted skills are essential for developing innovative solutions in a rapidly changing, digitalized world. The shift in service designers' skill sets reflects a change in societal demand from products to services and, ultimately, to broader societal transformations. Modern designers collaborate on complex and wicked societal problems at both local and global levels. While design education has traditionally focused on product, interface, and interaction design, the design profession and practice context have evolved significantly over the past last two decades [5-9]. In the post-digital age, design education and designers as service developers are vital. Design is essential for forming future ecosystems and communities since it is both a material and immaterial world-building activity. Design has an impact on people's lives and is complicit in the problems we face today. The difficulty is in implementing this change, which calls on us to teach designers and design researchers to think differently [10-12].

DESIGN EDUCATION

The field of design itself has expanded dramatically in recent years, in addition to the growing number of specialized design education programs. These days, designers are using their expertise in a variety of fields, such as systematic design, sustainable design, organizational design, and service design. Designers are now seen as strategic planners of the

digital era in addition to being skilled artisans. The researcher identifies four themes—performance, systemic, contextual, and global—that have historically served as the foundation for design education. These themes shape the future of design and design education. Currently, most design education programs focus on performance-based training, with only a few offering relevant instruction in systematic and contextual frameworks, and very few addressing global challenges in their curriculum. According to Wilde, the challenge of design education is twofold: in order for designers to use their world-building skills for significant and meaningful impact, society must acknowledge the potential of design beyond material and interaction aesthetics, and designers must develop the skill of transformative innovation. Thus, the purpose of design education is to create responsible, informed, and competent professionals who can help people accomplish their objectives more successfully.

Demand for Designers in Modern Era

In higher education, curricula are designed to meet the needs of the working world and the skills expected from graduating students. Developing a curriculum involves balancing current skills with future requirements. The motivation for curriculum reform comes from various sources, with a substantial portion of input coming from statistics. Statistics offer insights into factors like graduates' employment opportunities, geographical distribution, and job status one, three, and five years post-graduation. They also provide a broad overview of the roles that graduates typically assume after completing their studies [13, 14].

Transitioning from Industry 4.0 to Industry 5.0 necessitates significant changes for many businesses. As digital technologies continue to integrate into daily life on both individual and organizational levels, they play a crucial role in fostering sustainability and a circular economy. This economic and societal shift creates new career opportunities for designers who are equipped to understand complex systems and think iteratively.

Digitalization in Design Education

The research reflects the findings from Finnish higher education in design, where the content is diverse and under pressure for change, similar to global trends. These challenges are intensified by the fourth industrial revolution, a period characterized by the fusion of technologies across physical, digital, and biological realms, impacting various industries worldwide. To thrive in this era, designers must be proficient in physical, digital, and biological spheres to adapt to technological advancements effectively. The design process has evolved due to the fourth industrial revolution, presenting both familiar and drastically changing aspects. Meyer and Norman categorize these challenges into four groups: performance, systemic, contextual, and global challenges.

The 21st century has witnessed a rise in digital products and services, blurring the lines between physical and digital realms. Digitalization, often linked to dematerialization, has led to the integration of user interfaces and software applications into numerous products. The latest development, artificial intelligence (AI), holds significant potential for the design field. However, it is crucial to debunk misconceptions surrounding AI's role - it is meant to enhance, not replace, designers by expediting the design process and improving outcomes [15, 16]. Recently, there has been a shift towards Industry 5.0, building upon the principles of Industry 4.0 with a focus on research, innovation, and human-centric approaches. The European Commission's report "Industry 5.0: Towards a Sustainable, Human-centric, and Resilient European Industry" emphasizes the importance of resilience, sustainability, and ethical considerations in the digitalization and AI adoption processes. This concept marks a notable change that aligns with the fifth industrial revolution, emphasizing the need for higher education to equip professionals who can anticipate and address the evolving societal demands introduced by Industry 5.0.

Digitalization refers to the restructuring of social life around digital communications and the use of digital technologies. This shift also creates new demands for individual professionals, impacting those working in design as well. One way to understand these changing competencies is through the European Commission's DigComp framework. This

framework serves as a valuable tool for evaluating the competencies of design education and comparing them to the expected standards. Therefore, this study also utilizes the framework to identify the specific skills that designers are expected to possess based on existing research.

In the age of digitization, the DigComp framework has shown to be a useful tool for developing curricula in higher education. The framework must be updated to include new competencies as society moves into the Fifth Industrial Revolution. The DigComp framework will be used to compare the study's literature review, and the findings will be presented in a way that complements the framework [17-20]. The framework's levels take into account the cognitive domain, autonomy, and task complexity. Information and data literacy are the main topics of relatively easy exercises at the Foundational level. Digitalization is defined as "marking new socio-technical structures through digital artefacts and changing the artefacts themselves." On the other hand, highly specialized individuals are able to solve complex problems with limited solutions; autonomy is achieved through integration to professional practice and guiding others; and the cognitive domain is fulfilled by an individual's ability to create new solutions.

METHODOLOGY

This study employed a systematic literature review methodology, which involves summarizing previous research on a specific topic to identify essential content. Systematic literature reviews serve to map discussions, screen out relevant scientific findings, and highlight important studies. SLRs provide an explicit and reproducible method for locating relevant work by researchers, scholars, and practitioners to address a specific research question. By collecting all relevant publications that meet pre-defined inclusion criteria, SLRs aim to answer specific research questions comprehensively. The systematic approach minimizes bias in the search, identification, evaluation, synthesis, and analysis of studies. SLRs primarily analyze existing primary data to gain insights into the research question at hand. These reviews aim to present a fair and objective evaluation of a research topic using a

reliable, rigorous, and transparent methodology. This review collected ideas on how design education and its future are perceived among scholars, as well as how design education should be developed in higher education. An SLR offers a thorough understanding of the information developed in previous research, which may also contain conflicting results. The competencies required for future curriculum development and design education at the higher education level were the specific subjects of this study. The review's objective is to examine the future competencies described in research on the evolution of design education. Planning the review and its protocol, discovering pertinent papers, conducting the review, analyzing and synthesizing data, and reporting the procedure and results are the five stages of this study. To guarantee a methodical approach, the PRISMA standard was adhered to. An evidence-based minimal set of items for reporting in meta-analyses and systematic reviews is provided by PRISMA [21, 22].

Seven pertinent databases were searched as the first step in the data extraction procedure. Elsevier, ProQuest, Taylor & Francis Online, Wiley Online Library, EBSCO, Scopus, and Web of Science were among the databases searched to find pertinent studies. These databases were chosen on the basis of their accessibility, publishing profiles, and thematic relevance. Scientific databases were used to find pertinent peer-reviewed publications published in English between 2014 to 2024. The exclusion criteria have to be in line with one of the disciplines because this research is multidisciplinary, combining design and educational research. The educational research tradition was chosen as the deciding factor over design research since the study question relates to curriculum development. For example, this study did not include conference papers or proceedings. Databases were first searched using study-related keywords. After that, irrelevant articles were eliminated and

duplicates were eliminated. Preliminary coding was used to assess the remaining articles.

The coding process involved deductive content analysis with a predetermined set of categories or codes. The first author conducted the coding and analysis. Codes were based on two main research questions: "What are the future competences for designers?" and "How should the new competences be integrated into design education?" The keywords and selective codes used in this research were: design education, competence, working life, and digitalization. The research focused on changes in design education, needed competences in the workforce, the impact of digitalization on working life, and employee skills. The gathered information was organized into two tables. One table included basic article information (theoretical background, methodology, sample size, instruments, findings, and future research questions), while the other table presented findings based on the coding system [23, 24].

Content coding method was used to review the articles. Coding is an essential step in data analysis for creating categories and developing theories. The coding process began with open coding to identify relevant concepts, followed by selective coding to solidify core categories, and concluded with establishing relationships between related concepts and core categories. The initial data analysis phase involved a detailed examination of the subject area to ensure accurate results from chosen keywords. Selective codes were then developed based on core material gathered during this phase. Selective codes in this study included design education, digitalization, competence, and working life. The content of the chosen articles was classified using the selective codes once they had been coded. Sub-codes including problem solving, thinking technologies, co-creation and co-design techniques, and meta-competence skills were added to the design education code. Sub-codes such as

the capacity to comprehend dynamic corporate contexts, interdisciplinary problem solving, self-initiative, and flexibility were included in the competence and working life codes. Sub-codes for the digitalization code included information management skills, analytical thinking, and emotional intelligence.

RESULTS

The publications included for this study address a variety of subjects from competency, educational, and industrial viewpoints. Instead of addressing every problem found, each article concentrates mostly on one subject. The absence of studies that thoroughly examine digitalization, competency, design education, and working life in a single study is highlighted by this analysis. Through the research process, it became evident that digitalization is no longer the primary factor driving societal changes. The emerging concept that must be considered in future design curriculum development is the Fifth Industrial Revolution, Industry 5.0. While current design education accounts for digitalization, the focus should shift towards understanding the competencies required by Industry 5.0 in the upcoming development phase. Therefore, the results are presented in relation to Industry 5.0 rather than a digitalization framework, as Industry 5.0 inherently encompasses digitalization competencies.

DISCUSSION

Future Competences for Designers

Analysis of selective codes like Competence and Working Life, along with their sub-codes, reveals the evolving competences expected of future designers. The impact of post-digitalization and the rise of Industry 5.0 is clearly evident from the coding, indicating a shift towards addressing global challenges and systemic issues in the working life of designers.

Industry 5.0 addresses significant challenges such as climate change and biodiversity collapse. To address these challenges, a global shift towards systemic

change across all societal levels is necessary. Interdisciplinary problem-solving skills are crucial for designers working in a social and global context. The transition from Industry 4.0 to Industry 5.0 emphasizes the need for resilient, sustainable, regenerative, and circular economy practices over traditional overproduction and consumption models. This shift requires changes not only in industries but also in the education sector to emphasize sustainability and problem-solving competencies further [25, 26].

Industry 5.0 places a strong emphasis on environmental policy and sustainability. As a result, it is crucial to focus on competencies that will ensure the effective design and development of future goods and services. Curriculum should highlight competencies such as facilitation, resourcing, systems thinking, anticipation, normative competency, strategic competency, collaboration, critical thinking, self-awareness, and integrated problem-solving. Designers must enhance their creative practices and adopt bottom-up approaches to navigate various disciplines. Curriculums should also include meta-competences like integrative thinking, enabling analysis, synthesis, problem-solving, and continuous learning to prepare designers for the evolving landscape. Scientific, critical, and systemic thinking are essential for designers to address contextual challenges and contribute to environmental transformation.

The evolving work environment requires designers to have a deep understanding of complex and interconnected forms of cooperation. Knowledge work now involves more ambiguity and complex interactions, necessitating personal involvement, self-initiative, flexibility, autonomy, and mobility. Designers play a crucial role in providing sustainable solutions through their creations, be it artifacts, atmospheres, or services. To thrive in the fifth industrial revolution, designers must excel in physical, digital,

and biological spheres and possess the ability to adapt to rapid technological advancements while considering societal and environmental impacts. They must be adept at estrangement and comfortable with uncertainty to foster innovation.

Today's focus is not just on the object itself but on the entire ecosystem, encompassing organizational structures and social issues. Designers operating in these environments must view the system holistically, understanding its complexities through analytical and critical thinking, collaboration, and teamwork. Future designers should possess transferable skills that enable them not only to grasp disciplinary or interdisciplinary knowledge but also to apply this knowledge effectively in diverse situations. The ability to adapt, change, and build knowledge and abilities for various situations is known as transferable skills.

Design Education with Emerging Competencies

The paradigm shift from digital and service design to wicked issues and process design is strengthened by design education, digitalization, and their sub-codes, Selective Codes. While the second study question highlights the pressure for change in thinking skills, the competence and working life codes indicate the impact of social change on a designer's work.

Design education must focus on coping with complexity and how teaching and learning methods support students in working within the complex environments brought about by the Fifth Industrial Revolution. Understanding fluid business environments is essential knowledge for future designers. They are not only expected to be creative in their work but also to have a deep understanding of intertwined business environments and stakeholder needs. One study recommends close collaboration and sharing of creative processes through social participation in real-world industry-academia cooperation. Encouraging and enabling communities of practice at a grassroots level is also crucial [27, 28].

Modern design challenges are not always more difficult than those from the past. One of the main forces behind design evolution is the ability to deal with complexity. The seeming sharp rise in complexity is not only the result of outside factors like societal and technical advancements, but also of designers' growing ambition and capacity to recognize and handle such complexity. In order to be authentic in learning, one must solve ill-defined problems in interdisciplinary contexts, build active relationships and collaborations with professionals and experts in the field, and—most importantly—get industry-driven standards and feedback to direct the work. The knowledge economy and the Industry 5.0 framework depend heavily on competencies for a sustainable economy and the capacity to autonomously and creatively address difficult problems while working.

We need to train designers for the inherent instability of the current situation rather than imparting skills related to antiquated procedures and working practices. In addition to immediate crises like climate change, ecosystem collapse, social and environmental inequities, conflict, mass migration, poverty, and food scarcity, designers must be prepared to handle unforeseeable possibilities. Bringing disparate stakeholders together without diluting viewpoints or experimental approaches is a crucial problem for design in the face of global issues. Complex problem solving requires critical, systemic, scientific, and creative thinking—thinking abilities that may not be sufficiently taught in today's design school. Critical thinking involves actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information to guide belief and action. The fundamental reasoning that students need to acquire in order to evaluate and understand intricate global systems and events is known as systemic thinking. Using logical, analytical, systematic, inductive, and deductive reasoning to define, identify, create alternative suggestions, and find best solutions, scientific thinking helps students confront a variety of problems in a time of

global competitiveness. Co-creation pedagogy, in which educators, students, and business work together to address common issues, is the most efficient way to build these skills. Intense collaboration is nothing new in higher education, but it is essential to improve it in the context of Industry 5.0. Key competencies include collaboration among stakeholders, the application of open-strategy and innovation methodologies, and the ability to work on complex problems by utilizing specialized knowledge from various disciplines to achieve a common understanding. This collaborative effort leads to positive outcomes and revitalizes approaches to tackling complex issues and significant societal challenges. Transferable skills involve not only understanding disciplinary or interdisciplinary knowledge but also being able to apply this knowledge effectively in different situations. It is essential to adapt and develop competencies to suit varying circumstances [29, 30]. Researchers emphasize the importance of debating current issues, exploring different solutions, and envisioning alternative futures. Future professionals will need to possess competencies that go beyond current educational offerings to meet the demands of Industry 5.0. Creativity and flexibility in thinking are key competencies for future designers. Creativity is multidimensional, comprising fluency, flexibility, originality, and elaboration. During the research process, efforts were made to investigate design education, considering the various influences on it. The study challenges existing research by exploring newer, less-researched social themes such as sustainability thinking and transitioning from a user-oriented design approach to a planetary design framework. The research findings have been refined concerning design curricula, and the final results will be shared with design educators as part of the design thinking reference framework. Future competencies for designers and the content for the future designers' curriculum framework are offered in relation to the DigComp frameworks based on the results

of the comprehensive literature review. The outcomes of the systematic literature research also integrate the curriculum's content structure with designers' future competencies.

CONCLUSION

The critical competencies for future designers include critical thinking, collaboration in multidisciplinary teams, systemic understanding, and communication skills. These core competencies should guide curriculum development, with the unique demands of Industry 5.0 emphasizing sustainable development principles, ecosystem design, and the application of sustainable design skills across various contexts. In contrast to Industry 4.0's user-centered design approach, a focus on planetary design is paramount in all activities. Regarding complex issues, relevant competencies for curriculum planning involve problem-solving capabilities, adapting design principles to new contexts, and continuously updating expertise to meet current demands.

The evolving research questions underscore the need to enhance meta-skills in teaching. Design methodologies and practices are at a pivotal juncture, heavily influenced by Industry 5.0's emphasis on sustainability across all design endeavors. Design has transcended its traditional focus on aesthetics and functionality to encompass strategic, perceptual, and ideological dimensions. Previous studies have envisioned designers' evolving role as catalysts for socio-cultural innovation, bridging diverse knowledge domains and creating new frameworks to facilitate positive cultural transformations.

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