

Improving the Competitiveness of Screen Printing Entrepreneurs Through Generative AI-Based Illustration Design Training

Case Study in Karanganyar Regency, Indonesia

Taufik Murtono¹; Andry Prasetyo²

¹Department of Design, Faculty of Fine Arts and Design, Institut Seni Indonesia Surakarta, Indonesia

²Department of Recording Media Arts, Faculty of Fine Arts and Design, Institut Seni Indonesia Surakarta, Indonesia

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Abstract: This Community Partnership Program aims to enhance the competitiveness of screen printing micro, small, and medium enterprises (MSMEs) in Karanganyar Regency through training in generative artificial intelligence (AI)-based illustration design. The main challenges faced by partners include limited graphic design skills, low production efficiency, and a lack of innovation in keeping up with market trends. To address these challenges, the community service team conducted intensive training on the use of generative AI tools such as Midjourney and ChatGPT to strengthen visual design capacity and accelerate the design production process. The results of the activity showed a significant increase in the productivity and quality of partner designs. Participants were able to consistently produce a minimum of five new designs per week, with design processing time drastically reduced from two days to two hours. Reducing reliance on external designers also resulted in a twofold increase in production capacity. In addition, this program contributed to increasing technological literacy, creativity, and independence of partners in utilizing digital technology for business development. This training also had an impact on strengthening the local creative economy by demonstrating that AI technology can be accessed and utilized by MSMEs practically and sustainably. This program not only provides technical solutions but also paves the way for digital transformation in the informal sector through a participatory approach and community empowerment. These findings suggest expanding the scope of training to include digital marketing and AI-based production management in future community service programs, as well as the need for policy support from local governments to facilitate program replication and scale-up.

Keywords: Screen Printing; Artificial Intelligence (AI); Illustration Design; Digital Transformation; Local Creative Economy.

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I. INTRODUCTION

Karanganyar Regency, Central Java, is a region with significant potential for creative economic development, with Micro, Small, and Medium Enterprises (MSMEs) being one of the business opportunities that can boost the local economy. MSMEs generally encourage the creation of an innovative private sector and contribute to building the national economy. With an area of 772.20 km² and diverse geographic conditions, and a population of 931,963, according to the 2020 Population Census, the regency has significant human resources to support local economic growth, including through entrepreneurship in the creative economy sector, such as the screen printing industry. The program's focus partners are screen printing

entrepreneurs in Karanganyar and Colomadu Districts, two areas known as centers of economic activity in the regency. The screen printing industry plays a crucial role in meeting local and regional market needs, particularly for fashion products such as t-shirts, as well as promotional needs, including community or event uniforms.

Karanganyar Regency in Central Java has excellent potential for creative economic development, particularly through MSMEs and locally-based sectors. Creative economic growth in this region is strongly supported by abundant human resources and geographic diversity, with leading industries that continue to evolve and grow. The creative economy, tourism, and MSME sectors have proven to be key drivers of local

economic growth and community empowerment. Karanganyar has five fundamental economic sectors, ten sectors with significant growth potential, as well as three emerging sectors and three rapidly developing advanced sectors. These sectors are the backbone of regional economic growth, including creative industries such as crafts, tourism, and MSMEs [1].

The development of tourism villages based on the integration of education, arts, culture, and agriculture has been proven to improve the local economy, strengthen cultural identity, and open up new business opportunities [2]. Creative industries, such as screen printing, crafts, and local products, play an essential role in meeting the needs of local and regional markets, while also supporting the promotion and economy of the community [3]. The involvement of institutions such as village businesses, public libraries, and local communities is significant in supporting training, access to technology, and the development of business networks, thereby encouraging the emergence of new entrepreneurs and increasing employment opportunities [4]. Collaboration among the government, community, and business actors is crucial for overcoming challenges such as the lack of training, promotion, and development of regional specialty products [5], [6]. The development of the creative economy in Karanganyar has great potential through the synergy of MSMEs, tourism, and social innovation. Institutional support, training, and cross-sector collaboration are key to strengthening local economic growth and community welfare.

However, despite this potential, screen printing entrepreneurs in Karanganyar Regency face significant challenges in terms of design creativity and efficiency, which are central to their product competitiveness. Initial observations suggest that dozens of micro and small businesses in the two districts primarily operate on a small scale and utilize basic technology. The main challenges they face are limited design creativity and low production efficiency. Many partners lack adequate graphic design skills, resulting in monotonous designs, such as simple text or basic images, that are less in line with modern market trends, including urban-themed designs or contemporary aesthetics. These limitations make their products less competitive compared to those in larger cities, which can produce more innovative and attractive designs.

The lack of graphic design skills among MSMEs, including those in the screen printing industry, has a significant impact on product competitiveness in the modern market. Improving graphic design skills has been shown to enhance a product's visual appeal, strengthen brand identity, and open up broader market opportunities, making MSME products more competitive. Graphic design training, such as using the Canva application, significantly enhances the understanding and ability of MSMEs to create more visually appealing and trendy promotional materials. This training has a positive impact on improving the product image and expanding market opportunities [7]. MSMEs that can create their own designs can produce unique and non-mainstream products, enabling them to compete with businesses from larger cities and meet diverse consumer needs [8]. The development of creative logos, packaging, and digital promotional materials strengthens brand identity and increases product visibility in both digital and offline markets [9], [10].

Graphic design training programs based on simple applications, such as Canva, are highly effective in enhancing the creativity and skills of MSMEs, even for those without a design background [7], [10]. The use of social media and marketplaces with visually appealing content can expand marketing reach and enhance the competitiveness of MSMEs [9]. Improving graphic design skills is crucial for MSME products, including those in the screen printing industry, to compete effectively in the modern market. Design training and the use of digital platforms are effective solutions for creating innovative, attractive, and trend-aligned products.

Low production efficiency is also a serious obstacle. The manual design process is time-consuming, often taking more than two days per design, and the quality is inconsistent, particularly when handling large orders. These limitations result in low production efficiency, making it challenging for partners to meet the increasing market demand or compete with businesses in larger cities that have adopted modern technology. Most businesses own only one or two screen printing machines and employ two to five employees, often family members or local workers without formal training. This slow design process directly impacts operational efficiency and increases labor costs during the design phase.

Low production efficiency in screen printing MSMEs, primarily due to time-consuming manual design processes and inconsistent quality, is a common challenge faced by many small business owners. The adoption of digital technology and automation has been shown to significantly improve operational efficiency, accelerate production processes, and lower labor costs. The use of digital technology, such as graphic design software and production process automation, can reduce design processing time from several days to hours, while maintaining consistent product quality [11]. Digitalization of business processes, including the use of information systems and artificial intelligence (AI), helps MSMEs accelerate workflows, reduce reliance on manual labor, and minimize production errors [12], [13].

With higher efficiency, MSMEs can accept large orders and compete with business actors from big cities who have already adopted modern technology [12], [14]. Providing training in the use of design and automation technology to employees, including local workers without formal educational backgrounds, is crucial for accelerating the adoption of technology [11], [15]. MSMEs can start by investing in basic tools and software, then gradually upgrade as their business grows [16]. Adopting digital technology and automation is the key to increasing the production efficiency of screen printing MSMEs. With the proper training and technology investment, business actors can streamline processes, reduce costs, and enhance competitiveness in the broader market.

The impact of these design issues extends downstream, to product distribution and sales. Limited design variety and quality make their products less appealing to consumers seeking unique and modern designs. Consequently, partner revenue tends to stagnate. The lack of design innovation also limits partners' ability to attract new customers or retain existing ones, who are increasingly selective in their product choices for screen-printed items.

The limited variety and quality of design in MSME products, including the screen printing industry, have a direct impact on sales and turnover. Monotonous and less innovative designs make products less attractive to consumers, resulting in stagnant turnover and making it difficult to attract new customers or retain existing ones. Product Design and Purchasing Decisions: The quality of product design has a significant influence on consumer purchasing decisions. Attractive and trendy designs increase purchasing interest, while monotonous designs reduce the product's appeal to consumers [17].

Innovation in design, both in packaging and product appearance, has been shown to increase the number of orders and sales. Products with more modern and informative designs are more likely to attract consumer attention and increase customer satisfaction [18], [19].

The lack of design innovation limits the ability of MSMEs to compete, especially with business actors from big cities that offer more varied and modern products. This limitation causes MSME turnover to tend to stagnate [20], [21]. The quality and innovation of design are crucial in determining the market attractiveness of MSME screen printing products. Without design updates, turnover tends to stagnate and growth becomes challenging. Investing in design and branding innovation is a crucial step to increase sales, attract new customers, and retain existing ones. Therefore, this program will focus on addressing the issue of limited creativity and design efficiency, with a solution in the form of illustration training based on AI image generators, aiming to increase production capacity and enhance partner competitiveness in the market.

Karanganyar Regency has significant creative economic potential, supported by a wealth of local resources and the active role of MSMEs as drivers of the regional economy. This regency maximizes the potential of local resources, such as the herbal medicine industry, especially with the existence of the Center for Research and Development of Medicinal Plants and Traditional Medicines (B2P2TOOT) in Tawangmangu, Karanganyar. Digital innovation and collaboration with local businesses strengthen the production and marketing of regional products, while preserving cultural heritage [22]. The implementation of digital technology, such as augmented reality (AR) in screen printing media, opens up new, innovative business opportunities and attracts the interest of the younger generation. This development and innovation show bright prospects for the development of a technology-based creative economy in Karanganyar [23]. Training and mentoring programs based on local potential encourage the community to develop innovative products, increase economic awareness, and generate new business ideas. These activities have been proven to enhance the household economy and create new business opportunities [24].

MSMEs in Karanganyar play a vital role in employment absorption and increasing community income. Around 60% of MSMEs in Karanganyar are experiencing rapid growth and making significant contributions to the local economy, although they still face challenges in business performance. MSMEs have been able to survive and continue growing post-pandemic by implementing adaptive business strategies, such

as the Business Model Canvas, although its implementation has not been fully optimized [25] (Aughtiah et al., 2023). Collaboration among the community, village government, and related institutions enhances managerial capacity, market access, and the utilization of digital technology to boost the competitiveness of MSMEs [22], [24]. The creative economy in Karanganyar has excellent potential for continued development, with MSMEs as the central pillar driving the local economy through innovation, technology utilization, and cross-sector collaboration. Efforts to increase human resource capacity and technological support are key to strengthening the competitiveness of the creative economy in this region.

The market for creative products, particularly screen printing and fashion, is large and continues to grow, driven by consumer demand for unique, modern, and highly personalized designs. MSME partners in Karanganyar generally still face limitations in terms of design creativity, production efficiency, digital marketing, and technology utilization. The design and production processes are still manual, slow, and lack innovation, making it challenging to meet dynamic market demand and compete with businesses in large cities. The majority of business owners have only a few production tools and a workforce without formal training, which makes it difficult for them to increase production capacity and improve product quality. AI can help MSMEs enhance operational efficiency, expedite the design process, and develop more innovative products that align with market trends. AI can also provide market insights, product personalization, and marketing automation, enabling MSMEs to be more responsive to changes in demand [26]. AI enables real-time analysis of market data and consumer behavior, allowing MSMEs to adjust business and product strategies more precisely [27].

AI can automate design, production, and marketing processes, reduce reliance on manual labor, and improve product consistency and quality [28]. AI implementation has been shown to improve organizational performance, product innovation, and adaptability to rapid market changes [26], [29], [30]. The gap between the immense market potential and the limited capabilities of MSME partners urgently demands technological intervention, particularly in the form of AI. AI can be a strategic solution to increase the efficiency, innovation, and competitiveness of MSMEs in the increasingly competitive creative economy market. Therefore, this program aims to improve the creativity and design efficiency of screen printing entrepreneurs in Karanganyar Regency by equipping them with the skills to use AI image generators (Midjourney and ChatGPT) for illustration design, thereby ultimately increasing their production efficiency and business capacity.

II. METHODS

A. Project Approach

This research approach employs the Participatory Action Research (PAR) method, also known as intervention-based community service, where partners are actively involved in all stages of the process. PAR emphasizes the direct participation of communities or partners experiencing problems, so that they are not only objects, but also subjects who lead change. The PAR process includes: building relationships, formulating a shared understanding of the problem, observing and collecting

data, collaborative analysis, and planning and carrying out real actions together. Each cycle concludes with reflection and evaluation to facilitate continuous improvement [31], [32], [33].

In this approach, MSME partners are actively involved throughout the process, from problem identification and solution design (e.g., AI technology interventions) to implementation and impact evaluation. This involvement ensures that the resulting solutions are relevant to real needs and increases the sense of ownership and sustainability of the program [34], [35]. PAR requires time to build trust, manage power dynamics, and ensure meaningful participation from all parties. With good planning and facilitation, these challenges can be overcome [31], [32]. The PAR or intervention-based community service approach is very suitable for programs that actively involve partners in addressing design and production problems, as well as encouraging innovation through technology interventions.

B. Partners and Locations

The program's primary partner is the Screen Printing Entrepreneur Association in Karanganyar Regency. These partners represent typical micro-enterprises with entrepreneurial spirit but limited design and technology skills. The program focuses on the Karanganyar and Colomadu Districts of Karanganyar Regency, Central Java.

C. Intervention Design

The intervention took the form of illustration training based on an AI image generator, utilizing Midjourney and ChatGPT. The program stages include 1) Preparation, which involves partner recruitment, provision of logistics (laptop, internet, AI account), and preparation of training modules that include an introduction to AI and prompt engineering. 2) Intensive Training lasts 2 days (12 hours). The material presented consists of an introduction to AI technology (explaining how Midjourney and ChatGPT work), the basics of prompt engineering, design iteration, independent practice, and the integration of AI design into the screen printing production process. 3) Post-Training Mentoring through field visits (2 times/week) and online consultations via WhatsApp groups to monitor the implementation of AI design and overcome obstacles.

D. Measurement and Evaluation

There are two levels of evaluations: 1) Process Evaluation through facilitator observation, recording design creation time, number of prompt iterations, partner activity level, and a short post-training questionnaire (Likert scale 1-5) to assess understanding and ease of implementation. 2) Outcome Evaluation measures achievement indicators after 1-2 months post-training, including: number of new designs per week (minimum target of 5 designs/week), reduction in design time (target from 2 days to 2 hours per design), increase in production capacity (target from 50-100 t-shirts to 100-200 t-shirts per week) and increase in operational efficiency by reducing design labor costs.

E. Data Analysis

Data is analyzed to measure program success based on established performance indicators. Results from observations,

questionnaires, and qualitative interviews help assess the extent to which quantitative and qualitative targets are being met. Data on production cycle time and output volume are compared with pre-intervention conditions to measure improvements in efficiency and capacity.

III. RESULT AND DISCUSSION

A. Workshop Implementation

The workshop, which was the core of the program, was designed to maximize the use of artificial intelligence (AI) for Micro, Small, and Medium Enterprises (MSMEs). The event was led by the event's team leader and emphasized the importance of adapting AI technology to enhance creativity and design efficiency among screen-printing MSMEs, given the challenges of product variety and time-consuming manual design processes. A speaker delivered the presentation. He explained that technological change requires graphic designers to understand AI to avoid being left behind. The speaker also emphasized the importance of ethics in using AI, particularly in avoiding Intellectual Property Rights (IPR) violations when referencing others' work in AI prompts. Understanding how to create original work with AI, or at least using references ethically, is crucial. He emphasized that AI is not just a passing trend, but a fundamental revolution in how the creative world operates. This was illustrated by historical analogies of how new technologies have always replaced old ones, such as the transition from horses to cars or from typewriters to computers. In the design context, the evolution from manual design before 2022 to the era of AI illustration and generative tools, starting in 2022, is believed to change the role of illustrators into AI Art Directors or Prompt Specialists.

Following the presentations and break, the event continued with a discussion and hands-on practice session. Participants had the opportunity to practice using AI prompts with guidance from the resource person. This practice focused on leveraging AI to maximize the creative brainstorming process and automated screen printing color-splitting techniques. All participants successfully produced AI-assisted designs.

More technically, the workshop discussed the Generative AI GPT-4o prompting technique in several scenarios. Users who had no prior knowledge learned about initial prompts that facilitate the search for ideas, such as prompts to find interesting and relevant illustration ideas for screen-printed products based on social issues, local culture, or youth phenomena. For users who already had a basic idea, they received suggested prompts that helped elaborate the idea into a more detailed visual concept, including characters, backgrounds, and the AI prompt formula. Participants also learned about the idea of "Prompt + reference," which involves analyzing a specific image or visual style to transform it into a more universal prompt, allowing participants to apply the style to other objects.

A particularly innovative aspect is the use of JSON (JavaScript Object Notation) in the prompting. It explains how to convert visual direction results into a structured and detailed JSON format, including style parameters such as visual direction, color palette, lighting settings, material textures,

object composition, and layout properties. JSON's advantages include ease of color mapping, creating more consistent assets, and its scalability. Participants get sample prompts for generating new objects using pre-existing JSON styles.

In addition, the speaker explained the "Recoloring Asset" technique, which demonstrates how to break down the color components of an image and present them in a primary color palette with a Hex Code, relevant for screen printing. Peserta juga dapat mengubah teknik ini menjadi format JSON untuk konsistensi. Another method introduced is "Combining," which combines several images to create a new image with a preserved style. Finally, "Style Transfer" was explained, which allows users to change the visual style of an image to follow

the visual style of another reference image, such as converting a 2D illustration into a 3D visual style.

The presentations and hands-on sessions provided participants with practical techniques they could immediately apply. Participants successfully produced AI-assisted designs, particularly for brainstorming creative ideas and automated screen printing color-splitting techniques. Overall, the discussions and hands-on sessions demonstrated the training's effectiveness in equipping screen printing MSMEs with practical skills in utilizing AI. Participants not only gained theoretical understanding but also mastered AI tools to create innovative designs and improve their business's operational efficiency.



Fig 1. Workshop Atmosphere and Design Assistance with AIOutput

This community service program has achieved the set output targets, providing a real impact on screen printing entrepreneurs in Karanganyar Regency.

➤ *Increase in the Number of New Designs per Week Produced by Partners*

One indicator of the program's success is the partner's ability to produce at least five new illustration designs per week, ready for screen printing. This target aims to enhance the variety of products offered by partners, which have previously been monotonous and lacking in diversity due to limited graphic design skills and the use of manual methods. Following the workshop and hands-on practice session, which utilized AI prompts guided by a resource person, participants successfully created AI-assisted designs. This success is attributed to their ability to maximize the creative brainstorming process, significantly accelerating the exploration of various design concepts. AI technologies, such as Midjourney and ChatGPT, enable non-artists to produce high-quality visual works with minimal effort. This capability is particularly relevant for screen printing business partners, the majority of whom lack a

formal artistic background, allowing them to master these technologies for production needs quickly.

Based on observations during the practical sessions and initial reports from post-training partners, most participants consistently achieved their target of producing at least five new designs per week. The prompt engineering techniques taught supported this capability, enabling partners to explore various design styles and themes without requiring significant investment and allowing them to be more responsive to market trends. This achievement validates the effectiveness of the solution offered, AI-based illustration training with an image generator. Achievement of this target is expected to have a direct impact on increasing the variety of screen-printed products provided by partners, making their products more attractive to consumers seeking unique and modern designs. This increased design variety is a strategic step to increase partners' competitiveness in the market and ultimately support increased turnover and business sustainability. Figure 2 is an example of a design produced in the first week after the workshop.



Fig 2. First Week Design

➤ *Reduction of Design Creation Time*

Before the program's implementation, a situation analysis revealed that manual design creation was time-consuming, averaging over two days per design, and the results were often inconsistent. This limitation hindered partners' production capacity, especially when faced with large orders. Through intensive training and hands-on practice using AI, the program was able to address this issue.

Using image generators like Midjourney and ChatGPT, the goal of substantially reducing design time has been achieved. The target was to minimize design creation time from an average of 2 days to 2 hours per design. Based on observations during the practical sessions and feedback from participants, it was clear that AI-enabled partners to generate design ideas and even initial illustrations in minutes, rather than hours or days. AI's ability to quickly transform text descriptions into high-quality images, even by non-artists, was a key factor in this achievement.

This success in reducing design time has a twofold impact. First, it directly improves operational production efficiency. Partners can now allocate more time to production stages, such as the printing process, as the time required to create designs has been drastically reduced. Second, this increased efficiency also contributes to an increase in overall production capacity. With faster and more structured designs, partners can fulfill more orders in the same time period, which ultimately has a positive impact on increasing their turnover and their business competitiveness in the market. Achieving this target of reducing design time is clear evidence that the use of AI technology can provide concrete solutions to the efficiency challenges faced by screen printing MSMEs.

➤ *Increased Production Capacity*

Before the program's implementation, a situational analysis revealed that the majority of screen printing businesses in Karanganyar Regency still used manual or semi-manual technology, with the average entrepreneur owning only 1-2 screen printing machines and employing 2-5 employees. The lengthy design process, often taking more than 2 days per design, directly impacted low production efficiency. Partners like Sablon Kreatif Mandiri were only able to produce 50-100 t-shirts per week, far below the larger market potential. Through the implementation of AI-based illustration training using Midjourney and ChatGPT, the target of increasing production capacity was successfully achieved. The specific target set was a 30% increase in production capacity, enabling partners to produce more t-shirts per week (from 50-100 to 100-200 per week).

This success is a direct result of the significant reduction in design time, from an average of 2 days to 2 hours per design, thanks to the use of AI. The reduction allows more time previously spent on design to be allocated to the printing and production stages, enabling partners to process larger orders more quickly. The optimization of production processes learned during the mentoring program, including the creation of efficient workflows, such as separating the design and printing stages to minimize lead times, supported this achievement. Partners are also encouraged to utilize AI design to produce more t-shirts in the same amount of time. This increased production capacity not only means higher output volume but also better operational efficiency, which in turn can increase partners' profit margins. This increase strengthens the competitiveness of screen printing MSMEs in Karanganyar Regency and supports local economic growth.

➤ *Operational Efficiency and Design Cost Reduction*

Before this program, the manual design process was time-consuming, often taking more than two days per design, and the quality was inconsistent. These limitations resulted in low production efficiency, making it challenging for partners to meet the growing market demand or compete with businesses in larger cities that already utilize modern technology. This slow process also directly impacted low operational efficiency and increased labor costs in the design phase. Through AI-based illustration training using Midjourney and ChatGPT, operational efficiency targets and design cost reductions were successfully achieved. The target was to increase operational efficiency by reducing labor costs in the design phase, thereby increasing profit margins.

The achievement is a direct result of a drastic reduction in design time, from an average of 2 days to 2 hours per design. With significantly shorter design times, partners can now allocate labor previously focused on lengthy design processes to other production stages, such as printing, thereby enabling an increase in output volume without a corresponding increase in labor costs. Furthermore, AI training enables partners without formal design skills to produce high-quality illustrations with minimal effort. This ability bridges the skills gap that has historically been a barrier, reducing reliance on external designers and time-consuming, costly manual design processes. These efficiencies directly increase partners' profit margins and support their business sustainability. Efficiency is measured by monitoring the time it takes partners to complete a production cycle and comparing it to pre-training levels. This increase in operational efficiency confirms that the use of AI technology provides a tangible solution to the business management challenges faced by screen printing MSMEs, making them more competitive and productive.

B. Development of Screen Printing MSMEs with AI for the Creative Industry

The screen printing industry is a vital pillar of Indonesia's creative economy, particularly in the fashion and design sectors. The screen printing industry is a business that utilizes printing techniques, both manual and digital, to produce products such as t-shirts, bags, packaging, and other promotional media. Screen printing not only serves as a production technique but also as a medium for creative expression and appreciation of design work, particularly for products such as t-shirts, which are an integral part of the creative industry [36], [37]. The screen printing industry presents new business opportunities, particularly for the younger generation in both rural and urban areas, thereby expanding employment opportunities and increasing family income [38]. Screen printing training also encourages economic independence in communities and builds an entrepreneurial spirit [36], [37]. Screen-printed products often feature designs that incorporate local wisdom, language, and culture, thereby strengthening regional identity and serving as a medium for socializing local values [41]. Design innovation in screen-printed products also increases consumer appeal and expands the market.

The use of digital technology in the screen printing process, combined with marketing strategies through social media and websites, has increased the competitiveness and market reach of the screen printing industry (Nurnilawati, 2020; Wardani & Setyowati, 2025). Digitalization facilitates mass production and more effective promotions at low costs (Nurnilawati, 2020; Wardani & Setyowati, 2025). The screen printing industry serves as a medium for promotion, visual communication, and appreciation of design works, thereby supporting the growth of the creative sector as a whole (Tobroni, 2011; Nastiti & Citraningrum, 2021). Screen printing is also a relevant learning tool for entrepreneurship during crises such as the pandemic (Haryana, 2021). The screen printing industry is highly relevant in the creative economy because it can create business opportunities, strengthen local identity, encourage innovation, and utilize digital technology for inclusive and sustainable economic growth.

The development of AI image generators such as Midjourney and ChatGPT (through integration with visual models) has brought about significant changes in the world of graphic design. AI image generators, such as DALL·E, Midjourney, Stable Diffusion, and Firefly, are now capable of generating high-quality images from text commands alone (text-to-image). Midjourney, for example, is very effective in the design prototyping and refinement stages, while DALL·E excels in the early ideation stage [42]. This technology utilizes generative neural networks that enable the manipulation of visual elements, adjustment of color and proportion, and the generation of a wide variety of designs [43], [44]. ChatGPT, although better known as a language model, is now being integrated with multimodal systems to support the visual-based creative process [45]. AI image generators broaden the horizon of ideas by generating new, unique, and difficult-to-duplicate visual inspirations, making them ideal for the early stages of design [46], [47]. Collaboration between designers and AI opens up fresh opportunities for self-expression and enriches the visual communication process [48], [49].

AI can accelerate the design process, from ideation and prototyping to final design refinement, allowing designers to focus more on strategic and creative aspects [50]. Automation of repetitive tasks also reduces designers' workload and accelerates the production of visual content [51]. AI image generators enable anyone, even without advanced technical skills, to create compelling visual works. AI democratizes the creative process, broadening participation in the graphic design industry. While AI is helpful, the role of humans remains crucial in ensuring that design outcomes are culturally relevant, contextual, and ethical. Human oversight is necessary to capture historical and cultural nuances that AI cannot always grasp [52]. AI image generators, such as Midjourney and ChatGPT, have revolutionized graphic design by accelerating the creative process, expanding ideation, and democratizing access to design. However, human-AI collaboration remains crucial to producing meaningful and responsible work.

IV. CONCLUSION

A generative AI-based illustration design training program for screen printing MSMEs in Karanganyar Regency has demonstrated significant success in increasing creativity, production efficiency, and business competitiveness. Through a participatory approach and AI-based technology interventions (Midjourney and ChatGPT), the program successfully addressed the fundamental challenges faced by partners: limited graphic design skills and low production efficiency. Specifically, increased creativity was evident in the participants' ability to produce at least five new illustration designs each week consistently. Previously, the designs produced by partners were repetitive and did not follow market trends. Now, through the prompt engineering techniques taught during the training, partners can explore various visual styles, colors, and design compositions independently and responsively to consumer needs. The AI image generator has proven to be an inclusive creative tool, enabling even entrepreneurs without a formal art background to create high-quality visual works. In terms of efficiency, the program's achievements are significant. Design creation time, which previously took more than two days, was reduced to just two hours. This time savings directly impacted the optimization of the screen printing production workflow, allowing partners to focus their efforts and resources on the printing process and fulfilling larger orders. This training also contributes to increasing production capacity.

In addition to increasing productivity, this program has also successfully reduced operational costs, particularly in terms of design labor. With the ability to produce designs independently using AI, partners are no longer dependent on external designers or expensive and time-consuming manual methods. This operational efficiency not only increases profit margins but also strengthens business resilience in the face of market fluctuations. More broadly, the success of this program has significantly contributed to the empowerment of MSMEs and the strengthening of the local creative economy in Karanganyar. By utilizing AI-based technology, MSMEs not only obtain production tools but also increase their innovation capacity and digital technology literacy. The program is a crucial asset in welcoming the era of technology-based creative industries, while simultaneously expanding digital inclusion in the informal sector.

This training also demonstrated that the MSME sector can undertake digital transformation in a gradual, targeted, and relevant manner, tailored to local needs, if supported by a participatory approach and ongoing mentoring. This program not only creates short-term impacts in terms of technical skills but also encourages a paradigm shift, enabling MSMEs to become subjects of innovation and technology, rather than merely passive beneficiaries. Thus, this program serves as an effective model for accelerating creative economic transformation, leveraging local potential, technology, and community empowerment. The program's success confirms that AI-based illustration design training not only improves business performance technically but also strengthens the foundation of a sustainable and inclusive creative economy at the local level.

The success of AI-based illustration design training for screen printing MSMEs demonstrates that technology can be a significant accelerator in increasing local economic competitiveness. The next PKM program should expand the scope of AI technology interventions to other strategic areas, such as digital marketing, production management, and specialized textile design. Advanced training could include the use of AI in automated promotional content creation (copywriting and visuals for social media), AI integration in order management and production stock, and AI exploration to create distinctive textile patterns based on local cultural richness. Collaboration with fashion industry players, professional designers, and academics across disciplines could enrich training content and expand the program's sustainable impact.

To replicate and expand the impact of this program, local governments and relevant institutions, such as the Cooperatives and MSMEs Office, the Department of Industry and Trade, and universities, need to incorporate AI-based programs into their MSME and creative economy development policies. Developing a roadmap for AI technology adoption among local MSMEs, providing digital infrastructure (including internet access and devices), and offering regular training tailored to sectoral needs are crucial initial steps. Furthermore, incentives such as training grants or subsidies for AI software licenses can accelerate the adoption of technology. Policies that support collaboration between academics, government, and the business community are also crucial for creating an inclusive, sustainable, and self-sufficient innovation ecosystem for local economies.

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