

USE OF ICT AND AI IN DESIGN AND PRODUCT DEVELOPMENT BY SME'S IN THE CREATIVE SECTOR, INCLUDING CRAFT AND ARTISAN MAKERS

Magdalena RATALEWSKA

University of Lodz, Faculty of Management, Department of Entrepreneurship and Industrial Policy;
magdalena.ratalewska@uni.lodz.pl, ORCID: 0000-0001-7257-6840

Purpose: This article aims to explore the use of ICT and AI technologies in the design and product development of SMEs in the creative sector, identifying the key benefits brought by these technologies, the barriers and challenges faced by the companies analyzed.

Methodology: quantitative research was conducted in 2018/2019 and 2023/2024, using a survey questionnaire aimed at SMEs in the creative sector in Poland. The degree and manner of application of ICT and AI in product design and creation was analyzed, focusing on various industries including artists and craftsmen.

Results: The results indicate that a significant proportion of the surveyed companies are actively using ICT in the product creation process (78% in 2018/2019 and 61% in 2023/2024). The use of ICT, AI and machine learning varies depending on the industry and the specifics of the business. Some companies express resistance to the implementation of ICT and AI, preferring traditional work methods due to the desire to preserve the uniqueness and authenticity of products.

Research limitations/implications: The study is limited in terms of sample representativeness and may quickly become outdated due to the rapid development of technology. Further research with a broader and more diverse sample and in-depth qualitative analysis is suggested. Additionally, the research was conducted only in Poland, which may limit its applicability to other geographical contexts.

Practical implications: The results highlight the need to support SMEs in the creative sector through ICT and AI training programs, access to experts, and financial and infrastructure support. It is also important to develop strategies and policies to support the integration of digital technologies, taking into account industry specifics and intellectual property protection.

Originality/value: The article fills a research gap on the use of ICT and AI in creative sector SMEs, providing up-to-date data and analysis. It provides valuable information for researchers, practitioners and policy makers interested in developing this dynamic sector of the economy.

Keywords: ICT, IT, SMEs, Creative sector.

Category of the paper: Research paper

1. Introduction

The creative sector and its industries are playing an increasingly important role in the modern economy, especially in highly developed countries, where it is one of the fastest growing economic areas. Its driving force is the introduction of innovative products to the market, which at the same time create new jobs. The sector relies on human skills and talent, and is based on the extensive knowledge of creators, which results in diverse and unique creations. Products of the creative sector are characterized not only by the features of a typical market commodity, but also by special added value, which is often provided by an interesting and well-thought-out form and high quality. Increasingly, these products are not simple, but complex or highly complex, which require the cooperation of numerous specialists and artists and the involvement of new technologies. Creators and employees in the creative sector often emphasize the originality of their creations, and creativity in the process of making products or providing services is one of their main motivators for work. The diversity of the creative sector's creations is an important part of its peculiarities, being both a factor in the success of businesses and a source of additional challenges. The complexity and uniqueness of the products require coordination and cooperation at various stages of production, which is key to achieving high-quality final results. Activities in the creative sector provide its creators with the opportunity not only to earn money, but also to benefit from intellectual property rights.

One of the significant elements of the creative sector is the integration of information and communications technology (ICT) and artificial intelligence (AI). ICT and AI play or can play an important role in the processes of creation, production and distribution of creative products, enabling not only automation and efficiency, but also new forms of interaction with audiences. Artificial intelligence makes it possible to analyze large data sets, predict market trends and personalize user experiences, which significantly increases the appeal of creative sector products. The integration of modern technologies, such as ICT and AI, into the creative sector allows even greater use of the potential of human creativity, opening up new opportunities for creators and businesses and contributing to the further development of this dynamic sector of the economy.

The creative sector creates those activities whose significant part of value added is intangible in nature, and whose cultural values of products (e.g., symbolic meaning, branding, or design) are at least as important as their utilitarian qualities. The role of these activities in the economy is constantly growing, as shown by empirical studies conducted in various parts of the world (cf. Florida, 2002, 2005, 2008, 2010, 2017; Caves, 2000; Hawkins, 2002; Garnham, 2005; Hesmondhalgh, Pratt, 2005; Cunningham, 2005, 2011; Piber, 2020; Dellisanti, 2023; Salder, 2021; Koch et al., 2023; Micheli, Jansen, 2024).

In order to achieve the research objective, content analysis was carried out on leading databases of scientific publications, including conference articles, such as BASE, Emerald, ScienceDirect, Scopus, SpringerLink, Web of Science and Wiley. To streamline the research process, the EBSCO Discovery Service tool was used, which allows simultaneous searching of the aforementioned databases through a unified interface. The study covered the period from 2014 to 2024. The research keywords that were used to search for publications included: (1) “Information and Communications Technology” OR “artificial intelligence” AND “Small and medium-sized enterprises” - 80,876 results; (2) “Information and Communications Technology” AND “artificial intelligence” AND “creative sector*” OR “creative industries*” - 45,052 results. After eliminating from the search results papers that did not meet the research objectives - mainly due to inappropriate topic coverage - 132 publications were finally identified that met the analysis criteria. As can be seen, there is a lot of research on issues related to the use of ICT tools and IA by SME enterprises, but there is still a noticeable gap in the research on the use of ICT and IA in SME enterprises operating in the creative sector. The purpose of the research described in the article is to analyze the use of ICT and IA in the design and creation of products of SMEs in the creative sector.

2. Creative sector

The term was first introduced by the UK's Department for Culture, Media and Sport (DCMS) in 1998 to describe industries that derive from individual creativity, skills and talent and that have the potential to create wealth and jobs through the creation and exploitation of intellectual property (DCMS, 1998, p. 3). Creative industries encompass activities at the intersection of art, business and technology, producing symbolic products that rely heavily on intellectual property (UNCTAD, 2004, p. 4). The significant size of creative sector industries and the dynamic pace of their development over the past two decades have attracted the attention of both theorists and practitioners eager to learn more about its characteristics and opportunities (Caves, 2000; Landry, 2000; Florida, 2002, 2005; Hesmondhalgh, 2002, 2013; Miles, Green, 2008). As Caves (2000, p. 40) points out, the creative sector is distinguished from other sectors by, among other things, the hard-to-predict demand for its products. The complexity and diversity of the sector's products contribute to the difficulty of understanding audience reactions and predicting their market behavior. Landry (2013, p. 11) defines the creative sector as a sector of activities leading to the production of a product whose added value is an original, original idea, related to the form and/or function of the product or the manufacturing technology and/or materials used. The added value makes the product competitive with other creations (due to its unique, unrepeatable character, functionality, aesthetics or price). Cunningham (2011) considers the creative sector as a collective term

covering a wide range of activities that link technology, culture and the economy. He defines it as an area of activity where cultural and creative production combines with technological and market innovations and considers the impact of digital transformation on these industries. Garnham (2005) emphasizes the economic aspects of the creative sector, defining it as industries that produce and commercialize cultural goods. His definition emphasizes the importance of intellectual property and profits generated by creativity, making it a key component of the modern knowledge economy. Jason Potts et al (2008) expand on the definition of the creative sector, describing it as a system of dynamic interactions between creativity, new technologies and the economic aspects of culture. They define the creative sector as a collective enterprise that creates value through networks, creativity and innovation, which transforms the traditional cultural industries into more integrated and technology-dependent activities. Each of these definitions highlights different aspects of the creative sector, from technological and cultural innovation, to economic implications, to networking and social interactions, demonstrating its complexity and multidimensionality.

According to a Europe-wide definition created by Kern European Affairs, the creative sector can be divided into two types of activities: cultural industries and creative industries. Cultural industries include such fields as film and video, television and radio, video games, music, books and press, while creative industries include design, advertising and architecture. Cultural industries are types of cultural activities whose outcome is related to purely artistic dimensions and traditional arts. Creative industries, on the other hand, use culture as an added value to produce non-cultural products (Kern European Affairs, 2006).

Following in the definition of the United Nations Conference on Trade and Development (UNCTAD), the creative sector or creative industries are defined as cycles of creation and production, distribution of goods and services that use creativity and intellectual capital as the main elements of the process (UNCTAD, 2010). UNCTAD also introduces the concept of a “creative product,” which is the result of the work of a creative individual (creator) and can be both a tangible and intangible product (Caves, 2000). The Statistical Office of the European Union (Eurostat) defines creative industries as cultural enterprises that create and distribute goods and services that are perceived as having individual, unitary attributes, use or purpose, and that include or carry artistic and cultural expression, regardless of their commercial value. Creative and cultural enterprises are involved in creating and providing market products and services that result from cultural and creative, artistic contributions that determine their value. This area includes the following cultural spheres: national heritage, libraries, archives, books and press, visual arts, performing arts, multimedia and audiovisual arts, architecture, advertising and handicrafts (ESSNet-Culture, 2012).

In Poland, too, the Central Statistical Office (CSO) has been involved in sorting out the terminology of the creative industries and assigning enterprises to appropriate categories. Based on the 2007 Polish Classification of Activities (PKD) and taking into account the field of culture, the CSO has proposed a model covering various areas of the creative industries.

These areas include: architecture and interior design; publishing; national heritage, libraries and archives; art education; fashion and industrial design; film and television production; radio and music production; programming; advertising and related activities; handicrafts; performing arts; and visual arts. For the purposes of this study, it was assumed that the creative sector consists of various creative industries according to the Polish qualification and combines elements of art, culture, technology and economy to create unique products and services that stand out in the market for their originality and intellectual value.

3. Products of the creative industries

As already mentioned, the definition of creative industries includes products whose creation depended not only on factors related to satisfying the author's need to produce a message following the creative process inside them, but also products created as a result of the creator's deliberate search for ways of expression (through a good or service), aimed at profit in material form. It should be emphasized that the products of the creative industry are created as a result of the work of creative people with high intellectual potential. A creative product is the result of the creator's work and can be both tangible and intangible in nature. The key characteristics of creative products are originality, individuality, and creativity, which give them a unique character that reflects the personality of the creator. Creative products can be divided into simple and complex products. Simple products include material things that require the use of tools to make them. These are durable products, most often capable of repeated use. The designer of such a product is a creative person, but non-creative entities may be involved in its production. An example of a creative product is a service, which can be a stand-alone creative service, such as an art exhibition, or part of another creative product, such as the makeup of actors for a film. Another key category is content that, although intangible, is graspable by the viewer and has an artistic effect. This category includes literary works, paintings, and musical works (UNCTAD, 2008). Composite products include events that are characterized by organizational and thematic coherence and are linked to the place where they are held. These products can be modified in terms of features or location, covering such forms as concerts, conferences and fashion shows. Another type of composite product is a venue, which is most often a facility where creative services are provided. These can include cultural venues such as art galleries, as well as craft studios or squats (UNCTAD, 2008).

The products of the creative sector are characterized by several unique features. First, due to the experimental nature and subjectivity of the experience, there is a great deal of uncertainty about the demand for a product or service (nobody knows). Second, for creator-entrepreneurs, art is an end in itself, bringing satisfaction from the act of creation. Production requires the simultaneous use of the varied and specialized skills of many people with different

tastes and preferences, with each person's contribution meeting minimum quality and quantity requirements. Diversity exists in both quality and content, and combinations of production factors are unique. Small differences in the skills of the people involved in creative work lead to large differences in their salaries. Coordination at successive stages of producing elements of the production process is extremely important and affects the outcome of the work on a product or service. In addition, the products of the creative sector are characterized by high sustainability, as is the process by which creators benefit from them (Caves, 2000).

Goods and services produced by the creative industries sector have a certain intellectual value, which can be the subject of protection by law, and which is related to the creativity required to produce them on the part of the creator. Products produced by the creative industries sector create a certain cultural value, which consists of aesthetic, spiritual, social, historical, symbolic, and authenticity values. Products produced by the creative industries sector are characterized by symbolic value – for they convey symbolic meaning or specific messages, so that they do not merely perform a utilitarian function, and this, among other things, distinguishes this sector from creativity within science, whose goal is to learn about the world and make it more human-friendly. The products produced by the creative industries sector are created in response to consumer demand, which is very difficult to estimate and study effectively, which contributes to the risks associated with operating in this industry, which are difficult to calculate, and the strong asymmetry in the costs and revenues of companies. The aforementioned indeterminacy also contributes to the difficulty of correctly estimating the cost of producing a product and the price accepted by the market. The products of the creative industries sector, thanks to their symbolic nature, can create symbolic capital that stimulates the creation of further products in these sectors. It is worth noting that they can stimulate not only other creators of creative industries but also inspire traditional industries.

4. Information and communication technology (ICT) and artificial intelligence (AI)

Economic transformation, technological advances, and globalization are moderating the shaping of how organizations and individuals define and structure production processes, as well as influencing how societies consume the products of these organizations and individuals. The development of the Internet plays a key role in these economic and socio-cultural transformations, enabling further digitization of media and social interaction. Information and communication technology (ICT) tools have facilitated greater digitization of media and creative-social interactions (Munar, Gyimóthy, Cai, 2013). Digitization has also influenced the deinstitutionalization of media conglomerates, opening up new opportunities for creators to reach wider audiences (Hirsch, Gruber, 2015). In addition, new business models are emerging

thanks to digital technologies, allowing creators to generate more value from their work and leverage it. Social media platforms are evolving, creating value from user contributions through the digitization of texts, sounds, and images. Users are contributing their knowledge and creativity to the rapidly growing global phenomenon of sharing and downloading content, which contributes to their popularity, shaping and changing public perceptions of products and organizations. As a result, ICT and social media are transforming traditional production functions, co-creating value across the historical boundaries of producers and consumers, and redefining the roles of intermediaries, gatekeepers, and experts, with significant implications for the creative industries due to their specificity (Pedersen, Slavich, Khaire, 2020, pp. 1-3).

Technological developments in digital media and information and communication technologies (ICT) are playing an important role in shaping creative industries, which are using innovation to transform both production processes and cultural aspects of business. Creative industries, use new technologies to explore new business opportunities and expand into global markets (Peris-Ortiz, Cabrera-Flores, Serrano-Santoyo, 2019, pp. 2-3). With their ability to generate creative content that impacts both local and international communities, these industries are helping to shape new directions in culture and the economy (Pedersen, Slavich, Khaire, 2020). The development of the Internet and related ICT technologies has enabled greater digitization of media, which in turn has helped transform the way people communicate and consume content. This affects new opportunities for creators and consumers to access and distribute content (Hirsch, Gruber, 2015). The increased reliance on digital technologies leads to issues related to copyright, data privacy, and digital security.

Artificial intelligence (AI), has become the next stage of ICT development, which is an advanced information technology that enables computers to understand and mimic human communication and behavior. By using collected data, AI makes it possible to create intelligent machines that think, react, and perform tasks in ways analogous to humans. Artificial intelligence is used to perform complex and specialized tasks, such as robotics, speech and image recognition, natural language processing, and problem solving. It is a set of different technologies that are capable of performing activities that require human intelligence. When applied to standard commercial processes, AI adapts by learning, acting, and performing tasks with human precision, simulating human intelligence in machines, and saving time and money in business operations (Toorajipour et al., 2021; Chintalapati, Pandey, 2022; Marinchak, Forrest, Hoanca, 2018; Soni, 2020). Artificial intelligence (AI) has revolutionized many aspects of daily life, including the way we do business. Today, not only large corporations but also small and medium-sized enterprises (SMEs), which traditionally relied on experience and intuition, are increasingly using AI to increase their productivity and competitiveness (Chaudhuri et al., 2022, 2023).

Initially, the main applications of AI focused on business process automation and data analysis, which is often referred to as hyperautomation. With the development of machine learning technologies, it has become possible to use AI to analyze large data sets, predict market trends, make management decisions, minimize risks, and assess customer satisfaction (Zapata-Cantu et al., 2022; Bharadiya, 2023). Artificial intelligence, already an integral part of many industries, is creating intelligent machines and devices that can think and react like humans. Called the next stage in the evolution of the industrial revolution, this technology has the potential to solve today's problems and anticipate future challenges. AI can also stimulate the creation of new technologies, industries, and environments by simulating human intelligence through machines, which includes learning, reasoning, and, most importantly, the ability to self-correct (Kaplan, 2021; Elhajjar, Karam, Borna, 2021).

In a global context, artificial intelligence (AI) and machine learning (ML) are seen as solutions that can significantly contribute to economic and social growth, offering new opportunities for businesses around the world. These opportunities range from automation to personalization in customer interactions, which can lead to better customer service and more efficient resource management (Tiwari et al., 2020; Schiessl et al., 2021; Frank, 2021). In addition to the improvements AI brings to businesses, there are some controversies surrounding its application in business. On the one hand, Pasquale (2015) points to ethical concerns about the unauthorized use of sensitive data. On the other hand, Burrell (2016) highlights the problem of lack of transparency in decisions made by AI, which are not always understood by humans. This raises questions about the accountability and controllability of automated systems. Organizations must therefore not only keep abreast of technological advances but also address these issues by ensuring that new solutions comply with applicable regulations and ethical standards (Pezzini, Konstantinou, 2013).

5. Research methodology

The surveys were conducted in 2018/2019 and 2023/2024. Respondents were able to declare the use of ICT and IA technologies in various areas of the company's operation, i.e.: product design and creation, sales, purchasing, business management support, market information gathering, promotion in the broad sense, and others (this option was not used by respondents). For the purposes of this paper, only the results and analysis obtained for product design and creation were focused on.

The first study focused on micro, small, and medium-sized enterprises from the creative sector. In Poland, the sector was divided into 12 industries, which included 48 PKD codes. Analyzing the percentage share of each industry in building the state of the creative sector in Poland, and taking into account the fact that the activities at the core of the creative industries'

products/services have different contents of the technical component, enterprises belonging to four industries were selected for analysis: architecture and interior design, fashion and industrial design, programming and computer games, advertising and related activities. By selecting technologically diverse industries, an effort was made to preserve the internal diversity of the creative sector with the possibility of internal comparisons. The quantitative survey assumed the examination of 460 enterprises, 115 for each selected sector. The result was 452 correctly completed sheets. The research tool was an anonymous, self-administered survey questionnaire. The quantitative survey was conducted at the end of 2018/2019 among companies that met two criteria: they had up to 249 employees, and 75% of revenue in 2017 came from one of four industries: architecture and interior design, fashion and industrial design, programming and computer games, and advertising and related activities. The sample selection for the survey was random, based on the CEIDG database and the PKD codes of the business activities. From the CEIDG database, 100,000 enterprises were drawn for the survey using the CADAS system. Interviewers made 3796 telephone calls. In the end, 2,595 enterprises were surveyed, 984 of which did not meet the criteria for taking part in the survey. In addition, 1159 enterprises refused to participate in the survey. The empirical research was carried out on the basis of anonymous data obtained from the survey questionnaire (Ratalewska, 2020).

The second survey in 2023/2024, continuing the above-described sampling and survey instrument, focused on creative sector SME enterprises run by craft and artisans without being limited to the four industries selected in the earlier survey, and broadened the base to include freelance craft and artisans affiliated with various associations, incubators, etc. At this stage, 598 craft and artisans associated with sculpting, lace-making, carpentry, ceramics, corsetry, confectionery, floristry, printing and publishing market, fashion, interior design, music, performing arts, acting, etc. were surveyed.

6. Characteristics of the survey sample

The 2018/2019 survey sample has an even distribution of enterprises belonging to selected creative industries. In terms of turnover, the dominant business sector of the surveyed enterprises was services (70%), followed by manufacturing (16%) and trade (14%). The service sector generated the most turnover in all the surveyed creative industries - it dominated enterprises belonging to the advertising and related activities and architecture and interior design industries. Manufacturing, on the other hand, generated the most turnover in the fashion and industrial design sector, and trade in the programming and computer games sector. At the time of the survey, 40% of the analyzed enterprises were less than three years old, 28% of them were established after 2010, 21% were established in the first decade of the millennium, and 11% of the surveyed enterprises were established before 2000. Of the surveyed

enterprises, 38% were family businesses. The surveyed enterprises produced two-thirds of their turnover by operating in the local and regional markets, and only about 7% of their turnover was related to international operations. An analysis of the market coverage of enterprises in all the creative industries surveyed indicated that enterprises in the programming and computer games and fashion and industrial design sectors (27% and 7%, respectively) had the largest share of turnover creation in the domestic and international markets (33% and 10%, respectively). In terms of the number of employees employed, medium-sized enterprises obtained the largest share in creating turnover in the domestic and international markets. The surveyed enterprises were most often located in small or medium-sized cities (42% and 29%, respectively), those located in cities with more than 500,000 residents accounted for 15.3% of the surveyed enterprises, and those in cities with less than 10,000 residents accounted for 13.7% of the enterprises. The surveyed enterprises were managed by a slight majority of men - 53%. No correlation was noted between the gender of the owner and the level of IT use. Among the respondents, the largest number were those under 30 years of age (40%) and those in the range of 31-39 years (30%). The younger the owner of the surveyed enterprise was, the more willing he was to use ICT in the surveyed areas of creative enterprise operation. Business experience was distributed according to age, with the largest number of respondents found in the range of 4-10 years.

In the 2023/2024 sample, respondents represented the manufacturing and service sector. They were dominated by young companies or those with generations of tradition. Of the surveyed enterprises, 41% were family businesses. The surveyed enterprises generated their turnover by operating in the local and regional markets, and about 15% of their turnover was related to international operations - and this usually applied to brands related to arts and crafts. In this pool of respondents, most were representatives of micro and small enterprises (62%). As in the earlier survey, the surveyed enterprises were most often based in small or medium-sized cities (34% and 29%, respectively). The surveyed enterprises were managed by both men and women. No correlation was noted between the gender of the owner and the level of IT use. Among the respondents, most were in the 31-39 age range (42%) and those under 30 (32%). As in the earlier sample, the younger the owner of the surveyed enterprise was, the more willing he or she was to use ICT in the surveyed areas of creative enterprise operation. Business experience varied according to the age of respondents, with the largest number of respondents having more than 10 years of experience.

7. Result

As of 2018/2019, as many as 78% of the respondents used ICT technology in the design and creation of their products. Depending on the industry and the size of the companies surveyed, new technologies were either a contributor to the creation of the product and the embodiment of their creator's vision (without their participation, the product could not have been created), or only an assisting element in their creation. In the 2023/2024 survey, the level of use of ICT tools in product design and creation among craft and artisans was lower, at 61%, which may be due to the specifics of the sample. Respondents who regularly used ICT were more likely to take advantage of the advanced capabilities offered by artificial intelligence (AI) and machine learning (ML).

Let us have a look at the results we received. In the architecture and interior design industry, the majority of respondents (73% 2018/2019 and 89% 2023/2024) use ICT tools to create detailed architectural and interior design projects. According to respondents, these programs enable precise space planning, visualization, and design documentation. 2023/2024 also brings the opportunity and need to use AI and ML at 45% of respondents to create realistic visualizations of designs, which allows better presentation of concepts to clients. In fashion and industrial design companies, respondents working on their designs are using ICT to create 3D models of clothing, graphic forms, or the design of the material itself (63% 2018/2019 and 74% 2023/2024). Artists and craftsmen in the industry 23% use AI to analyze market data and predict future fashion trends, which allows them to better tailor their collections to customer expectations and to create personalized clothing designs, which increases the appeal of products in the eyes of consumers. In the programming and gaming industry, there is 100% use of ICT and AI tools for product design and development in both research periods through game engines and project management tools which helps, which helps in team coordination and task management. AI is used most often to automatically generate game content such as levels, characters, and dialogues, which significantly speeds up the production process and player behavior, allowing games to be better tailored to users' preferences and improve their experience. In the advertising and related activities sector, ICT tools are used for data analysis (78% 2018/2019 and 85% 2023/2024). For this purpose, respondents use tools such as Google Analytics, and Adobe Analytics to monitor and analyze the effectiveness of advertising campaigns. Respondents in this sector are also using ad campaign management platforms (65% 2018/2019 and 73% 2023/2024) which enables them to automate marketing processes and better coordinate activities. 44% are using AI to create personalized advertising content that is better tailored to consumer preferences and behavior. Artists in music creation and composition declare using ICT tools for recording, editing, and mixing sounds, which they believe is the basis of modern music production (78% of indications) only 12% declare using AI to create new music. In contrast, 28% of respondents declare using AI as a support in the

creative process, i.e. these algorithms can suggest chords, melodies and rhythms, which helps artists explore new ideas. Artisans (sculptors, lace makers, carpenters, ceramicists, corset makers, candy makers, and florists) declare 64% use digital tools to design and model their wares, of which 34% declare using these tools in the creation process itself. The use of AI capabilities is still an unknown area for most of them, 68%. Among the respondents, some saw no need to use ICT in the design and creation of a product/artisan (2018/2019 - 22 indications, 2023/2024 - 39) and their rejection was a conscious choice for them. One of the main reasons surveyed craft and artisans avoid using ICT and AI is the desire to maintain the uniqueness and authenticity of their products. Handmade products allow subtle differences to be introduced into each product, making each piece one-of-a-kind. Many forms of craftsmanship and art represented by the respondents have deep roots in cultural and historical traditions. The use of traditional production methods not only maintains these traditions but also adds artistic and historical value to the final products. The craft and artisans surveyed see their crafts as a way to pass on their cultural heritage to future generations. In some of the cases analyzed, unique recipes and production techniques are key assets that distinguish an artist or craftsman's work from others. The use of ICT and AI could potentially put these professional secrets at risk of disclosure. For the artists surveyed, protecting the intellectual property of their techniques and recipes is crucial. For these craft and artisans, the process of creation is in itself an important experience that not only leads to the final product but also shapes their artistic identity. Working by hand gives them the satisfaction of the physical act of creation, which can be difficult to achieve with automated tools.

Respondents also pointed to several key issues related to the implementation and use of ICT and AI technologies: (1) implementation costs: 62% of respondents consider the high cost of implementing new technologies to be a major obstacle; (2) lack of technical competence: 65% of respondents report difficulties related to insufficient technical knowledge and lack of adequate training; (3) data security: 73% of respondents are concerned about data security and protection when using new technologies, especially AI; (4) legal issues: 67% of respondents point to legal ambiguities related to the use of AI, especially in the context of intellectual property; (5) integration with existing systems: 46% of respondents point to problems with integrating new tools with their companies' existing systems and the cost of implementation.

Respondents identified several key areas of support that would be helpful in the successful implementation and use of ICT and AI: (1) grants and financing: 69% of respondents suggest the need for financial support in the form of grants or loans for implementing new technologies; (2) access to experts: 55% of respondents would like to be able to consult with ICT and AI experts. They stressed the importance of aid institutions or centers for cross-sector cooperation; (3) technology infrastructure: 53% of respondents indicate the need to improve technology infrastructure to better integrate new technologies; (4) legal and regulatory support: 45% of respondents highlight the need for clear regulations on AI use and data protection; (5) training, education and system support: 44% of respondents stressed the need for training

and courses to improve technical and digital competencies and the need for system-level support.

8. Conclusions, limits, and further research directions

Summarizing the results of the survey, it should be noted that a significant proportion of the surveyed companies (78% in 2018/2019 and 61% in 2023/2024) are actively using information and communication technologies (ICT) in the design and product development process. The high adoption rate of ICT in industries such as architecture and interior design (73-89% usage in the surveyed periods) underscores the key role of these tools in the precise planning, creation of visualizations, and design documentation related to the product offered. The gaming industry is an example of a sector where ICT and AI technologies are being used to their full potential (100% usage), from graphic design to project management and content generation. Automation and personalization through AI enable the creation of more advanced and customized user experiences. Research reveals that the use of artificial intelligence (AI) and machine learning (ML) is more diverse and depends on the specific industry and type of business. In 2023/2024, 45% of companies in the architecture industry will use AI to create more realistic design visualizations. In sectors such as fashion, where trend analysis and product personalization are key, about 23% of companies use AI to analyze market data. It should be noted that a significant percentage of respondents (22 indications in 2018/2019 and 39 in 2023/2024) express resistance to adopting ICT and AI, preferring traditional work methods, highlighting the difficulty of balancing the preservation of uniqueness and authenticity of products with the use of new technologies in their creation. The increase in resistance over the research period may be due to the selection of the target group and the industries analyzed. Craft and artisans, in particular, emphasize the importance of handwork to preserve artistic and historical value, which may be threatened by excessive automation. While ICT and AI technologies bring numerous benefits such as efficiency, accuracy, and innovation, they also come with challenges. Implementation costs, lack of technical competence, concerns about data security, and integration with existing systems are major barriers.

The study presented here is not free from the limitation of quantitative research, which includes the problem of sample representativeness, which may not reflect the entire creative sector due to the focus on only selected industries and regions. In addition, the rapid pace of technological change may make the survey results quickly outdated, especially in the context of the development of new AI and ML tools. In addition, the subjectivity of respondents' answers, based on their perceptions of the benefits and barriers associated with technology, may have affected the objectivity of the results.

Further research directions should include expanding the research sample to make it larger and more diverse to obtain more representative results. Additionally, it is crucial to extend the scope of the research beyond Poland to other countries, to ensure that the findings are applicable in various cultural and economic contexts, thereby enhancing the generalizability and relevance of the results on a global scale. Longitudinal studies can help monitor changes in the use of ICT and AI in the creative sector to understand technological evolution and its impact on the industry. Further analysis of the phenomena will help understand how these differences affect the adaptation and use of new technologies. Additional qualitative research can provide a deeper understanding of the motivations, experiences, and challenges faced by SME entrepreneurs in the creative sector.

Practical implications include the development of digital and AI training and education programs tailored to the needs of the creative industries. Providing access to technology infrastructure and tools can make it easier for smaller companies to implement modern solutions. Formulating strategies and policies to support the integration of digital technologies, taking into account industry specifics and intellectual property protection, is key. In addition, the development of technological solutions that support traditional production methods will help protect the unique cultural and artistic characteristics of products.

To sum up, the results point to the growing role of ICT and AI in the creative sector, but also to the many challenges that must be addressed by both researchers and practitioners for technology to deliver the expected benefits while preserving the uniqueness and value of traditional work methods.

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