AI, AESTHETICS AND PROFIT IN COMMERCIALIZATION OF ARTS: REVISITING ADORNO'S PARADOX

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Abstract: Nowadays, the usage of artificial intelligence (AI) in art works is massive. It has become a pro-contra in society because not everyone enjoys the AI usage in artworks. However, the needs to get valued, recognition, and even profit for either artists or public who utilize artworks for commercial things. This study aims to describe how the Adorno's paradox becomes the challenge for artists to balance the profit and art aesthetic value. This study uses qualitative method with the literature review and NVivo tool to interpret the interview with 3 informants from non-artists background but are the artwork enthusiasts. The novelty of the research is the informants used, the tool and the idea used to combine art and business mindsets simultaneously. The results based on the new framework proposed in this study is how the government's roles in issuing policy to balance freedom for artists, profitable artworks and original meaning and value of the artworks. This research is urgently required to know, maintain and sustain the value of the artworks meanwhile giving more access to profit and people to enjoy the arts

Keywords: AI; Aesthetic; Adorno's Paradox; Profitable Artworks; Value of Artworks

Introduction

Theodor W. Adorno, well-known philosopher, artist, musician, is the writer of "Aesthetic Theory" book, which is very interesting to discuss about aesthetic theory in this case is called as "negative aesthetic" as the critics to modern arts and mass culture as he already wrote another book to discuss about it (Zuidervaart, 2015). Although Adorno criticized the commercialization of arts in his era, he also admitted that the ability of the modern arts to adopt the complexity of culture, arts and social issues is better than traditional arts. The book was driven by the emerging mass culture in 19th century (approximately 1950-to the early of 20th century). Adorno concerned in the threats of arts' potentials and autonomy due to the mass culture and linked to against to capitalism together with other philosophers in Frankfurt School to criticized the capitalism (Celikates & Flynn, 2023). The artworks, in Adorno's point of view is important to understand the condition of society in that era, so that artworks can be medium to social critiques.

The paradox of Adorno's idea related to this study is how the disagreement of mass culture and agreement of art potential to against the status quo by the modern art. Other paradox is the critique to traditional aesthetics that only concerned in beauty and pleasure, but in the other side, the negative aesthetic, Adorno also appreciated the classical arts as the artworks with the deep autonomy, meaning and commitment. However, Adorno still had the expectation for modern arts to develop as new opportunity to bring new positive change among society although there was a pessimistic view on modern art as it can be under commodification, market demand and thus the value and meaning of the arts will be standardized according to the market preferences. Adorno's idea challenged the traditional arts and cultures to move from comfort zone to contribute for human development in many areas of life, not only focus on responsibility in beauty and pleasure (Hellings, 2014). The freedom, autonomy and contribution of artists stated by Adorno is important to give artists more space to express their concerns, either in politics, culture or other fields (Demirel & Altintas, 2012).

In the context of modernity and contemporary era, the power of digital media is massively used globally to offer merely pleasure and entertainment for art enjoyment and in the end brings the profit. According to Adorno's idea, it can be a new challenge for traditional artworks whose values, meanings and commitment to history or heritage are supposed to be maintained and sustained. The digital era with the growing social media usage, streaming platform and tools to create arts are expected to homogenize and manipulate the real aesthetic values and meanings of arts and cultures. Meanwhile the recent artworks are surprisingly giving new trend by using Artificial Intelligence (AI) in art industry which has been started in 2023, dominated by computer vision, machine learning, natural language processing and others. Based on Market.US report, AI in art global market is predicted to grow in the future as it noticed in 2023 the AI in arts was US$ 3.2B and seemed to grow rapidly. This website also stated that in 2033, the market of AI in arts will reach US$ 40.4B with the main modes to spread AI in arts by cloud and on-premises bases (Market.US).

The research aims to describe how the Adorno's paradox becomes the challenge for the artists to balance the profit and art in the conceptual ways. This aim is urgent due the broader usage of AI in art world may bring pro and contra among artists and societies. Thus, this research has urgency to know how to maintain and sustain the value of artworks while giving more access to profit and people may keep enjoying the arts. The novelty of the research is the informants used, the tool and its basic idea to combine art and business mindsets simultaneously under the Adorno's concept.

The main literatures to build a new framework based on articles discussing AI which related to its products in artworks, aesthetic, artists and their careers. Ramesh, et al. (2022) in their study about "Hierarchical Text-Conditional Image Generation with CLIP Latents" aimed to develop AI model to produce high quality and various text-based images. Using the hierarchical architecture and CLIP latents, it shows the AI development in producing commercial artworks. Meanwhile, Mohamed, et al. (2024) investigated AI impact to the social media content, aesthetic and user engagement by using the social media content analysis and interview with the users. The result shows AI can affect the aesthetic and commercialization of arts in social media. Jiang et al. (2023) found the impact of AI to profitability of arts and how the artists adapt to the changes regarding their careers and incomes either in positive and negative ways. The ability of AI to increase the human perception on the creativity was found by the study of Horton et al. (2023) in which the investigation was done to know how the bias towards AI influences of the human perception on the

human creativity through the psychological experiments. However, the AI impact to creative industry, including arts, was studied by Davies et al. (2020) and the results of the study shows how the AI change the method of creative industry works and affect the profitability through the transformation and the changes of aesthetic value.

Research Method

This research used qualitative research with the data collected from informants through the in-depth interview and the 12 literatures review processed by Nvivo and also using VosViewer across 200 data searched in Crossref and Google Scholar.

Table 1. Profile of the Informants			
Age	**Occupation**	**Tenure in Artworks**	**Art field**
28	Non-Artist	Non-Artist	Non-Artist
58	Artist	> 5 tahun	Perfoming arts, dance, music
47	Non-Artist	Non-Artist	Non-Artist
38	Non-Artist	Non-Artist	Non-Artist
37	Artist	> 5 tahun	music
22	Artist	> 5 tahun	music

Source: Author (2024)

The choice of the informants is based on the convenience sampling method to ease and make the discussion becomes more objective. Table 1 shows the composition of informants' profiles either artists or non-artists to enable the objective and various perceptions.

Table 2. Literatures to process with VosViewer Tool		
Source	**Keyword search**	**Numbers of Titles found**
Crossref	"Artificial intelligence" and "aesthetics" and "artworks" and "profit" and "commercial use" and "adorno paradox"	200

Google Scholar	"Artificial intelligence" and "aesthetics"	200
	"Artificial intelligence" and "artworks"	200
	"aesthetics" and "profit"	200
	"aesthetics" AND "commercial use"	200
	"Artificial intelligence" and "Adorno paradox"	None is found
	"profit" and "Adorno paradox"	None is found

Source: Author (2024)

Table 2 shows the lists of the literature sources used to get references which then processed by using VosViewer to find the gap and novelty, meanwhile Nvivo will also use 12 literatures to be processed to strengthen the in-depth interview results to be more objective and to enhance the validity by using technical triangulation.

Discussion and Results

Using the VosViewer, the visualization of the concept network based on 1000 literatures in total with different keywords as shown in Table 2 and the interrelationship of the concepts is displayed below (Fig. 1). Some nodes in the Fig.1 presents the connection among keywords. The green nodes show the connection with "artwork", "creativity" and "history", the blue ones relate the concept with "aesthetic", "ethics", "commercial use" and "profit" concept, and the yellow ones relate with the technical concepts, such as "generative artificial intelligence", "algorithm" and "visual arts". The gradient on the right corner of the Fig. 1 describes the periods (2021-2022) in which the concepts are most relevant to the context. The yellow nodes relate to the new and booming concept thus more relevant in the latest years and in the contrary, the blue or purple ones are more relevant to the previous years.

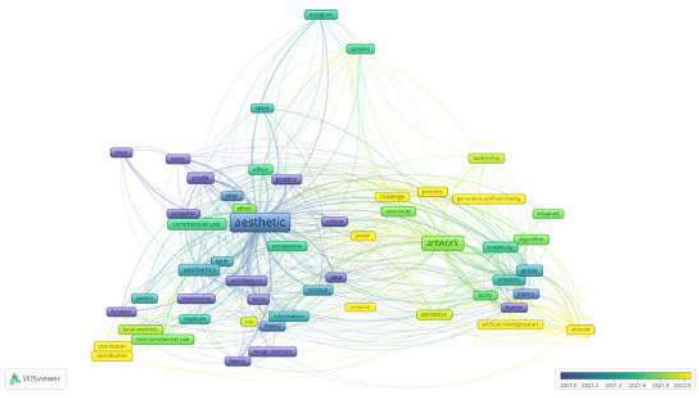

Figure 1. Visualization of Concept Network. Source: Author (2024)

The Fig. 1 is about to answer the research question "how the Adorno's paradox becomes the challenge for the artist to balance the profit and aesthetic value of the artworks" in some points. First, the diagram shows the strong relationship of aesthetic concept and commercialization thus it proves that aesthetic value is collided with the commercialization of artworks. The second is about AI, itself, has changed the artwork production landscape and thus it makes the new challenge to maintain aesthetic value among the market demand and preference, meanwhile the artists have to balance artistic and economical motives. The third shows the diagram shows the concept clusters to identify the possible sub-theme of the research, such as: aesthetic cluster, AI and Tech Cluster, Commercialization cluster, and artist-creativity cluster. There is new far cluster shown in the diagram, Facial aesthetic cluster which then is more relevant to surgery or facial treatment.

The fourth finding from the diagram shown as Fig. 1 is the clusters. The clusters found have relationship to each other such as: 1) AI & Aesthetic, which based on the diagram, AI is used to both exploration and creation new form of artworks.; 2) Commercialization & Aesthetic, which in some cases, the artists will compromise the commercialization which give them economical profit by sacrificing the aesthetic choices; 3) AI & Artist, which as the relationship between AI & Aesthetic, the artificial intelligence is used to enhance the artists' creativity and/or explore the new form of the artworks. The issue of ethical implications of the usage of AI in artwork is also included in this relationship.

The in-depth interview with 6 informants as listed in Table 1, is processed by NVivo based on four questions, such as: 1) "What do you think of AI to commercialize arts?"; 2) "What do you think of AI usage in artworks"?; 3) "How far do you use AI for your arts creation or enjoyment?; and 4) "What do you think of an artwork?. The process of qualitative research based on the in-depth interview has 5 main steps: 1) Data collection by interviewing the 6 informants (3 informants are artists and the rest of 3 informants are non-artists. All the artists interviewed have more than 5 years tenure in artworks. All the artists have main focus on music. The three non-artists informants also enjoy music as their favorite artworks; 2) Data reduction, to select, simplify and transform the raw data to the more organized data and the researcher erased the irrelevant information to the questions; 3) Coding and data presentation, using NVivo nodes and codes are helping the crucial step in categorizing data into specific category or theme. In addition, the data presentation will be used to get better understanding and find the relationship of the concept; 4) Triangulation, the validity test after data reduction and coding to test the validation; and 5) Data interpretation, is the last step in the process of testing the data.

Figure 2. Word Cloud of 12 Literatures. Source: Author (2024)

NVivo processed 6 transcripts of interview and 12 chosen literatures. First, the literatures resulted in word cloud as shown in Figure 2. The word cloud shows the most frequent words in the scripts of the interview. The big font size words are the main theme dominating the answers. Such as: 1) *Seni* (art), Artist, Arts: these words show the focus in 'art' regardless the form of the artwork; 2) AI, Usage, *Teknologi* (technology): 3) This shows that AI is common discussion in art context; 3) *Musik* (music), *Karya* (artwork): "Art" shows that music is considered common art that utilize AI; 4) *Kualitas* (quality), *Otentik* (Authentic), *Asli* (original), which are showings that in terms of AI, people question the originality and if the AI work can be called as the real artwork as human artwork; 5) *Membuat* (create/make), *Menghasilkan* (produce), *Produk* (products): the paradox is shown here as AI is believed to help people at work especially in arts, but on the hand, they also worry of the originality of the art value; 6) *Mengenal* (knowledge), *Belajar* (learn), *Mengetahui* (know): The words show AI and arts interaction should be elaborated to support creative process; 7) *Batasan* (limit), *Tantangan* (challenge), *Masalah* (problem): The words seem to be pessimistic about the usage of AI in artworks such as the limitation of AI artwork and human artwork thus it challenges the artists and also create problems in ethical issues, originality and the authentic and aesthetic value of the arts.

Text search query of the 12 articles shows the The diagram as Fig. 3 shows that 12 articles used as inputs into Nvivo and text search within the articles according the AI usage in arts shows that the topic became the academician's concern, especially in: software, technical aspect, ethics, responsibility, etc.

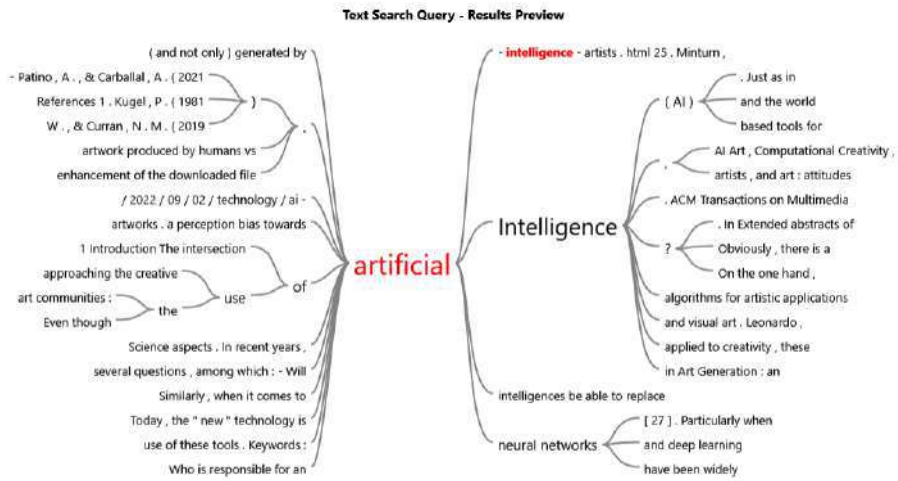

Figure 3. Text Search Query of 12 Literatures . Source: Author (2024)

According to the in-depth interview process with diverse informants, the data presentation has shown four types of mind maps and the matrix coding as follows:

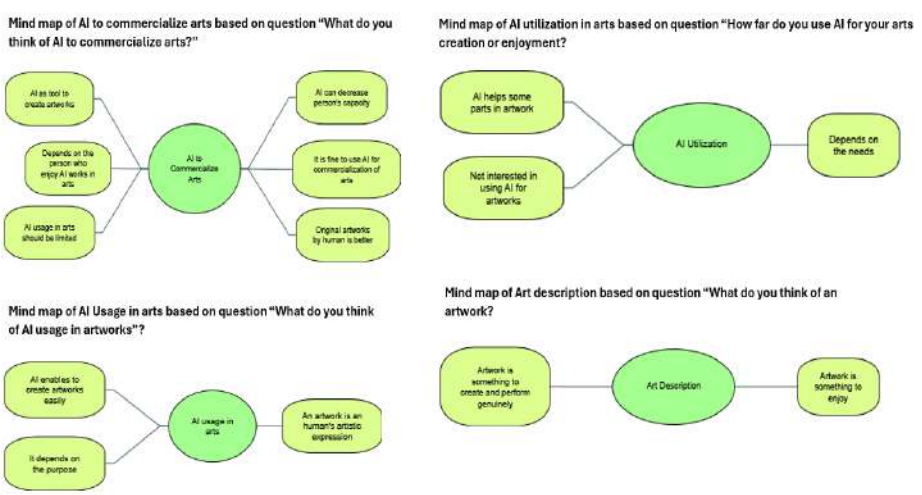

Figure 4. Mind maps of the 'in-depth' interview results. Source: Author (2024)

Fig. 4 describes the reduction process of the answers given by the informants to the four main question topics, namely: AI to commercialize arts, AI usage in arts, AI utilization and Art description.

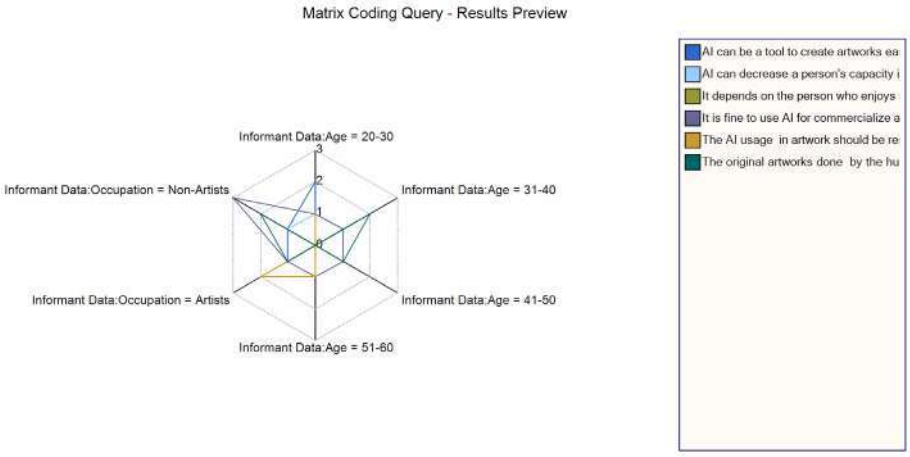

Figure 5. Matrix coding "AI to commercialize arts" and Age.
Source: Author (2024)

Fig. 5 shows that there are differences of opinion regarding the use of AI in art according to age, namely the younger age group (20-30 years) has a more positive view of the use of AI in art compared to the older age group. Meanwhile, in terms of work, artists tend to have more diverse views compared to non-artists.

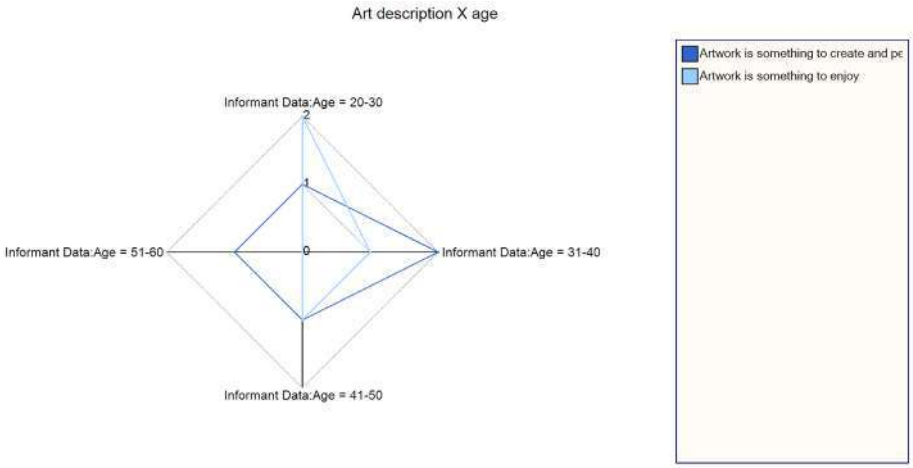

Figure 6. Matrix coding "Art description" and Age.
Source: Author (2024)

Fig. 6 shows the 20-30 Age Group views artwork as something that must be created and displayed, as well as something that must be enjoyed. While the older age group tends to view artwork as something that must be enjoyed, although there are still some associations with the category of "creating and displaying". So that the older the informants have less clarity of their description of art whether for the purpose of enjoyment or performance.

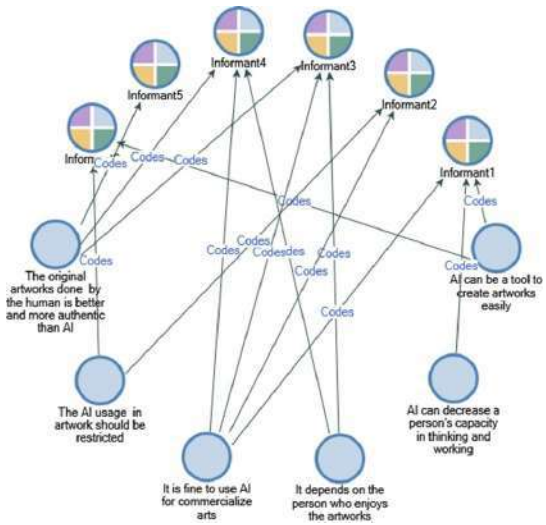

Figure 7. Project map "AI to commercialize arts" X informants
Source: Author (2024)

The project map image (Fig. 7) is interpreted as the diverse perceptions from each informant, either about the view to "AI is a tool" that can help in the creative process or their opinion to appreciate more works of art made by humans. In addition to different opinions, the relationship between concepts shows that a person's view of AI is related to their view of the aspect of authenticity or commercialization of art itself. On the other hand, this diagram shows that the perception of AI in art is complex and not always linear, which can be influenced by factors such as personal experience, educational background, and aesthetic values.

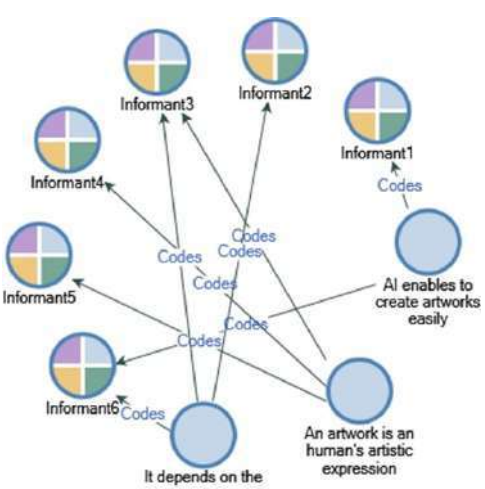

Figure 8. Project map "AI to commercialize arts" X informants
Source: Author (2024)

Fig. 8 shows that each informant has different views on the role of AI in art, some see it as a tool in the creative process but others appreciate artwork made by humans more. While the lines connecting the concepts show that a person's view of AI is related to their view of the authenticity or commercialization of art

while the complexity of the perception of the use of AI in art is non-linear.

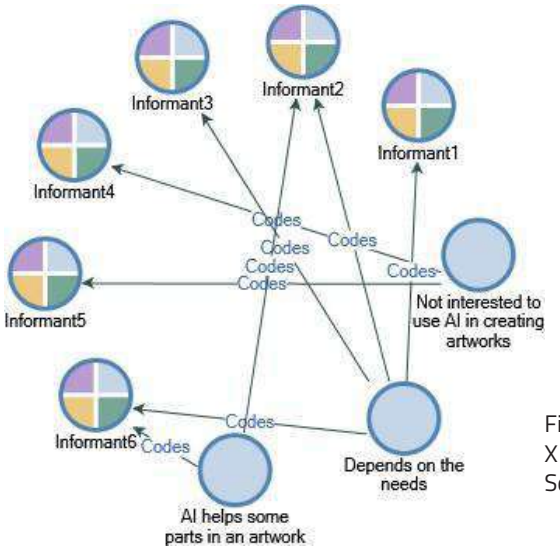

Figure 9. Project map "AI utilization" X informants
Source: Author (2024)

This visualization illustrates an interesting take on how people think about the role of AI in art. By understanding the diversity and complexity of these views, we can develop a better understanding of the social and cultural implications of the development of AI technology in the context of art.

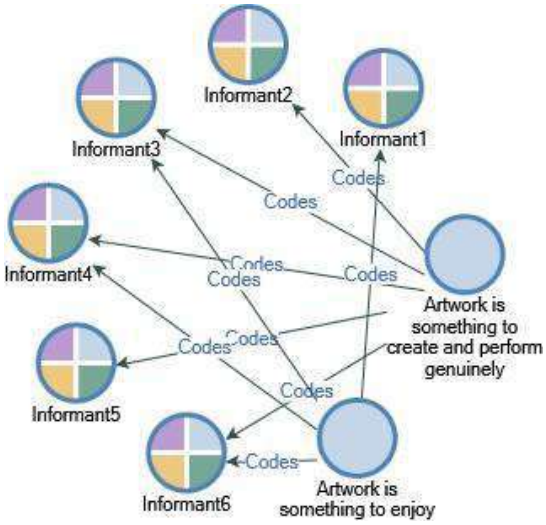

Figure 10. Project map "Art description" X informants
Source: Author (2024)

This visualization shows that there is no single definition of art but it is very diverse. In addition, a person's view of art is often nuanced so that the perception of art is complex and not always linear because many factors can influence a person's view, including personal experience, cultural background, and education.

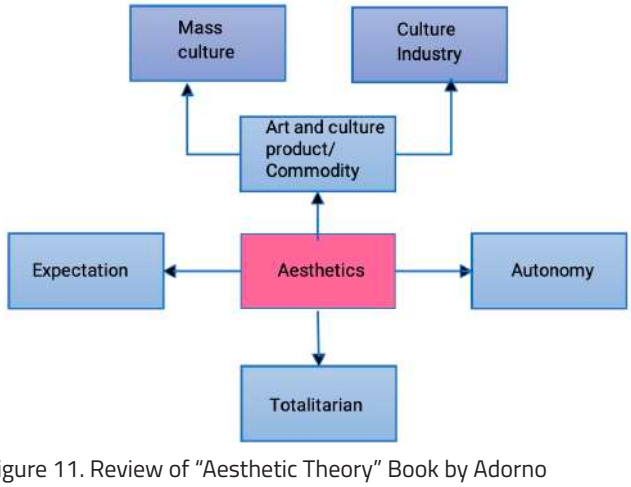

Figure 11. Review of "Aesthetic Theory" Book by Adorno
Source: Author's Working paper (Sari, 2024)

Based on Adorno's Theory (Adorno, 2002), in the context of modernity and contemporary in the era of globalization with all kinds of digital media power, art offers a lot of pleasure and entertainment alone that can generate profit. However, in line with Adorno's thinking, society needs the art education to consider the art as something sacred, free, and has the deepest meaning which is regardless artwork is intended for aesthetic pleasure alone or becomes a tool to challenge injustice in the era when the artwork is created. It is because the main focus is how with a correct understanding of art and culture can make them sustained. Adorno's criticism of the cultural industry is still relevant today because in the digital era, social media and online streaming platforms are actually used to inform things that are shallow in nature, trying to homogenize and manipulate the truth and true meaning of art or culture. So, it is important for artists or cultural figures who create and oversee their works to remain in an autonomous situation for their works to have deep and sacred meaning.

From the results of the review of the book "Aesthetic Theory" a mind-mapping can be made under 'aesthetics' as main topic, which Adorno associates it with his view of the hope that art can be a new opportunity to voice criticism of reality in society. Even though in this book Adorno also criticized capitalism that drives art and culture to materialism purpose with mass production of art and culture. The aesthetics that Adorno thinks about is autonomy that is necessary to support the freedom that is expected. Moreover about aesthetics, according to Adorno, is based on more abstract art products, full of complex meanings and not conveyed clearly and frankly, so that these art and cultural products are not directed at mass culture and practices in the cultural industry.

The four aspects as main findings of this research along with the comparison to Adorno's paradox are perception on AI, perception on commercialization in arts, the relationship between AI and art commercialization and informant's responses. The first aspect shows the perception on AI in which most of informants see AI as the tools to help the creative process but however they still worry of the missing originality and humanization in artworks. It supports some part of Adorno's view about missing authenticity, originality and aesthetics and the other research which found that people devalue art labeled AI-made (Horton et al., 2023). Thus, it implies in the need of defining the "originality", "authenticity" and "aesthetics" in digital era.

The second aspect, Perception on commercialization in arts, shows that most of informants agree that commercialization destroy the aesthetic value of artworks and this aspect finding supports Adorno's theory and his idea of contemporary arts. However, it should be related to the other study which found that human creativity still remains important in the artwork production, even though the medias spread the narration of how machines replace the artists (Aris et al., 2023). The third aspect of the finding is about the positive relationship between AI and art commercialization thus it shows the paradox compared to previous findings, seems like this finding is against Adorno's opinion so that it is suggested to define the complexity of technology, arts and market. Companies engage with AI and the creative industries in many sectors such as advertising, architecture, crafts, design, film/video, even the music and other performing arts (Davies et al., 2020).

The last aspect as the finding of this research is informants' responses with the common opinion about the fear of the negative impact of AI to art values. It is a kind of dilemma that shows especially paradox in economical and profit context which needs and aesthetic values in artworld and among the artists. This paradox urges the existence of the balance between its commercially profitable aspects and its artistic-aesthetic values in creative industry. This industry, however, uses AI in many areas, for example music and performing arts which take places in many products, related to many entertainment medias such as podcast, internet radio, trade shows, concerts, music venues, event management, etc., and in architecture and design, AI are also used in UX design, home renovation, interior design and so on (Davies et al., 2020). This situation requires the artists, capitalists, and society to balance the AI and aesthetic values because the usage of AI in artworks is not deniable and avoidable. A study about how the AI used in art education found that this introduction of AI technology in art education will bring greater learning experience among students (Sahnir et al., 2023). This way brings new hope to optimize the usage

of AI in terms of inclusivity, personal and more interesting.

The new model of theoretical framework built from this research for further research about the relationship of the Adorno's paradox and elements of AI usage in artworks (Fig. 12). It shows the Adorno's paradox in the AI era included government role as the policy maker to support the artists financially, and also regulate the art market, thus the government is placed to influence the culture industry and art and culture product or commodity as well as AI. The regulations in those areas are required. This finding is relevant to the finding of the literature used that AI has enriched the creative process and the correct policy enable the AI potential in Indonesian arts (Hanifa et al., 2023). The element "Artists" then is placed near expectation and connected to aesthetic, because artists are the creator of artworks need to explore the new aesthetic forms and in the same time to meet the expectation of community. Society will be the influencer of expectation and culture industry because community create the model of market demand and trends in arts and culture.

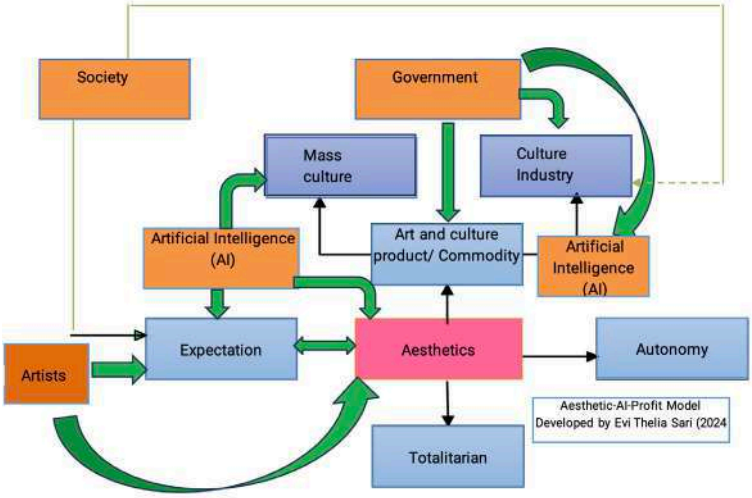

Figure 12. Aesthetic-AI-Profit Model
Source: Author (2024)

Artificial intelligence in AI-Aesthetics-Profit Model shows its influence to 'culture industry', 'mass culture', 'aesthetics', 'expectation' and has connection with art and culture products. The 'autonomy' and 'totalitarian' are not directly connected to AI but cannot be eliminated from the model because of the "new aesthetic definition" may influence the "new totalitarian definition" and "new 'autonomy' definition". The model is the extended version from mind-mapping of Aesthetic theory by Adorno with the consideration on the finding results after some interview and literature review for this study.

Revisiting Adorno's paradox which mainly drawn from his masterpiece "Aesthetic theory" especially about the commercialization of the arts while based on literature review, articles and interviews, there are three main points should be added for new model, namely: 1) Relativity of Aesthetic value: it implies that aesthetic value affect expectation and also is affected by it; 2) AI role in redefining the arts, which is implied in speeding artwork production and create new expectation among the people; and 3) Commercialization of arts in the AI era, is implied as the ability of AI to make the commercialization of arts run faster and change the dynamic of artists, industry of arts and also community as consumers.

Conclusion

The findings are then able to answer the research question about how the Adorno's paradox becomes the challenge for the artist to balance the profit and aesthetic value of the artworks. The research confirmed the Adorno's paradox by leaving continuing dilemma in this modern era where the contemporary arts using the advanced technology grow rapidly. However, the findings imply as the redefining aesthetic in the digital era, not only the aesthetics issues but also originality and authenticity. Other implications of this research is about balancing the economics and aesthetic aspects, especially in creative industries to boost profit for the actors in this industry and as the understanding the AI complexity in discussing AI impact to artworks.

Some limitations of this research are in the number of informants used is mainly in music, it is better to compare with other art fields. the literature used needs to be added (not only 200 literatures for each keyword), as the preliminary research, it needs elaboration in the further research and the model proposed needs to be tested by using more informants, literatures and other research methodologies. However, this research raised new ideas for further research such as: 1) The changes of artists role in AI contexts; 2) Ethics, copyright, ownerships of the artworks; 3) Art acceptability in exclusivity of artworld; 3) and Regulation in AI usage and development in arts.

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THE ROLE AND CHALLENGES OF ARTIFICIAL INTELLIGENCE IN DIGITAL ILLUSTRATION WORK AT DB 2.4 STUDIO SURAKARTA

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Abstract: Artificial Intelligence (AI) comes as a new form of technological development, which offers to help digital- based human work. In the field of digital illustration, the presence of AI is strongly suspected to have provided some significant changes in the creative work process. The presence of AI seems to be a new partner in collaboration. But on the other hand, the presence of AI also provides various challenges for illustrators in the existence of their work. This research examines: (1) how do illustrators at DB 2.4 Studio utilize AI in their creative work process?; (2) what are the challenges that arise from the presence of AI in digital illustration work? Using qualitative methods with case studies. The research aims to analyse how AI plays a role in the world of digital illustration for illustrators, as well as the challenges that arise due to the presence of AI for the digital illustrator profession. AI plays an important role in helping the illustrator's work process at DB 2.4 Studio, namely as a spark of ideas and helping communicate the brief between the client and illustrator more effectively and efficiently. In order not to be displaced by AI, illustrators must have a good social network, utilize various digital platforms, develop creativity and unique, good communication with clients, and solve problems.

Keywords: artificial intelligence, role of AI, digital illustration, challenges

Introduction

Currently, human life has been faced with an era called the digital era. This is marked by rapid progress through development and the results of transformation into digital-based technology. The transformation ultimately brings changes to all aspects of human life that are fast-paced, easy and efficient (Setiaji, 2023). By definition, digitization can be interpreted as the transformation of all types of information including text, sound, video, visuals, and other data from various sources into digital language (Machekhina, 2017). This view is reinforced by (Wuryantai, 2013) which states that digitization is a process in which all forms of information, whether numbers, words, images, sounds, data, or motion, are coded into bits (binary digits or commonly symbolized by the representation of 0 and 1) so as to enable manipulation and transformation of data (bit streaming). Digitalization occurs in all aspects of the field of information, communication, economy, health, industry, and education and in the field of art (Setiaji, 2023).

As technology develops, then humans begin to create smarter technology, which is often called "Artificial Intelligence". Artificial Intelligence (AI) is a concept that has been part of public discourse for decades, often depicted in science fiction movies or in discussions about the possibility of intelligent machines taking over the world and making humans mere slaves in a new AI-dominated order (Dwivedi et al., 2021).

Artificial Intelligence (AI) is a branch of computer science related to the simulation of intelligent behaviour on computers. Although this definition seems simple, experts in the field have not reached a consensus on what intelligence really means. However, some AI experts argue that something is considered 'acting intelligent' if: (1) its actions are appropriate to its situation and purpose; (2) have the ability to adapt to changes in the environment and goals; (3) can learn from experience; and (4) making informed decisions taking into account limitations in perception and computing (Wahl et al., 2018).

In Indonesia, AI is also often used in a creative economy work. According to the

2025 Creative Economy Development Plan (Ministry of Trade, 2008) that the creative economy is an industrial sector that arises from the use of creativity, skills, and talents of individuals to produce welfare and create jobs through the development and utilization of creativity and innovation. From this definition, it can be concluded that the creative industry utilizes creativity and innovation with the aim of channelling skills and talents, so that it can create job opportunities through this creativity (Rusdi & Sukendro, 2018).

One of the creative economy fields often uses AI in its work is illustration. In its development, illustration became an expression of visual language, so aesthetic considerations became important, especially in the process of developing creativity, imagination and exploration of techniques, including the use of techniques that is able to support the illustration image, to create certain effects. Done (in Ulfah & Budiwiwaramulja, 2019) said that illustration is the art of telling a story with pictures, the characters are alive, and the ideas are clear.

At this time, illustrator workers are starting to switch from manual (using paper, canvas, paint, or ink) to digital with computers and applications. The consideration is simple, namely because creating illustrations digitally can speed up work that is not limited by space and time, and can also be easily duplicated (Al-Az, 2024). Illustrators in their work eventually form a kind of network, both between illustrators in long-distance relationships and teamwork in the form of work studios. One of the studios in Surakarta, namely "DB 2.4 studio", is a form that depicts a team working in an illustration project. The DB 2.4 studio consists of 6 illustrators and has 2 work systems, namely individual project work and project as a team.

DB 2.4 Studio is located in Nusukan Village, Banjarsari District, Surakarta City and has various activities, including: Working on illustration projects, discussions, training, and graffiti. Related to the illustration making process, DB 2.4 is ultimately open to all possibilities of dynamic technological advancement, including using AI (Artificial Intelligence). Seeing this, this research is ultimately interested in exploring in depth related to (1) How illustrators in DB 2.4 Studio use AI in their creative work process, (2) Challenges that arise from the presence of AI in digital illustration work in DB 2.4.

Method

The research method used in this article is a qualitative research method. Bogdan and Tylor briefly define that qualitative research is a method that produces descriptive data in the form of words, both in writing and orally (Ratna, 2016). Qualitative research is descriptive and tends to use an inductive approach so that

in the process and meaning it highlights the subject's perspective more (Setiaji, 2023). The research strategy used is a single case study pinned. The single case study case model is suitable for the presentation of a single perspective reality and is focused on one characteristic goal, meaning that this research is carried out in one location, and then the case study is a single case study (Sutopo, 2002). Data collection techniques are carried out through interviews, direct observation, and analysis of documents or archives. The analysis used is descriptive analysis by looking for literature or reference sources from journals, articles, research results and books that are relevant to the research. This study explains how illustrators in DB 2.4 Studio use AI in their creative work process and the challenges that arise from the presence of AI in digital illustration work in DB 2.4.

Discussion and Results

This research tries to dig deeper into the application of AI in the work process at DB 2.4 Studio, Surakarta and the challenges that arise from the presence of AI in illustration work. This study uses a case study in DB 2.4 Studio by exploring the process of making illustrations carried out by each illustrator in DB 2.4 Studio which totals 5 people. From the process, the 5 people then found a conclusion related to how illustrators in DB 2.4 Studio can utilize AI technology in their work process. In this study, direct interviews were conducted regarding opinions regarding the challenges for illustrators due to the current emergence of AI.

1. DB 2.4 Studio

DB 2.4 Studio is a workplace as well as a community engaged in digital illustration services since 2019 in Surakarta, precisely on Jl. Merbabu 1, Nusukan, Banjarsari District, Surakarta. The name DB 2.4 Studio is taken from one of the rooms in the UNS Student Dormitory (Sebelas Maret University), namely Building D, section B, 4th floor, room number 2. The number in the room reads DB 2.4. The location of the UNS Student Dormitory is in Jebres Village, Jebres District, Surakarta.

Simply put, the studio was formed because its members have the same background, namely alumni of FKIP Fine Arts UNS students who coincidentally have the same anxiety, mission, and desire to develop art into the digital realm consistently.

Initially, the members of DB 2.4 consisted of 5 people, namely Faiq Al-Az, Farkhan Muhammad Amin, Aufa Faizul Malik, Galih Anggit Prasetyo, and Rudiyanto. Then after changing places, now the members are 6 people, namely

Faiq Al-Az, Farkhan Muhammad Amin, Galih Anggit Prasetyo, Rudiyanto, Tegar Bima Prayoga, and Satria Yuwan Indonesia.

Although BD 2.4 is an illustration studio, the activities carried out are not only working on illustration projects. Activities at the DB 2.4 studio include: Digital illustration services via web and social media, selling NFT works on Opensea, workshops, trainings, discussions, and graffiti/mural events.

To create digital illustrations, DB 2.4 Studio uses tools in the form of PCs/ Laptops and Ipads. The software used is Adobe Photoshop and Procreate. Meanwhile, the website or service platforms used in selling illustration services through Fiverr, Opensea, Instagram, X, and contests.

2. How Illustrators in DB 2.4 Studio Utilize AI in Their Creative Work Processes

The presence of AI is an important part of the process of creating illustrations in DB 1.4 Studio. Although it does not make AI instantly without doing the drawing process, the presence of AI becomes a partner in collaborating, becoming a solution, and making work more effective and efficient. In this case, it is important for an illustrator to accept every technological development that exists even through filtering in considering various aspects in it (Yuwan, 2024).

The AI used in DB 2.4 Studio is used for brainstorming in text, visual processes, and communication (Al-Az, 2024). Some of the AI applications that have been used in DB 2.4 Studio are divided into 2 bases, namely text and visuals. Text AI, DB 2.4 Studio uses Chat GPT and Gemini AI, while visual-based AI, DB 2.4 Studio uses Copilot, Leonardo, Dall-e, Midjourney, Adobe Firefly, Remini, and Adobe Photoshop's Generative Fill (Amin, 2024).

There are various ways and strategies carried out by illustrators or artists in utilizing AI in the process of working. Here's how illustrator does it in DB Studio 2.4.

A. Galih Anggit Prasetyo

Galih Anggit Prasetyo is an illustrator who chooses dark art, horror, or metal themes in his work. Detailed lines, solid colours, and creepy objects, such as skulls, corpses, or bloody scenes, characterize his work.

Galih Anggit Prasetyo utilizing the 'Fiverr' web service and social media in the form of Instagram in selling and offering digital illustration services. In his work, Galih Anggit Prasetyo uses Adobe Photoshop with a tablet pen tool with a PC/ laptop.

The following is the process of making illustrations carried out by Galih Anggit Prasetyo using AI.

1. Brief

The initial process starts from a brief (work concept) from the client, which contains important things that must be done by the illustrator. In this case, the web service used is Fiverr.

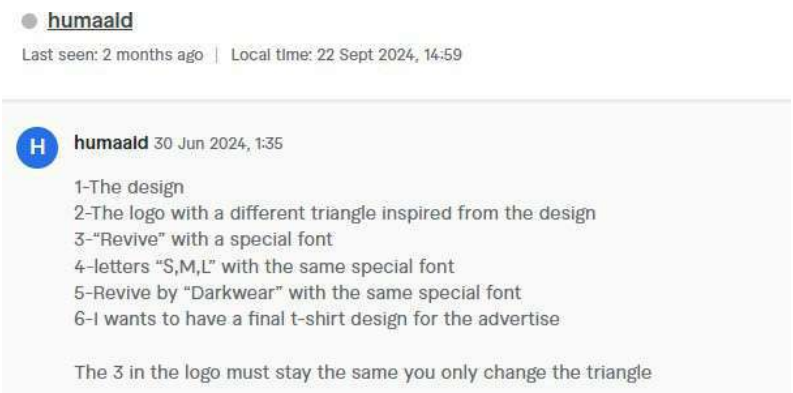

Figure 1. Brief from the client on Fiverr web (Source: Galih Anggit Prasetyo, 2024)

2. Reference Search with AI

After receiving a brief, Galih Anggit Prasetyo then carried out a reference search process. At this stage, Galih Anggit Prasetyo uses the help of AI, namely using Copilot AI to get an overview of the shape that is in accordance with the representation of the desired idea and brief.

Figure 2. AI results from Galih Anggit Prasetyo using Copilot AI.
Source: Galih Anggit Prasetyo, 2024

2 AI images were obtained in the process carried out by Galih Anggit Prasetyo. Furthermore, the images obtained are used as a reference to make objects to determine the shape, expression, anatomy, and dark light in sketching.

3. Sketching

This process is carried out by tracing/drawing on the reference. In this process, Galih Anggit Prasetyo did not redraw exactly the same as the reference, but made modifications according to his imagination and characteristics. This is done to maintain the distinctiveness, uniqueness, or identity in the work.

4. Detailing and Inking

After the rough sketch as an image of the object is completed, the next stage is the inking and detailing process by tidying up the details of the lines and black blocks to get the desired details. In this process, Galih Anggit Prasetyo also added a background to add a livelier atmosphere.

Figure 4. Detailing Line and Inking.
Source: Galih Anggit Prasetyo, 2024

5. Colouring and Finishing

This process is the final stage in the making of illustrations carried out by Galih Anggit Prasetyo. At this stage, the colouring is determined according to the characteristics of the colour that is often chosen by Galih Anggit Prasetyo with solid and bright colours. The final stage then adds gradations, shadows, and text to the work.

Figure 5. Colouring and Finishing Process.
Source: Galih Anggit Prasetyo, 2024

B. Rudiyanto

Rudiyanto is an illustrator whose work has vintage, retro, or 80s-90s illustration themes. The process of work carried out by Rudiyanto is actually not much different from that carried out by Galih Anggit Prasetyo. However, in this study, there is a different case in the process carried out by Rudiyanto, namely how AI is used to help the communication process between the client and the illustrator. The web service used by Rudiyanto is Fiverr, while in the process of making illustrations; Rudiyanto uses an Ipad with procreate software. The following is the process of making the illustration.

1. Brief

In the early stages, the client sent a brief to Rudiyanto in detail with clear points. Then to determine the desired visuals, both in terms of composition, perspective, and proportions, the client creates illustrations as a key reference using AI. The position of AI here is as a medium to provide more detailed clarity on how the visual achievement that the client wants if the photo reference is not able to represent the concept.

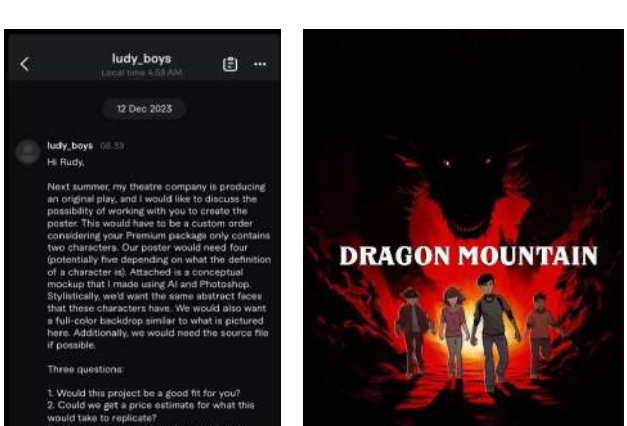

Figure 6. Brief and Reference AI from Client.
Source: Rudiyanto, 2023

2. Sketching and Inking Process

At this stage, after getting a brief and reference from the client, Rudiyanto then made a sketch. Unlike Galih Anggit Prasetyo who carried out the process of making a rough sketch first to continue with the inking, the sketching and inking process carried out by Rudiyanto was carried out simultaneously.

Figure 7. Sketching and Inking Process by Rudiyanto. Source: Rudiyanto, 2023

3. Colouring and Finishing Process

After the inking process was completed, Rudiyanto then continued the colouring and finishing process. The colouring process is carried out by doing a colouring process that is adjusted to Rudiyanto's characteristics, namely using colours that tend to be dull typical of classic colours that are not bright. In the finishing stage, Rudiyanto added details such as highlights, textures, and text to add dramatic effects to his work.

Figure 8. Colouring and Finishing Process by Rudiyanto. Source: Rudiyanto, 2023

C. Farkhan Muhammad Amin

Farkhan Muhammad Amin is an illustrator with an illustration style that combines cartoons with ukiyo-e (classic Japanese painting style). Farkhan uses several platforms to sell his illustrations, including Fiverr, Opensea, and X. In the process of making illustrations, Farkhan uses an Ipad with procreate software. The following is the process of making illustrations that Farkhan did on the Fiverr website.

1. Brief and Reference

In this process, this study found cases that can be said to be experienced in the process carried out by Galih Anggit Prasetyo and Rudiyanto at the same time.

First, the client sends a Farkhan brief accompanied by a reference to the AI results from the client.

Figure 9. References from Client using AI. Source: Farkhan Muhammad Amin, 2024

2. Reference Search with AI

At this stage, unlike Rudiyanto who slightly modified the reference from the client to an illustration, Farkhan actually processed the AI results with the client using Copilot AI in 3 stages. In the first stage, Farkhan determines the figure/ model using AI in 2 processes, and then Farkhan determines the background using AI.

Figure 10. The process of creating references by Farkhan with Copilot AI. Source: Farkhan Muhammad Amin, 2024

3. Line Making Process

The process of making the line carried out by Farkhan is not only tracing from the references obtained, but is still processed again according to the style that is Farkhan's signature. Turning it into an ukiyo-e cartoon style.

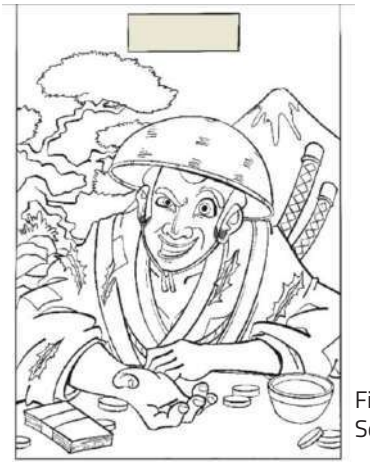

Figure 11. Line Process by Farkhan.
Source: Farkhan Muhammad Amin, 2024

4. Colouring

At this stage, Farkhan does colouring using ukiyo-e colours, which tend to be dull/not bright.

Figure 12. Colouring Process by Farkhan. Source: Farkhan Muhammad Amin, 2024

5. Finishing

At this stage, Farkhan adds details such as shadows, highlights, textures, and text.

Figure 13. Finishing Process by Farkhan. Source: Farkhan Muhammad Amin, 2024

D. Satria Yuwan Indonesia

Satria Yuwan Indonesia is an illustrator who has a visual pop art style with psychedelic themes. Yuwan's works are often in the form of characters accompanied by solid and bright colours. Yuwan chose several digital platforms to sell his illustrations, including on Opensea in the form of NFTs, Instagram, and Fiverr web. In the process of making works, Yuwan uses 2 tools, sometimes PC/Laptop, sometimes Ipad. The software used is Adobe Photoshop and Procreate. The following is the process of creating an illustration from Yuwan from the Fiverr website.

1. Brief

The first stage is for the client to send a brief to Yuwan briefly. At this stage, unlike some illustrators who get visual references, Yuwan is free to make illustrations according to his imagination.

The concept of the illustration is "the world is your oyster" so i would like it to be awoman (looks like a modern Indian woman, I'll share my Instagram profile and you can take inspiration for face and outfit from there) she is sitting, lounging in an open oyster with pearls, she has a glass of wine with a garnish in the glass (usually ita an olive, i would like it to be the earth)

Figure 14. Brief from Client. Source: Satria Yuwan Indonesia, 2024

2. Reference Search

Because the client did not provide a reference, Yuwan then used AI in the process of brainstorming using Copilot AI to be used as a reference in the illustration making process.

Figure 15. AI Prompt and Result by Yuwan. Source: Satria Yuwan Indonesia, 2024

3. Line Making

At this stage, Yuwan really only took a small part of the AI reference part for the tracing process. Most of his work is the result of his imagination in interpreting the brief into the desired object.

Figure 16. Line Making Process by Yuwan. Source: Satria Yuwan Indonesia, 2024

4. Colouring Process

In the colouring process, Yuwan chooses bright colours that are characteristic of his work. At this stage, Yuwan revised several parts of the image, namely hair and body according to the client's wishes. After that, Yuwan added shadow details and highlights to make the image more dynamic.

Figure 17. Colouring Process by Yuwan. Source: Satria Yuwan Indonesia, 2024

E. Faiq Al-Az

Faiq is an illustrator who has the characteristic of 'rough' strokes in his illustrations. The colours in Faiq's work tend to be dull, not bright, and the dark-light game is an important aspect of his work. Many of his works are inspired by grunge, punk, and similar styles, so spontaneous strokes are very noticeable in his work. In the process of making Faiq's work using a PC/Computer with Adobe Photoshop software. The web service used is Fiverr. The following is the process of making illustrations of Faiq Al-Az.

1. Brief and Reference

This is the initial stage, where the client sends the desired brief and reference to be used as a reference for Faiq in working on illustrations.

Hi my friend, I have a new series for you. Want to do 3 posters highlighting the environmental issues of WIND TURBINES. It truly is a terrible issue here in Australia.

Figure 18. Brief and Reference from client. Source: Faiq Al-Az, 2024

2. Modifying References

This stage is a process where Faiq modifies the references from the client to adjust the proportions and perspectives to match the desired composition. At this stage, Faiq uses the AI feature of Adobe Photoshop, namely Generative Fill to add the cropped object to the canvas plane.

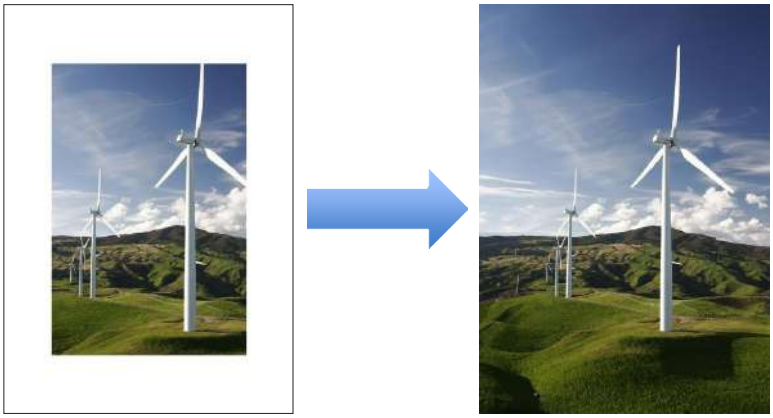

Figure 19. Reference Modification Process using Generative Fill by Faiq.
Source: Faiq Al-Az, 2024

Once the proportions of the process using Generative Fill are complete, the next step is to convert the hill object reference to a barren land that also uses Generative Fill.

Figure 20. Changing objects using Generative Fill by Faiq.
Source: Faiq Al-Az, 2024

In the next stage, Faiq added some photos of the object in the reference. The object is adjusted to the concept that the client wants.

Figure 21. The Process of Adding References. Source: Faiq Al-Az, 2024

After adding the photo to the reference, Faiq then carried out the Generative Fill process again by adding a koala animal object to the reference.

Figure 22. Adding Objects with Generative Fill by Faiq. Source: Faiq Al-Az, 2024

3. Line Making

After making modifications from the client reference and it is considered sufficient, the next step is to create a line by tracing the reference. In this process, Faiq chooses brushes according to his characteristics, namely brushes that are similar to pen.

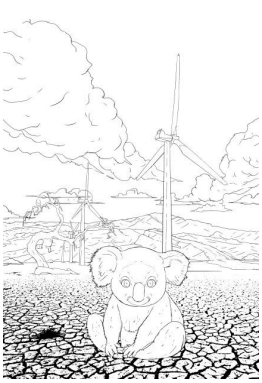

Figure 23. Line Making Process by Faiq. Source: Faiq Al-Az, 2024

4. Colouring and Finishing

At the colouring stage, Faiq usually uses a colour palette that has been prepared in advance, so that the colours in his work have strong characteristics. After that, creating gradation colours and adding shadows and textures carry out the detailing stage.

Figure 24. Colouring and Finishing by Faiq. Source: Faiq Al-Az, 2024

Through the results of the study, it was found that Illustrators in he DB 2.4 studio do not utilize AI by producing AI illustration products instantly to be sold. Illustrators only use the AI results as a reference to then process them into works according to their style. AI is also used to help the discussion process between the client and the illustrator when the brief presented has not yet resulted in an agreement on the visual to be achieved. Regarding text- based AI, illustrators in DB 2.4 Studio also use it to create concept maps or brainstorm ideas when they need new ideas in their work (Al-Az, 2024).

3. Challenges Arising from the Presence of AI in Digital Illustration Work in DB Studio 2.4

In addition to playing a role in assisting illustrators' work in DB 2.4 Studio, AI also presents various challenges that then require illustrators to continue to be creative. Interviewing 5 illustrator members in DB Studio 2.4 then carried out data mining, and the following data was obtained.

Through the interview, there are 5 points that are challenges for an illustrator, including:

a. As an illustrator, it is important to develop social networks both with fellow illustrators, and the public in general. This is for the sake of establishing a strong emotional bond so that it can attract potential clients to come. Through this bond, clients will appreciate the personality of the illustrator more than using robots in the form of AI.
b. The need to develop existence by utilizing various platforms in the

publication of works. This aims at the works made can be widely known by the public. Through popular works, it is not impossible to bring the existence of the illustrator as well.

c. The importance of continuing to develop creativity in processing objects. Processing here can make the resulting image have uniqueness, distinctiveness, and identity in his work.
d. Establish good communication with clients. This is important to do so that the client orders continuously.
e. Solution in working on illustration projects. This will make the client have full confidence in the work given to the illustrator. Because basically, clients certainly want every project to run smoothly without obstacles.

Conclusion

1. The development of AI in this era of digitalization can ultimately become a useful collaboration partner in helping illustration work in DB 2.4 Studio. The role of AI is not used to create illustration works instantly with all the work using robots, but the AI that has been produced is still being reprocessed according to the results desired by the illustrator. For DB 2.4 Studio members, AI is used in several functions, namely functioning as an idea starter in maturing concepts in written form, helping to brainstorm ideas visually, and helping to communicate with clients virtually so that the work to be created has the same purpose and purpose between the two parties (client-illustrator).

2. In addition to playing a role in helping human work, it turns out that the creation of AI also affects the public's view of various types of jobs that have the potential to be taken over by AI. This concern was then responded to by the illustrator's personal view of DB 2.4 Studio as a new way and strategy in his work. There are several points that are important for illustrators to do so that AI does not displace their work. According to DB 2.4 Studio, these important points include: Developing a good social network will have the potential to establish emotional closeness, develop existence by utilizing various digital platforms, develop creativity both skills and ideas to offer uniqueness and characteristics in their work, establish good communication with clients to attract clients to order services back, solutions to all illustrative problems faced in a particular project. These are the various reasons that allow that the illustration services offered will continue to be in demand by clients without being replaced by AI.

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THE ART OF COLLABORATION: FILMMAKERS AND AI IN INNOVATION

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Abstract: This research explores the impact of artificial intelligence (AI) on the film industry, particularly in Hollywood, where AI enhances scriptwriting, storyboard creation, music composition, special effects, and set design. Using a qualitative approach and semiotic theory, the study analyzes films utilizing AI in production. While AI can reduce manpower, lower costs, and improve efficiency, it also poses challenges, including risks of plagiarism and potential misuse leading to criminal activities.

Keywords: AI, Film, Industry, Film Production

Introduction

Artificial intelligence or AI was created by an expert named John McCarthy in 1956. According to John McCarthy, AI is the science and engineering of creating intelligent machines, specifically creating intelligent computer programs. AI is an act of creating robots or programs that are as intelligent as humans (McCarthy, 2007). The definition of AI according to Marvin Minsky's theory with Seymour Papert, known as the perceptron theory, is the limit of artificial neural networks. According to Marvin Minsky, AI has a function as a computer construct capable of performing tasks that can be done by humans and require intelligence to perform. This approach emphasizes the system's ability to complete tasks traditionally considered to require human intelligence, such as visual perception and language understanding. Artificial intelligence has previously been used for industrial and household needs, aimed at helping humans to work faster and more efficiently.

AI systems have three fundamental components: 1. machine learning, 2. deep learning, and 3. neural networks. Machine learning is heavily used in Google applications where the Google search engine can perform identification. New identification can be done by the Google search engine when a user provides a code that will be processed by the search engine to perform identification and find answers to commands given using that code. The use of deep learning can be seen in smartphones with voice control. Smartphones can detect sound, for example, when a smartphone owner forgets where they put their phone, they can clap loudly and the phone can detect the clapping sound and respond by ringing the ringtone. For neural networks, it can be seen when an airline passenger is about to enter the boarding area and the AI system will detect the passenger's face according to the code given by the staff, and the AI system will mark the passenger's face to ensure security according to the data received.

AI is becoming increasingly prevalent in the digital age. Rapid technological advancements are driving the creation of more innovative solutions. The development of AI with more complex computer systems aims to meet the

needs of modern society. The demand for AI has become quite significant in various industrial sectors, including the transportation, film, healthcare, and other industries.

The development of AI systems requires the application of artificial intelligence in the real world that can provide positive changes, including improving quality and providing efficiency for artificial intelligence users and influencing the economic sector of its users. The following is the use of AI in the transportation sector. The use of AI systems in transportation can be seen in Google applications that have self-driving Google. Google application users can download the AI system and easily use the AI system to perform fairly accurate navigation with GPS facilities and cloud services that can make it easier for drivers to find addresses according to the radar directed by the AI system. AI systems can provide quality improvements to transportation systems.

Methods

AI systems are used in the film industry. AI plays an important role in addressing the needs of the film industry. This research uses a qualitative method with a semiotic analysis approach to show changes in the film industry sector through the context of film production management in explaining the phenomenon of AI related to film values. Semiotics uses a sign system from Roland Barthes. Data collection is done systematically and by collecting case studies of film studios that use AI to see the use of AI systems by filmmakers with the films produced. This method is used to uncover future filmmaking with AI in the present. This research focuses on the use of AI systems as a solution for film studios that use them with filmmakers as the subjects who produce films.

Semiotics can be examined by looking at the form, content, and context chosen to analyze the elements that form AI's contribution to filmmaking. Form becomes the forming element of the filmmaker's collaboration with AI in filmmaking. Content can be seen in the meaning of the form of collaboration, and context can be seen in the variety of conditions when a film as an object is produced and interpreted with different interpretations by others. The symbols and meanings of AI used in films have added value to those films.

Result and Discussion

AI usage in the film industry has seen a significant increase with the development of increasingly complex and innovative AI systems.

The Future Filmmaking with AI:

a. Studio in Hollywood
b. AI is solution
c. AI can change the paradigm pattern

Case study: The film *The Irishman* uses artificial intelligence to create character designs for Robert de Niro, Al Pacino and Joe Pesci by adapting changes in facial design to changes in time in the film. As the film's stars are all much older than most of their on-screen characters, ILM was brought to de-age the actors for the various time periods in the film. The film covers decades in the lives of these characters. Robert de Niro and Joe Pesci are both 76 years old, and Al Pacino is 79, yet in the film, de Niro alone appears as Frank Sheeran aged: 24, 36, 41, 42, 47, 55, and then eventually his actual age 76. The 209-minute film contains 1750 visual effects shots, and as the film was for Netflix is was mastered in 4K, including all the VFX.

For example, the de-aged Joe Pesci was de-aged to a thinner version of Russell Bufalino than the actual actor Joe Pesci was at that similar age. In this way, Helman was focused on the arc of the characters in the film, not necessarily the perfect likeness of the same actor but younger.

Filmmaking consists of six stages: development, pre-production, production, post-production, distribution, and exhibition. The development stage involves the development of the story by the director, producer, and screenwriter. This stage requires a script that will be realized as a film. AI can be used to generate scripts. AI algorithms can identify plotlines by analyzing story structures. Filmmakers can access applications like ScriptBooks, which use AI to predict film outcomes. This application has AI that analyzes scripts. AI algorithms validate content and story according to codes specified by the filmmaker. This application can be accessed at www.scriptbook.io. Using AI to assist in scriptwriting can make the process faster and more efficient. A case study of Sony Pictures using ScriptBook to analyze 62 of their films exemplifies this.

AI can also be used in the pre-production stage in collaboration with filmmakers for location scouting. AI can analyze locations based on the specific needs of the story. Filmmakers need to input specific location requirements into the AI system. This includes data such as setting, required location time, specific demographics needed, and the desired look and mood for the story. Filmmakers can use AI tools like Refsee, which has an extensive database suitable for various story needs. Filmmakers can also access Google Earth and Street View for virtual exploration of potential locations. Using AI for location scouting can streamline the work of production managers and make the location manager's

job faster and more efficient.

The development of increasingly complex and innovative AI can also facilitate film promotion. AI systems can help analyze the audience base and the popularity of actors, providing a percentage of the actor's popularity in relation to film promotion. A case study of Century Fox using the Merlin application for the film Morgan serves as an example.

Some examples of film studios using AI in film production include:

- Warner Bros uses the AI application Cinelytic AI, which has the function of predicting film success and box office estimates."
- "20th Century Fox uses an AI application called Merlin. The use of AI aims to find the right match between the film and the desired genre and audience classification, along with demographic information about the film."
- "Sony Pictures uses ScriptBook with the aim of analyzing 62 of its films."
- "The Irishman film used AI to design the characters of Robert DeNiro, Pacino, and Pesci, and for special effects in the film using the Medusa application.

These translations emphasize the specific AI applications used by these studios and their purposes.

AI innovations in film production offer **reduced manpower, lower production costs, and increased efficiency**

However, AI also presents challenges like the potential plagiarism of visual works and the risk of global criminal activities arising from irresponsible AI misuse.

THE FUTURE ROLE OF ARCHITECTS IN THE AGE OF ARTIFICIAL INTELLIGENCE

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Abstract: Our built environment is under constant pressure as a result of the increasing complexity of our world. Translating society's ever changing needs into concrete, efficient, and sustainable solutions is a daunting task for architects. Important problems like the housing crisis, fast urbanization, population density, and climate crisis demand a new architecture that is willing to take on the challenge. In order to meet these challenges, the industry today needs to innovate, adapt, and change. The next development in an architect's toolkit is artificial intelligence (AI), which when combined with data is assisting architects in shifting to a more outcome-based style of working to produce better outcomes. AI-powered tools can process, analyze, and make sense of the massive amounts of data generated during the design, construction, and operation of a building. While AI certainly makes the design process more efficient, it will not be able to replace the architect's creative mindset and ability to deliver unique designs that respond to specific clients needs, environmental demands, and social and cultural contexts. Much of what architects do involves creative analytical thinking, original perspectives, problem-solving abilities and soft skills that rely on human decisions and cannot yet be accurately replicated by technology. It's about working with each other's strengths: computers and software can automate tedious and repetitive day-to-day tasks, freeing up more time for architects to focus on the creative and personal sides of architecture. Their expertise and minds remain irreplaceable but can now be complemented with data and new technology.

Keywords: Architecture; Artificial Intelligence; Architects; Built Environment; Sustainable

Introduction

Today, we may have all the data all the time. In the future, as data is freed from file types and made granular and interoperable, you'll have the right data at the right time. Granularity, along with unified secure access, unlocks key workflows for architects. Think of the ability to define the outcomes of a project at its earliest phases, when decisions are less expensive to make; the ability to get real-time and on-demand insights as you're designing; and the ability to leverage AI for co-creation.

The role of architects is expected to evolve in the future as data becomes more connected across the AEC (architecture, engineering and construction) industry and with our built environment encompassing infrastructure, buildings, public space, water structures, airports and more. Cloud-based software Autodesk Forma, for instance, enables architects to drive better outcomes by harnessing data from day one. With the help of AI-powered capabilities, they can create 3D massing models. They can test in real time a wide range of scenarios and analyze the impact from diverse environmental conditions –sun, daylight, wind, noise, microclimate and more– in order to find optimal solutions within the chosen parameters. They can rapidly create and iterate different versions to streamline the design stage, minimize rework and lay a solid evidence-based foundation for a more sustainable and efficient process.

AI: the next evolution in the architect's toolbox. The conversation about data-driven design and AI often goes hand-in-hand. AI is the next evolution in the architect's toolbox, and together with data, it is helping architects move towards a more outcome-based way of working to achieve better end results. AI and data have a complementary relationship; AI-powered tools can process, analyze and make sense of the vast amounts of data generated during the design, construction and operation of a building. AI algorithms can be used to identify patterns and trends in the data, make predictions and generate insights that can inform different design decisions. And the more and better data is input into the system –from sources such as BIM databases, IoT devices,

weather and traffic data and user feedback– the better the AI gets at learning.

As AI technology continues to advance and data flows improve across the entire project lifecycle, removing traditional siloed ways of working, this will strengthen the role of architects as orchestrators. Architects will potentially gain a greater responsibility for managing the processes, data and relationships throughout a project, starting from early phase planning and ending with disassembly at the end of a building's lifecycle. And with this holistic approach to designing and constructing our built environment, it is possible to improve both quality and efficiency. To enable this transformation, AI will have to be integrated into a modern design firm's workflow, and architects must acquire the necessary skills to work with these tools and avoid falling behind. In essence, we must recognize the power of data and AI-powered tools for assisting architects in their work, helping them create better solutions for the complex problems that our societies and cities are facing now and in the near future.

While AI excels at processing data and optimizing solutions, the essence of architecture lies in the irreplaceable human qualities of creativity and intuition. The ability to conceive original ideas, envision spaces that evoke emotions, and weave cultural narratives into designs remains uniquely human. AI can offer suggestions and variations, but it is the architect's intuition that guides the selection and refinement of those options.

Human creativity vs. machine efficiency. Human architects possess a deep understanding of how people interact with spaces, drawing from personal experiences and cultural contexts to create designs that resonate on a deeper level. This inherent creativity and intuitive understanding of the built environment are what elevate architecture from mere construction to an art form.

The future of artificial intelligence in architecture is bright. Emerging technologies like generative design, machine learning, and robotics promise to revolutionize the industry further. The collaboration between human creativity and AI's computational power will lead to innovative and sustainable architectural solutions that address the challenges of the 21st century.

The industry is moving toward data-driven design. From AutoCAD to BIM in the cloud, the architecture industry has come a long way –but this digital transformation is just starting. Data has become fundamental to how people work and companies from all fields have successfully integrated it into their daily workflow. In architecture, more and better data allows professionals to deliver user-oriented projects that integrate seamlessly with their surroundings,

which in turn generates more data, complexity and optimization. While the rise of BIM enabled stakeholders to collaborate through a common database, the introduction of cloud-based solutions with user-friendly interfaces is expanding the accessibility of complex architecture projects to a wider range of stakeholders such as developers, governments and citizens. This allows them to become a more integral part of the planning process, enabling more inclusive communications right from the beginning.

Research Method

The adoption of AI tools in architectural design has brought tremendous advantages and opportunities. As we traverse this new era of tech-influenced design, it's evident that AI's role will only continue to grow and evolve. Artificial Intelligence is no longer just a buzzword in the architecture industry. Its integration into workflows, tools, and software solutions has expanded creative boundaries, improved efficiency, and navigated the path for sustainable designs. Absorbing the benefits of AI in architecture, it's clear that this technology is not just merely complementary; it is deeply transformative. This study describes current phenomena about the effects of the digital transformation, how it is reshaping the industry and the questions it raises about the future role of architects by using a descriptive methodology that blends case studies and literature reviews.

Discussion and Results

Although the use of AI in architecture is still relatively in its early stages, its potential for shaping the future of the industry is vast. Many already consider the groundbreaking technology to be an established field, and some have even dared to call it "the other designer in the room. "AI will not replace architects, but it will augment their work. Automation and artificial intelligence will not replace architects, yet this does not mean that the industry will not undergo profound transformations. As we know that "the opportunities that AI brings can ultimately change the existing workflow within architecture."

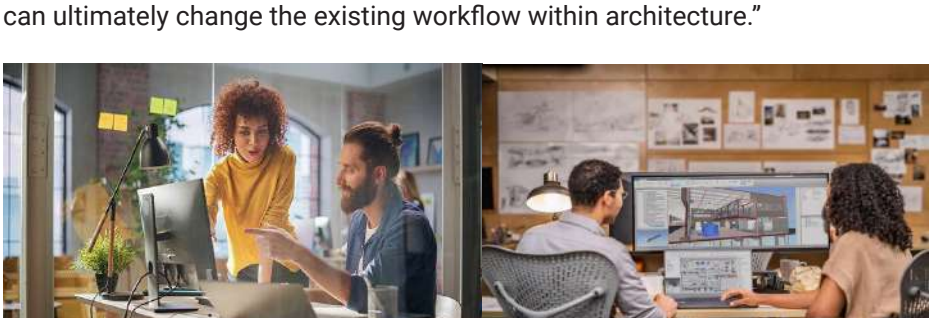

Figure 1. AI brings can ultimately change the existing workflow within architecture

Emerging AI technologies

- **Generative design**: This technology can be used to create new and innovative designs that would be difficult or impossible for humans to come up with on their own. For example, generative design could be used to create a perfectly optimized building for energy efficiency or to design a city that is resilient to climate change.
- **Machine learning**: This technology can be used to train AI models to recognize patterns and make predictions. In architecture, machine learning could predict how people will use a space or identify potential problems with a design.
- **Natural language processing**: This technology can be used to understand and respond to human language. In architecture, natural language processing could be used to create AI-powered design assistants that can help architects create designs that meet the needs of their clients.
- **Virtual reality and augmented reality**: These technologies can create immersive experiences that allow architects to explore their designs more realistically. VR architecture and AR could also be used to collaborate with clients and stakeholders on designs.
- **Robotics**: This technology could automate construction tasks, making construction faster, cheaper, and more efficient. Robots could also create more complex and intricate designs than would be possible with human labor.

Understanding the Role of Artificial Intelligence in Architecture

Artificial Intelligence (AI) is indisputably a game changing technology that is significantly impacting the architectural world. It's importance and potential can't be understated as it drastically transforms the design process, simplifies complex tasks, and facilitates the creation of more efficient and sustainable architectural designs.

In the intricate world of architectural design, the plan stands as a cornerstone, shaping spaces through a blend of creativity and organization. This process is being revolutionized. The integration of Artificial Intelligence (AI) tools in architectural planning is not just a trend, it's a transformative force that's ushering in a new era of innovation. AI is bringing a multifaceted set of capabilities to the table. It's not only expediting the design process but also enhancing the overall efficiency and sustainability of architectural proposals. From exploring a multitude of creative possibilities through generative design to predicting energy performance with sophisticated simulations, AI is empowering architects to make informed decisions and optimize their designs. And the best part is this doesn't come at the cost of their imaginative exploration.

The Need for AI in Architecture

In traditional architectural planning, generating a detailed floor plan in both 2D and 3D can be a time-intensive task requiring meticulous manual measurement. AI, such as that found in the OpalAi app, simplifies this process by automating the detection of walls, doors, windows, and other significant features. This allows architects to focus on more complex, creative aspects of their projects. AI is also integral to streamlining workflows. Traditional methods often involve juggling between different tools and programs, but AI boasts the capability to integrate seamlessly with existing architectural software, thus boosting performance and reducing assimilation issues.

Additionally, AI is able to address various design constraints and regulations while still providing innovative and visually appealing designs. This is evident in tools like Havenly and Hutch, which use AI to offer virtual visualizations of furnished spaces. By integrating AI into architecture, designers can focus on illustrating their vision without worrying about technical details, thus striking a balance between functionality, aesthetics, and clients' requirements.

AI in Architecture: 7 Benefits and Examples

Artificial Intelligence (AI), once confined to the realm of science fiction, is now a powerful tool reshaping industries across the globe. From education to medicine, new AI tools are changing the way we interact, create and work. In architecture, artificial intelligence is revolutionizing the architectural design process, optimizing designs, and enhancing building performance.

The role of AI in architecture

AI's relevance in architecture stems from its ability to process vast amounts of data, automate time-consuming tasks, and generate creative solutions. This has the potential to streamline workflows, enhance designs, and promote the creation of sustainable structures. Its capabilities are being harnessed across various stages of the architectural design process, from early-stage planning and conceptualization to physical construction.

Architectural design

AI algorithms can generate a multitude of architectural design solutions during the design process based on specific design parameters, pushing the boundaries of creativity and offering design inspiration. In the early stages, AI can analyze building site data, environmental factors, local planning regulations, and client preferences to inform initial design concepts. AI-powered software also aids in architectural visualization and rendering, bringing design concepts to life with real-time rendering and immersive client presentations (M. Glaser and S. Schwan, 2019).

Building construction

AI optimizes building processes by analyzing design data to identify potential issues and suggest improvements in architectural design, ensuring structural integrity. AI-powered project management tools streamline construction workflows, reducing delays and costs. Additionally, AI automates time-consuming tasks, such as floor planning and MEP construction coordination, allowing human architects to focus on more complex decision-making and creative endeavors.

Urban development

AI aids in urban planning by analyzing real-time data on traffic patterns, population density, and environmental factors to design more efficient and livable cities. AI-driven models can simulate the impact of urban design choices on sustainability and energy efficiency, helping real estate developers and urban planners make informed decisions (Zheng, H., & Yuan, P., 2021).

Sustainability

AI plays a crucial role in sustainable architecture by analyzing building performance data and simulating various scenarios to optimize designs for energy usage and energy consumption. AI-powered systems can control lighting, heating, and ventilation in smart buildings, further reducing environmental impact and promoting green architecture as a common solution for public spaces.

Figure 2. AI plays a crucial role in sustainable architecture

The 7 main benefits of using AI in architecture

The integration of AI in architecture (architectural AI) yields numerous benefits:

1. Enhanced creativity

AI algorithms such as Generative Adversarial Networks (GANs) and other generative AI technologies push the boundaries of traditional architectural design. These systems can analyze vast datasets of existing designs,

cultural artifacts, and natural forms to generate new, unexpected design concepts. Tools like DALL-E illustrate how AI can create entirely new forms and aesthetics, providing architects with innovative ideas that they might not have conceived independently. This symbiosis between human creativity and machine intelligence opens new frontiers in architectural aesthetics, allowing for the creation of structures that are both unique and functional. For instance, AI can suggest organic forms inspired by nature, leading to biomimetic designs that are both sustainable and visually stunning.

2. Increased efficiency

AI dramatically enhances efficiency in architectural workflows by automating time-consuming tasks. Tasks such as drafting initial floor plans, analyzing structural integrity, and optimizing spatial layouts can be performed swiftly by AI, freeing architects to focus on more complex design challenges. AI-driven software can analyze a site's environmental data to optimize the placement of windows for natural light or the orientation of a building to maximize energy efficiency. This not only speeds up the design process but also results in more refined, practical, and cost-effective solutions. Additionally, AI can manage project schedules and resources, predict potential delays, and suggest adjustments, ensuring that projects stay on track and within budget.

3. Improved accuracy

AI tools enhance the precision of architectural plans and construction documents. By leveraging machine learning algorithms, these tools can detect and correct errors that might be overlooked by human eyes, ensuring higher safety and compliance standards. For example, AI can cross-reference building codes and regulations with design plans, flagging potential violations before they become issues. This meticulous attention to detail minimizes costly rework and delays during construction. Furthermore, AI can simulate and analyze structural performance under various conditions, providing architects with critical insights into the durability and safety of their designs.

4. Cost savings

AI contributes to significant cost savings throughout a project's lifecycle. It optimizes design and construction processes and reduces material waste, labor costs, and energy consumption. Predictive analytics can foresee maintenance needs, allowing for timely interventions that prevent expensive repairs. For example, AI can monitor the health of building systems, predicting when equipment is likely to fail and scheduling maintenance before issues escalate. Additionally, AI can optimize supply chain logistics, ensuring materials are delivered just in time and in the right quantities, further reducing costs

associated with storage and wastage.

5. Better project management

AI enhances project management by providing tools that improve scheduling, resource allocation, and stakeholder communication. AI-powered project management systems can track progress in real time, identify bottlenecks, and suggest corrective actions. These systems facilitate seamless communication among architects, contractors, and clients, ensuring everyone is on the same page. For instance, AI can automate the distribution of updates and reminders, reducing the likelihood of miscommunications and delays. Additionally, AI can analyze project data to forecast future trends and outcomes, helping managers make informed decisions and mitigate risks effectively.

6. Sustainable design solutions

AI plays a crucial role in promoting sustainable architecture. It helps architects design buildings that optimize energy use, reduce carbon footprints, and utilize sustainable materials. AI can analyze climatic data to suggest energy-efficient HVAC systems, natural ventilation strategies, and renewable energy solutions like solar panels. It can also recommend the use of recycled or low-impact materials, contributing to greener building practices. By simulating different environmental scenarios, AI enables architects to create buildings that are environmentally friendly and resilient to climate change, ensuring long-term sustainability.

7. Enhanced client communication

AI-powered visualization tools, such as real-time rendering and virtual reality, revolutionize how architects present their designs to clients. These tools allow clients to experience a virtual walkthrough of their future spaces, providing a more immersive and comprehensible presentation than traditional blueprints and models. This enhanced visualization helps clients make more informed decisions, increasing their satisfaction and confidence in the project. Additionally, AI can generate detailed reports and analytics that explain the design's benefits and features, facilitating transparent and effective communication between architects and clients.

Case studies and examples

Zaha Hadid Architects is a pioneering firm in the use of AI. It has employed parametric design and machine learning algorithms to create innovative and complex structures. Other projects have utilized AI to generate floor plans for meeting rooms, optimizing building dimensions for maximum efficiency. Here are a few more real-world examples that demonstrate the transformative power

of AI in architecture:

1. The Shanghai Tower

The Shanghai Tower stands as a beacon of AI-driven architecture. Utilizing AI for energy efficiency, wind resistance, material selection, and construction management, the tower exemplifies how AI can enhance sustainability and structural integrity. AI systems optimized the building's aerodynamics to minimize wind loads and reduce sway, ensuring stability and comfort for its occupants. Additionally, AI facilitated efficient resource management and safety protocols throughout construction.

Figure 3. Shanghai Tower. Image by Gensler

2. Project HALO by Skanska

Skanska's Project HALO (High-rise Automation, Labor-Saving, and Optimization) integrates AI-powered robotics into construction workflows, significantly enhancing efficiency and safety. These advanced robots perform tasks such as bricklaying and concrete pouring with precision and speed, reducing the likelihood of human error. AI monitors site conditions in real time, predicting and preventing potential hazards and safeguarding workers. This project highlights AI's role in revolutionizing construction practices, leading to faster project completion and reduced costs.

3. AI-Designed 3D-Printed House in France by XtreeE

XtreeE utilized AI to create a 3D-printed house that marries aesthetic innovation with structural robustness. The AI algorithms optimized the design for material efficiency and strength, ensuring the house is both sustainable and durable. This approach reduces construction waste and allows for unique architectural forms that are difficult to achieve with traditional methods. The project underscores AI's potential in advancing sustainable building technologies.

4. The Edge, Amsterdam

The Edge in Amsterdam showcases AI's capability in smart building management. AI-driven systems optimize energy consumption, regulate climate control, and manage space utilization, creating an energy-efficient and

adaptive environment. The building's AI infrastructure continuously learns and adapts to user behaviors, enhancing comfort and productivity. This intelligent approach to building management demonstrates how AI can lead to more sustainable and responsive architectural solutions.

Figure 4. The Edge, Amsterdam. Image coutesy by edge.tech

These projects illustrate the diverse applications and benefits of AI in architecture, from design and construction to energy management and sustainability, highlighting the profound impact of AI on the future of the built environment.

Revolutionizing Architectical Plan Creation with AI

AI's role in creating architectural plans is of paramount importance. AI Architecture Plan Generators like Autodesk Forma allow architects to produce floor plans and room layouts using simple inputs. They can generate furniture arrangement ideas that consider a homeowner's style preference, making it both a time-saving tool and a creative companion for architects. The integration of AI in projects doesn't only foster efficiency but also offers new creative pathways through informed design choices and discovering otherwise unthought-of design options. That's precisely the aim of ClickUp, a project management tool that enables organization and tracking of projects in a seamless and efficient manner.

Familiarizing with Artificial Intelligence (AI) Tools in Architecture

The landscape of architecture is constantly evolving, with AI technologies playing an increasingly prominent role. AI is not only influencing how we design but also empowering us to push the boundaries of what is possible. In this section, we delve deeper into the AI tools changing and shaping the landscape of architectural design and optimization.

AI Tools for Drafting Plans

AI has morphed from a passing trend to an indispensable tool for architects, aiding in creating detailed and efficient drafts. AI-powered tools like Dreamhouse AI, Finch, and Getfloorplan are pioneering this new wave. Dreamhouse AI

program, for instance, is an advanced design assistant that gives users access to a Pro version with extra capabilities. It leverages AI to ensure optimal placement of furniture and décor, making it a boon for architects and interior designers. Finch program uses graph technology to optimize building designs, providing immediate feedback on building performance. Not only does it detect errors but also offers optimal solutions early, thereby paving the way for an improved design process. Getfloorplan program is an AI-powered service which lets users create detailed 2D and 3D floor plans, as well as 360 virtual tours. Users simply upload a floor plan or sketch, and the AI takes care of the rest, offering the finalized plan in under 30 minutes (M. Glaser and S. Schwan, 2019).

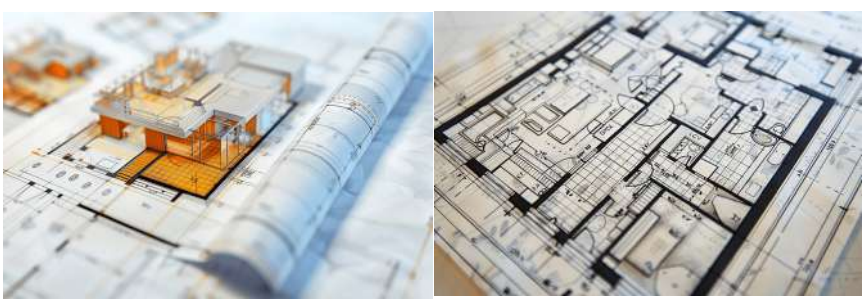

Figure 5. AI Tools for Drafting Plans

AI Tools for Design Optimization

In addition to drafting plans, AI significantly aids action on feedback and optimization of designs. Tools like HomeByMe and Finch, are perfect instances of how AI can enhance the design process.

HomeByMe program harnesses the power of AI, allowing users to preview future design changes to their house from a three-dimensional perspective. It motivates users to explore their creativity by offering a myriad of colors, fabrics, and well-known brands to choose from. Additionally, it also has a feature that enables users to share their designs with family and friends, allowing them to offer their input. Finch, on the other hand, not only helps in drafting but also optimizes designs. It aims to automate mundane tasks, thereby saving architects significant time. It instantly provides feedback on a myriad of key figures such as unit and area distribution, carbon footprint, daylight simulation, and other critical features. In addition, it allows users to design building mass in software like Revit, Rhino, and Grasshopper.

Architects have access to data-driven insights from day one using Autodesk Forma, where they can quickly compare and analyze massing models for a wide range of factors–from sun and wind to noise and operational energy–all within one single cloud-based software. Powered by machine learning, Forma's

rapid operational energy analysis allows architects to easily assess the impact of design decisions on the potential operational energy of their buildings during early-phase design.

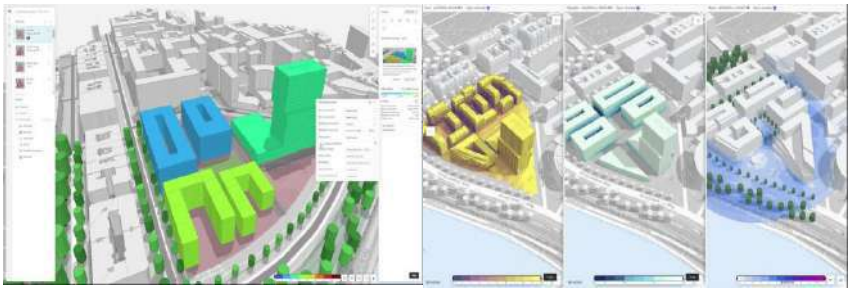

Figure 6. Autodesk Forma. Image Courtesy of Autodesk

Exploring AI in Smart City Design

Smart cities are an intricate blend of structures, systems, and technologies aimed at elevating the quality of life. As this urban development vision continues, artificial intelligence (AI) plays a significant role. Our focus expands into AI's importance for reshaping cityscapes and recognizing the challenges that come with its implementation (Zheng, H., & Yuan, P., 2021)..

Importance of AI to Future Cityscape

AI technologies such as generative design, predictive analytics, and autonomous systems can fundamentally reshape urban landscapes and public spaces. For instance, generative design, a technique used by many AI tools, like ArchitectAI and DecorAI, allows architects to automate the creation of model building designs. It achieves this by iterating through numerous designs within set constraints and parameters. Generative design not only accelerates the design process but also unveils unconventional and innovative design alternatives that might otherwise be overlooked.

Besides design, AI also aids in managing cities more efficiently. One notable example, the AI tool Finch, optimizes building designs by providing immediate feedback on building performance, error detection, and optimal solutions even at early design stages. This real-time feedback system enables architects to make strategic design decisions, aids in sustainable planning, and fosters an efficiently managed cityscape (Zheng, H., & Yuan, P., 2021).

While streamlining architectural design and city management, AI also amplifies the ecological sustainability aspect in smart city design. Through AI-powered tools, designers can calculate carbon footprints, carry out daylight simulations,

and other environment-related assessments. This data-driven approach enables the creation of more resource-efficient and ecologically sustainable designs, hence playing a vital role in building environmentally aware smart cities.

Challenges of Implementing AI in Smart City Design

As promising as AI's role in smart city design appears, it's not without challenges. One common technical hurdle is the requirement for considerable amounts of data. For AI systems like generative design or predictive analytics to work effectively, they require vast and diverse data sets. There's a need for high-quality data in urban planning regarding population distribution, traffic patterns, structural details, and more. Managing, securing, and properly leveraging such massive volumes of data presents a challenge.

Next, as AI is a new technology in the architecture scene, many architects and city planners may lack the necessary training to use these tools effectively. There's a need for significant investment in training and education to bridge this knowledge gap, and for some institutions, the cost might be prohibitive. Lastly, ethical concerns are prevalent when it comes to AI application. Issues like privacy infringement, data ownership, and the effect of automation on job displacement come to the forefront. It's crucial for architects, city planners, and relevant authorities to acknowledge these concerns and devise strategies to address them (S. Soliman, D. Taha and Z. El Sayad, 2019).

Addressing Ethical Considerations in AI Usage

Navigating the digital transformation in architecture implicates an array of ethical considerations. By carefully addressing these concerns, architects can harness artificial intelligence's potential while safeguarding their ethical obligations.

Data Privacy and Security

Harnessing the power of AI in architecture involves the collection and analysis of vast amounts of sensitive data. Floor plans, 3D models, material usage, and client preferences provide rich data sets for AI to optimize design processes. However, these same sets of data also pose significant privacy and security risks. Protecting this data is not just an ethical obligation, but a legal one as well. Data breaches can have severe consequences, leading to reputational damage and penalties. For example, when AI platforms like DecorAI help users generate new interior designs using room photographs, the collected data if not protected properly could easily be exploited. As such, architects must assure that the AI tools they use prioritize data security and comply with the

data protection laws relevant to their region.

Balancing Efficiency and Job Displacement

AI's efficiency in design processes raises another ethical concern: displacement of human labor. Platforms like Architizers Tech Directory offer a plethora of technical tools that streamline processes and increase efficiency in architectural design. In the digital revolution where "bits and bytes hold the key to automation and once unimaginable possibilities," professionals may fear the replacement of their roles by machines.

Yet, it's crucial to remember that AI is, at its core, a tool – one which architects can utilize to optimize their work. It does not seek to displace architects but to assist them, handling repetitive tasks and enabling professionals to focus on more creative and complex elements. Thereby, human oversight remains paramount in averting biases and affording ethical and aesthetic considerations. Thus, architects need to balance the use of AI tools with human contribution and manage the transition process thoughtfully and equitably.

Leveraging AI in Sustainable Architecture Design

In the realm of sustainable architecture design, AI's influence is profound and far-reaching. Let's delve into how AI-based tools prove instrumental in crafting eco-friendly building plans, using resources such as Havenly, Hutch, HomeByMe, DecorAI, and ArchitectAI. We see Havenly leading the way as an effective online tool, fusing stellar database selection with 3D imaging technology. This combination aids homeowners to visualize their space, plan interiors, and hence design a sustainable habitat tailored to their preferences. Proceeding to Hutch, the core differentiator is its interactive application. Homemakers snap photographs of their rooms, receive virtual projections of furnished spaces that Hutch suggests, and make modifications based on those. Similarly, SmartDraw fast-tracks the execution of ideas into designs. With a rich library of sample files and an easy-to-use interface, users concoct unique, sustainable interiors by dragging and dropping images of furniture, appliances, and art pieces.

Figure 7. crafting eco-friendly building plans using resources AI based tools

HomeByMe expedites the process by offering a 3D perspective of any future design changes. Its comprehensive collection consisting of thousands of color options, fabrics, and well-known brands encourages users to build sustainable designs while collaborating with family for feedback right from their gadgets. Giving the tools a modern touch, DecorAI and ArchitectAI apply Artificial Intelligence to innovate interior design. DecorAI, the AI-powered tool, offers users up to five free design ideas for their room photographs. ArchitectAI, the first participant in AI architecture and interior design, transforms the style of building, interior images, and landscapes with just a single click.

Appreciating the Impact of AI on Architectural Creativity

Moving forward from a foundation of sustainability and ethics, we find AI's contributions to creativity in architecture truly transformative. Utilizing intelligent tools, architects get to uncover innovative design possibilities, break normal conventions, and come up with fresh, dynamic ideas. One perfect example is that of Havenly, an online interior design platform, which has revolutionized architecture creativity. It uses 3D imaging technology for visualizing spaces before making any purchases, not just enhancing convenience, but also broadening the vista of design enhancements. Similarly, the Hutch app takes a visually-driven approach, enabling users to virtually furnish their living spaces, opening a world of fresh creative possibilities.

Beyond these, DecorAI, a comprehensive AI-based tool, provides up to five distinct design ideas from a single photo of a room. This broad idea generation is among AI's profound impacts on architectural creativity, maximizing options and rendering imagination virtually limitless. On a more technical side, ArchitectAI changes the considerations of architecture and interior design, morphing photos and sketches into different styles. The capacity for one-click transformation into photorealistic renders spawns not only unique designs but also watermark authenticity that symbolizes top-tier professionalism.

Even more captivating, AI Room Planner and Dreamhouse AI further amplify this creativity. With the ability to upload room photos and receive rendered images in different styles, these AI-powered platforms have eliminated geographical boundaries, creating an array of possibilities in the architectural creative space. In a nutshell, these AI-backed tools and platforms demystify the conventional creative barriers in architectural design, allowing architects to create grander visions with a button's click. It's here that we realize AI's indentations don't just permeate function and sustainability, they immensely refill architectural creativity.

While AI certainly makes the design process more efficient, it will not be able to replace the architect's creative mindset and ability to deliver unique designs that respond to specific clients' needs, environmental demands, and social and cultural contexts. AI still has its limits; it is only as good as the data it is trained on and is determined by the ability of the algorithms to analyze and learn from that data. Much of what architects do involves creative analytical thinking, original perspectives, problem-solving abilities and soft skills that rely on human decisions and cannot yet be accurately replicated by technology. It's about working with each other's strengths: computers and software can automate tedious and repetitive day-to-day tasks, freeing up more time for architects to focus on the creative and personal sides of architecture. Their expertise and minds remain irreplaceable but can now be complemented with data and new technology.

In fact, according to an Oxford University study, architects have a very low chance (only 1.8%) of having technology and AI replace their jobs. AI presents many new opportunities for our profession, and I believe that the architect is harder to replace with AI than many other professions due to our job›s subjective nature. The decisions we make to create great buildings often depend on opinions, and as a result there is no right or wrong. It is important to acknowledge that AI technology is currently nowhere close to possessing true intelligence and feelings comparable to human consciousness. It is limited in the types of tasks it can complete, but there is a general consensus that the technology that already exists has the potential to be extremely powerful.

Figure 8. architect and AI technology

Addressing the elephant in the room: Will AI replace architects?

The question of whether AI will replace architects is a common concern. While AI can automate certain tasks and offload repetitive tasks, it cannot replicate the creativity, intuition, and critical thinking that human architects bring to the table. Human intervention remains essential for interpreting AI-generated results, making informed decisions, and ensuring that designs meet the needs of clients and communities.

The need for AI training

Equipping architects with AI skills is no longer a luxury but a necessity. As AI becomes increasingly integrated into the architecture industry, architects who possess AI literacy will have a distinct advantage. Understanding how to leverage AI tools effectively allows architects to streamline their workflows, explore innovative design solutions, and deliver projects more efficiently. Furthermore, AI proficiency empowers architects to interpret and critically evaluate AI-generated data, ensuring the technology is used responsibly and ethically. By embracing AI training, architects can position themselves at the forefront of the industry, driving innovation and shaping the future of the built environment (S. Soliman, D. Taha and Z. El Sayad, 2019).

According to a survey conducted by Chaos and Architizer, a staggering 60% of architecture professionals have no formal training in using AI tools for architectural design, with only 4% currently taking some sort of training. That alone poses an important obstacle to adopting AI tools in the industry, as the same survey found that only a mere 18% of the interviewees are planning to receive formal training in the near future. These are just a few of the upcoming AI innovations that are set to revolutionize architecture. As AI continues to develop, we can expect to see even more innovative and transformative applications of this technology in the architecture industry.

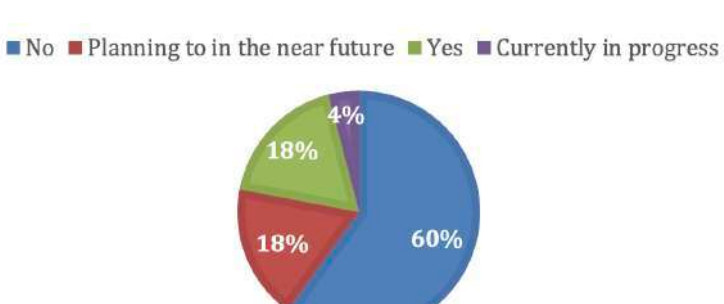

Diagram 1. Results of Questionairre : have you ever received any formal training in using AI tools for architectural design?

Current skill gaps and opportunities

While AI excels at optimizing processes and generating design options, it cannot replicate the uniquely human skills essential to architecture. These include creativity, intuition, and the ability to understand complex emotional and cultural nuances that inform design decisions. AI may suggest solutions, but the architect's critical thinking and experience ultimately evaluate those options and make the final call. AI lacks the empathy and interpersonal skills

required to effectively communicate with clients, understand their needs, and translate their desires into a built reality. The ability to negotiate, collaborate, and build relationships remains firmly in the domain of human architects.

AI and human collaboration

By integrating AI into their workflow, architects can leverage its strengths to enhance their own capabilities. AI can handle data analysis, optimization, and automation, freeing up architects to focus on the creative and strategic aspects of their work. This collaborative approach between human creativity and AI tools for architects has the potential to revolutionize the architectural industry, leading to more innovative, efficient, and sustainable designs that meet the evolving needs of society. Rather than replacing architects, AI systems are designed to complement their expertise, taking on time-consuming and repetitive tasks so that architects can focus on what they do best: design.

Conclusion

As we've seen, AI is transforming the architecture industry, offering a wealth of benefits that range from enhanced creativity and efficiency to cost savings and improved sustainability. By automating repetitive tasks, optimizing designs, and providing valuable insights, AI empowers architects to focus on the creative and strategic aspects of their work. Real-world examples and the use of AI in optimizing building dimensions demonstrate the tangible impact AI is already having on the field. The future of AI in architecture is incredibly promising. Emerging technologies like generative design, machine learning, virtual reality, and robotics are poised to revolutionize the industry even further. As AI continues to evolve, we can expect to see even more innovative and transformative applications that will reshape the way we design, construct, and experience buildings.

For architects, the message is clear: embrace AI. By integrating AI tools into their workflows and developing AI literacy, architects can unlock new levels of creativity, efficiency, and sustainability in their work. The collaboration between human ingenuity and AI's computational power has the potential to create a future where buildings are not only functional and aesthetically pleasing but also responsive to the needs of both people and the planet. The key is to view AI not as a threat but as a powerful ally, a tool that can augment our skills and help us achieve our full potential as architects.

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CONFRONTATION OF ARTIFICIAL INTELLIGENCE CONSTRUCTION IN THE TRADITIONAL CEREMONY "TUTUP TAUN NGEMBAN TAUN" IN CIREUNDEU TRADITIONAL VILLAGE: A COMPARATIVE STUDY OF CULTURAL DISCOURSE

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Abstract: This study aims to discuss the confrontation of artificial intelligence (AI) construction against the traditional ceremony Tutup Taun Ngemban Taun in Cireundeu Traditional Village, using a comparative approach in cultural discourse. This study uses a qualitative method with comparative analysis, based on cultural discourse theory and digital hermeneutics. Data collection was carried out through literature studies, empirical data, and field observations. The results of this study discuss the dynamics of artificial intelligence, an empirical review of traditional ceremonies in Cireundeu, and the confrontation between AI and local traditions. The conclusion of the study shows that there is a gap between technological modernity and the sustainability of tradition, with potential positive and negative impacts on local cultural framing.

Keywords: Artificial Intelligence, Cultural Discourse, Traditional Ceremony

Introduction

The development of artificial intelligence (AI) technology has brought significant changes in various aspects of human life, ranging from economics, education, to culture. AI is not only a tool that accelerates the process of industrialization and modernization, but also becomes an agent of change that changes the way humans interact with the world, including in terms of preserving traditions and customs. In the midst of globalization and digitalization, local traditions such as traditional ceremonies face great challenges, both in their preservation and adaptation to the times.

Studies on artificial intelligence tend to be new, but there have been various scientific writings that discuss this study. This article will try to divide several classifications of articles that discuss the study of artificial intelligence. Artificial Intelligence discusses its impact in education, which effectively makes it easier for teachers to explore material ideas to their students (Rifky, 2024), so that students are able to further develop their creativity (Dina et al., 2020; Pratiwi & Agustin, 2022). In addition, the presence of AI will actually cause laziness in students and teachers (Firdaus et al., 2023; Widat & Kurniawan, 2023), dependency (Syuhada et al., 2024), inaccurate data descriptions (Rochim, 2024), so that it can potentially create students stuck (Budiyono et al., 2024). Artificial Intelligence discussed its impact on the interaction of human resources and society, potentially losing human labour (Royhan Zaki Ramadhana & Muhammad Irwan Padli Nasution, 2024) and threatens the dignity of individuals (Pabubung, 2023). Artificial Intelligence discussed about its impact on information systems and data in general will appear to shift the accuracy of data (Misnawati, 2023), data privacy (Siti Masrichah, 2023), to the rise of plagiarism (Miftahul Huda & Irwansyah Suwahyu, 2024; Rhamadan & Ikhlas, 2023).

With various viewpoints of literature review on Artificial Intelligence above, this study will focus on the role of Artificial Intelligence in local traditions in Indonesia. Among them is being able to present data on the tradition of *"Tutup*

Taun Ngemban Taun". This research has an argument that artificial intelligence is effectively able to provide answers to all information in various fields. Even so, with its effectiveness, artificial intelligence has the risk of presenting invalid data. The data shift was found when the author compared data from Artificial Intelligence search tools such as ChatGPT, GeminiAI, Perplexity, Microsoft Copilot, with empirical searches in the field. This research raises at least two questions: How is traditional ceremonies explained in AI reviews? How to Confront Artificial Intelligence Construction to the Traditional Ceremony of *"Tutup Taun Ngemban Taun"* in Cireundeu Traditional Village: A Comparative Study of Cultural Discourse.

Along with the development of information technology, questions arise about how artificial intelligence can affect the way people understand and carry out their traditions. Several studies have shown that AI can serve as a tool for documenting, analysing, and even reconstructing cultural practices. However, there are also concerns that technological interventions may change the essence of the tradition, thus threatening the sustainability of the values contained in it (Harrison et al., 2021). In the context of *"Tutup Taun Ngemban Taun"* it is important to explore how the people of Cireundeu are responding to these changes and how they maintain the meaning of the ceremony that has become a part of their lives. This comparative study of cultural discourse will examine the interaction between AI and traditional ceremonies with a multidisciplinary approach, combining anthropology, sociology, and media studies perspectives (Mohammad Arif, 2021; Sultan et al., 2023). By utilizing the existing theoretical framework, this research is expected to provide new insights into the dynamics between technology and culture as well as the contribution of AI in supporting the preservation of local wisdom. Through in-depth observation and analysis, it is hoped that the results of this study can enrich the discourse on the relationship between tradition and innovation in the context of contemporary society (Sullivan, 2022).

This research argues that artificial intelligence is effectively able to provide temporary answers regarding information transmission in various fields of AI. Even so, with its effectiveness, artificial intelligence has the risk of presenting invalid data. The data shift was found when the author compared data from AI search tools such as ChatGPT with empirical searches in the field. This study aims to analyse how the construction of artificial intelligence confronts the traditional ceremony *Tutup Taun Ngemban Taun* in the Cireundeu Traditional Village, using a comparative approach in cultural discourse. This research will explore how AI can affect the implementation, perception, and sustainability of these traditional ceremonies. In this context, AI is seen not only as a technology,

but also as a discourse that carries certain values that can contradict or support local traditions.

This research enriches cultural theories, especially in the context of the relationship between technology (artificial intelligence) and traditional culture. In this case, how can AI influence, interact, or even contradict the values and customary practices in a community. The indigenous people of Cireundeu to maintain their identity and cultural values can use the results of this research. Understanding the impact of AI on traditional ceremonies can encourage people to be more aware of the importance of preserving their traditions while remaining open to technological innovation.

Research Method

This research uses a qualitative method focusing on a literature review with a literature study approach (Darmalaksana, 2020; Sarwono, 2006). This study uses a comparative analysis method based on theory (Creswell, 2014; Vaughn & Jacquez, 2020). The data collection technique is through empirical data tracing based on literature and field observations, identified by category, and interpretation according to research needs. Data analysis techniques through non-numerical normative comparative descriptive analysis based on a digital hermeneutic approach (Darmalaksana & Kulsum, 2022; Reijers, 2023).

Discussion and Results

1. Dynamics of Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science that focuses on developing systems that are capable of performing tasks that typically require human intelligence (Russel & Norvig, 2010). There are various forms of AI that have been developed, ranging from simple to complex systems. One of the most basic forms of AI is Narrow AI, also known as Weak AI. Narrow AI is designed to perform specific tasks, such as facial recognition, language translation, or data analysis. An example of Narrow AI is Apple's Siri or Google Assistant, which can only perform certain functions in a pre-programmed context (Damar et al., 2024). Unlike Narrow AI, there is General AI or Strong AI, that are designed to understand, learn, and perform any task that humans can do. Although General AI is still in the development stage, it has the potential to have capabilities equal to or even exceed that of humans in various fields. General AI will have the ability to adapt to new situations without human assistance, an ability that is still a challenge for scientists and researchers (Buxmann, 2019).

Additionally, there is a form of AI called Superintelligence, which refers to AI whose intelligence far surpasses the best human intelligence in almost all

aspects, including creativity, problem-solving, and social skills. Superintelligence is still in the realm of speculation and there are no concrete examples yet, but many AI experts have warned about the potential risks and impacts on humans (Aithal & Aithal, 2023). Machine Learning (ML) is a subfield of AI that allows systems to learn from data without the need for explicit programming. ML uses algorithms to analyse data, recognize patterns, and make decisions based on that data. One of the most common types of ML is Deep Learning, which uses artificial neural networks to mimic the way the human brain works. Deep Learning has been used in a variety of applications, such as image recognition, natural language processing, and video games (Chollet, 2018). Natural Language Processing (NLP) is a branch of AI that focuses on the interaction between computers and humans through natural language. The main goal of NLP is to make computers capable of understanding, interpreting, and generating human language naturally. NLP has been used in chatbots, sentiment analysis, and automated translators (Kevitt et al., 1992).

Another example of AI is Computer Vision, which allows computers to understand and interpret visual information from the real world (Karn, 2021). This technology has been widely used in facial recognition systems, autonomous vehicles, and medical image analysis. In the industrial sector, AI is also used in the form of Robotic Process Automation (RPA), which allows the automation of repetitive tasks without the need for human intervention. This is very beneficial for improving efficiency and reducing errors in business processes (Kitsantas et al., 2024).
AI has also been applied in healthcare through medical AI, which aids in disease diagnosis, treatment planning, and medical data analysis (Damar et al., 2024; Derrington, n.d.; Siti Masrichah, 2023). AI can process large amounts of medical data to find patterns that may be difficult for humans to see. Meanwhile, in the field of security, AI is used in Cybersecurity to detect threats and anomalies in computer networks. AI is able to learn past cyberattack patterns and predict potential future threats (Pupillo et al., 2021). AI development is inseparable from ethical challenges, especially related to privacy, algorithmic bias, and its impact on employment. Researchers are constantly trying to ensure that AI is used responsibly and does not cause social harm. These various forms of AI show how broad and deep the potential of AI is in changing various aspects of human life.

2. Field Survey of the Traditional Ceremony *Tutup Taun Ngemban Taun* in Cireundeu Traditional Village

Based on the presentation of the informant and field observations of the research, a description of the historical review, philosophical value, and its

relevance to the indigenous people of Cirendeu was obtained, as follows, the traditional ceremony *Tutup Taun Ngemban Taun* is a hereditary tradition carried out by the indigenous people of Cireundeu since the 16th century AD or 17th AD. This ceremony was initially held in a simple form in the houses of traditional leaders before finally being centred in Bale Saresehan, Centre for Traditional Activities. This tradition was initially limited to joint prayer as a form of gratitude for the blessings of the crops received. Over time, this tradition developed into a lively annual celebration, involving various elements of Sundanese arts such as *pencak silat, gamelan*, and *karinding*. This development is also influenced by the meeting of local and foreign cultures, such as the influence of the Dutch colonial period that once prohibited the use of Sundanese script so that Sundanese culture was reduced, so with this traditional ceremony, it is hoped that Sundanese culture will remain sustainable and not eroded by the times (Informant, 2024).

Photo 1. Procession of the Traditional Ceremony Tutup Taun Ngemban Taun in Cireundeu Traditional Village

The procession of the traditional ceremony of *Tutup Taun Ngemban Taun* is carried out for a whole month, starting from the 1st of Sura to the 30th of Sura based on the Saka Sundanese calendar. The series of events began with a joint prayer at *Bale Saresehan*, then followed by a *sungkeman* procession, a visit to the ancestral graves, and a rotating thanksgiving at residents' houses. The peak event is known as Ngajayak, where indigenous people parade a mountain of produce from the entrance of the village to Bale Saresehan. This procession is accompanied by a *lengser* dance, as a form of respect for the guests, and ends with a joint prayer for the blessings of the produce. At the peak of the event, Sundanese art was displayed as part of the ceremony, showing the togetherness and gratitude of the indigenous people(Interview on August 15, 2024).

The philosophical value of the Traditional Ceremony of Closing the Year of

Ngemban Taun lies in the community's gratitude to "the Creator". Every product collected from the harvest, whether in the form of leaves, fruits, to tubers, is presented in the form of offerings as a symbol of human dependence on nature. The people of Cireundeu believe that food and drinks consumed by humans are the source of life that needs to be respected. Therefore, they hold this ritual to honour the food that has sustained their lives, while hoping that the following year they will be given a better harvest and improved welfare (Interview August 15, 2024).

Photo 2. Closing Year 1957 Closing Year 1 Sura 1958 from Sundanese on August 2, 2024 in Cireundeu Traditional Village

This ceremony also contains the value of *muhasabah*, where indigenous people reflect on the life journey they have gone through for one year. They acknowledge that joy and sorrow are part of life, and humbly surrender themselves to the Creator. Thus, the Ceremony of *Tutup Taun Ngemban Taun* is a means for the people of Cireundeu to reflect on their identity as Sundanese, appreciate cultural values, and preserve the ancestral heritage that is rich in philosophical and spiritual meaning (Interview August 15, 2024).

3. Confrontation Artificial Intelligence of Construction On the Traditional Ceremony *Tutup Taun Ngemban Taun* in Cireundeu Traditional Village

Variable	Platform AI	AI Search Results and Narrative	References Offered by AI	Description of Real Data in the Field Based on Interview Results

Research Theme	OpenAI (ChatGPT), Perplexity, Copilot (Microsoft), Gemini AI	The AI explains the findings on the theme based on academic sources with each tendency.	Offers references to journals and books related to themes, such as hadith, fiqh, etc.	Based on AI Search Results and Narrative interviews with respondents in the field, the research theme was recognized as relevant and up-to-date.
User Perception	OpenAI (ChatGPT), Perplexity, Copilot (Microsoft), Gemini AI	AI provides an overview of public perceptions regarding themes.	Providing articles about public perception from random and abstract scientific research results means that the data obtained is invalid.	The results of the interviews show that the perception of the public is different from the AI narrative, and is more varied.
Research Methodology	OpenAI (ChatGPT), Perplexity, Copilot (Microsoft), Gemini AI	In general, AI provides research methodology options according to academic standards.	AI refers to commonly used research methodology book references, but data verification is still needed.	The methodology used in the field is slightly adapted to local conditions and research needs.
Academic Research Results	OpenAI (ChatGPT), Perplexity, Copilot (Microsoft), Gemini AI	AI presents academic findings from related journals and books in random and abstract.	References from scientific journals, conferences, and articles published by academic institutions are random and abstract.	The results of research in the field relatively support some of the academic findings displayed by AI.
Local Context	OpenAI (ChatGPT), Perplexity, Copilot (Microsoft), Gemini AI	AI exposes local context based on analysis of limited scientific sources.	Refers to history books and local research on the context of related regions, but cannot be traced/accessed further.	The interviews revealed significant differences in local cultural and social aspects.

Recommended Solutions	OpenAI (ChatGPT), Perplexity, Copilot (Microsoft), Gemini AI	AI suggests several alternative solutions to the problems discussed in general.	AI cites solution references from journals on public policy and relevant education strategies.	Interviews show that solutions on the ground are more pragmatic and tailored to needs.

Table 1. Comparison of Artificial Intelligence Construction Confrontation Data on the Traditional Ceremony Tutup Taun Ngemban Taun in Cireundeu Traditional Village

The comparison of AI platforms such as OpenAI (ChatGPT), Gemini AI, Perplexity AI, and Microsoft Copilot highlights their distinct approaches in providing research results, references, and contextual understanding. OpenAI tends to deliver comprehensive, detailed narratives, grounded in academic sources, making it suitable for in-depth exploration of themes like Hadith studies, Islamic history, and methodology. Gemini AI offers a more dynamic, up-to-date analysis with a strong focus on recent developments and broader contextual data, which makes it highly useful for research requiring contemporary insights. Perplexity AI is more succinct and direct, offering quick access to key points and references, which can be advantageous for fast research summaries. Meanwhile, Microsoft Copilot integrates technological and business-related contexts, focusing heavily on case studies, making it ideal for research linked to industrial and technological applications.

The implications of these differences are evident in how each platform aligns with real-world field data. For example, OpenAI and Gemini AI are better suited for academic research in areas like Islamic studies, where historical and cultural nuances are critical, yet the latter excels in keeping pace with emerging trends. Field data gathered through interviews often supports OpenAI's comprehensive approach but may reveal local variations that require further contextualization, a gap Gemini AI fills by offering recent cultural and social trends. On the other hand, Perplexity AI, with its concise summaries, is useful when immediate, general insights are needed, but it may lack the depth required for localized research. Microsoft Copilot's focus on industrial and technological solutions makes it less applicable for social and cultural research, but valuable for fields where technology and business integration are central.

Conclusion

Although various AI platforms such as OpenAI, Gemini AI, Perplexity AI, and Microsoft Copilot are capable of delivering structured and rapid information, one major criticism is the lack of relevance between AI-generated results and more dynamic, contextual field data. AI tends to draw from broad and

generalized databases, often overlooking regional or local differences. When applied to field research, particularly in areas with unique social and cultural characteristics, AI outputs are frequently misaligned with reality.

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THE USE OF ARTIFICIAL INTELLIGENCE IN DANCE ARTWORKS IN THE DIGITAL ERA

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Abstract: Artificial intelligence (AI) has become one of the fastest-growing technologies and has transformed many sectors, including the arts. In dance, AI plays a vital role in creating innovative choreography, facilitating the creative process, and presenting dynamic interactions between humans and technology. This journal aims to explore how artificial intelligence is used in dance artworks in the digital era, with a particular focus on Indonesia. Based on a qualitative approach, this study examines the latest technologies used in dance movement analysis today, how artificial intelligence is used in the creative process of dance, the role of AI as a creative collaborator, the challenges faced by artists in integrating AI, and the response of the arts community to this technology. This study also explores the gap in research related to AI in dance in Indonesia, which offers insights into the potential and future of AI in the arts. The results show that although AI provides great opportunities for dance, its adoption still faces technical and aesthetic challenges.

Keywords: Artificial Intelligence, Dance, Choreography, Digital Technology, Collaboration

Introduction

The development of digital technology has had a significant impact on almost all aspects of human life, including the arts. One of the rapidly developing technologies is artificialintelligence (AI). AI allows machines to imitate human intelligence, including in decision- making, pattern recognition, learning, and creativity (Russell & Norvig, 2016). With these capabilities, AI has opened up new possibilities for artists, including choreographers and dancers, to create innovative works of art and explore new ways in the creative process. The positive use of AI in the fields of creativity and art is used to produce text, visuals, music, art,and other creative content and can help create interesting poems, stories, articles, and videos so that these examples provide significant benefits in various fields, increasing efficiency, accuracy, and quality of human life (Nugroho et al., 2024).

In the field of dance, artificial intelligence has offered tools and platforms that allow artists to create choreography that was previously difficult for humans to achieve. This technology cannot only process dance movement data but is also able to analyse, modify, and produce new, innovative choreography. Several international dance projects have demonstrated how AI can be used to autonomously create choreography, assist in the creativeprocess, and integrate directly with dancers in live performances (McCormack & d'Inverno, 2020).

In a global context, the use of AI in dance has achieved significant achievements. For example, British choreographer Wayne McGregor has collaborated with AI scientists to create a dance work that uses Machine Learning to generate new choreography based on human body movement patterns. This project is one example of how AI can be a creative collaborator in dance, allowing for aesthetic and technical exploration that goes beyond conventional boundaries, in addition, the use of artificial intelligence in dance can be for training by developing a generative dance movement system and using Motion Capture technology (Cook& Colton, 2018).

However, in Indonesia, the application of AI in dance is still relatively new and has notbeen widely explored. In various regions in Indonesia, several choreographers have begun experimenting with AI, but the adoption of this technology is still relatively limited. This is due to various factors, including limited access to technology, lack of training and education on digital technology in the arts, and cultural resistance to the use of technology in tradition- based arts (Yi et al., 2024).

Indonesia has a very strong cultural and dance tradition that has deep spiritual and symbolic values (Mangoensong and Yanuartuti, 2020), which are often considered at odds withthe use of modern technology in the creative process. This creates challenges for choreographers and dance artists in Indonesia who want to explore its use in their work. However, there is great potential for AI to be developed in dance in Indonesia, especially in contemporary dance, which is more open to technological exploration.

This research is important because it fills the gap in the literature related to the use of artificial intelligence in dance in Indonesia. Most of the existing research focuses on the use ofAI in dance in developed countries, while its application in developing countries such as Indonesia has not been widely studied and most of it is still on the traditional and spiritual aspects of dance, while the technological aspect has not been widely studied. In addition, thereare few studies on how AI can be used as a creative collaborator in dance, most of the existingresearch still focuses on the use of AI as an analysis or tool in the creative process. AI has thepotential to be an active collaborator in the art creation process, which can provide real-time feedback, interact with human dancers, and even create new, innovative movements. So this research gap also contributes to artists and choreographers who want to explore the potential of AI in their artwork.

Research Method

This study uses a qualitative descriptive approach with a case study method. This approach was chosen to explore the subject's experience in-depth and understand the dynamicsof the use of artificial intelligence in dance. The case study method was chosen because this study focuses on several specific dance works that use AI in their creative process (Creswell, 2013). The subjects of this study consisted of six successful collaborative projects between dance experts and technology in Indonesia and several similar projects that are currently underway. These works were selected based on the criteria that AI is actively used in the process of creating choreography and performances. Data collection techniques were interviews, activity documentation, observation, and literature studies. Data were analysed using thematic analysis methods.

This analysis was carried out by identifying the main themesthat emerged from the data, such as the use of AI in the creative process, technical challenges, and artists' responses to the technology. The results of these data collection techniques were then integrated to provide a comprehensive understanding of the use of AI in dance (Braun &Clarke, 2006)

Results and Discussion

Artificial Intelligence Technology in the Creative Process of Dance in the Digital Era

Artificial intelligence (AI) has been used in various forms of art, including visual arts,music, theatre and dance. According to McCormack et al., (2020), AI can analyse patterns in art, learn from existing data, and produce new, original works. In the field of dance, AI is usedto assist in the process of creating choreography, analysing human body movements, and evengenerating new movements based on existing data. AI can process large amounts of movement data, recognize movement patterns, and create new and unique movement variations. According to Choi et al., (2023), AI in dance can produce more complex and dynamic movements, which may be difficult for humans to achieve without the help of technology.

Some of the latest digital technologies used in dance movement analysis today are:

1. **Motion Capture**, according to Badaruddin & Nugraheni (2023), is a technology also calledMOCAP, which is used to create animated films using a motion-recording device. This technology is used to change body movements. This is done by combining new media, usually on parts of the body that can be modified/changed with technology.

Figure 1. Use of Motion Capture
Source: https://calgaryherald.com accessed September 22, 2024

The latest Motion Capture systems use infrared cameras and marker sensors that can track movements with high accuracy, producing rich 3D data for analysis. According to Sykes (2024), motion capture allows dance artists to record human body movements and convertthem into digital visuals that are then projected onto the stage. This technology has been widely used in modern dance productions, especially in contemporary dance. However, artificial intelligence offers more than just a tool for recording or modifying movement; AI can create new movements that are entirely based on the analysis of human movementdata.

2. **Wearable Sensor**, according to Park (2016), Interactive dance performances have becomean active field of research. The main idea is to use data from tracking the dancer's movements to direct the creation of musical or graphic effects in real-time. Usually, two motion-tracking technologies are computer vision-based and sensor-based embedded or placed on the dancer's body. The technology used usually includes features of the Max/MSP and JITTER software packages, which are among the most widely used.

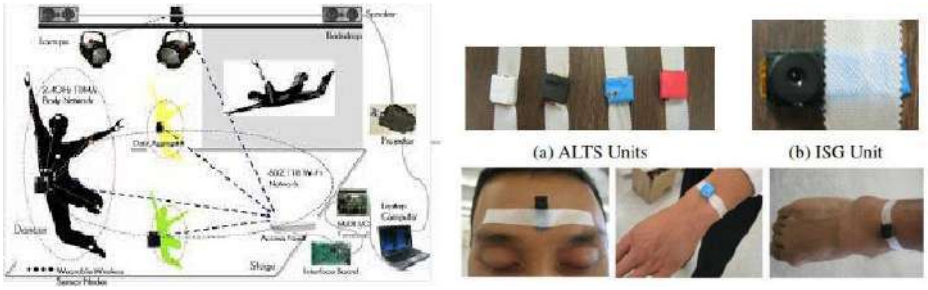

Figure 2. Simple Illustration of How Wearable Sensors Work for Dance Performances
Source: https://www.researchgate.net/publication/4228214, accessed September 21, 2024

Wearable Sensors are sensors that can be installed directly on the dancer's body, such as IMU (Inertial Measurement Unit) technology, making the sensor more sophisticated and accurate. Movement data collected from these wearable sensors can be analysed in real- time.

3. **A Depth Sensor Camera,**

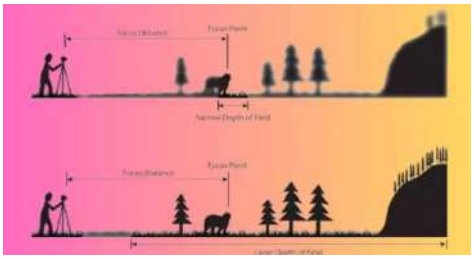

Figure 3. Simple Illustration of How Depth Sensor Cameras Work.
Source: https://gadgetaja.com, accessed September 21, 2024

According to Soon (2021), is a camera that uses sensing technology to measure the distance or depth of points in a scene and produces a series of images with depth images in each frame. Currently, the Depth Sensor camera is a technology that can analyse movements in a marker less manner, making the recording and analysis process easier. Depth Sensor cameras such as Kinect and RealSense can capture 3D information about dancer movements without the need for markers.

4. Deep Learning for movement analysis, According to Liu (2022), Deep Learning technology is a method in artificial intelligence (AI) that teaches computers to process data in a way inspired by the human brain. This technology can recognize complex patterns in images, text, and sound.

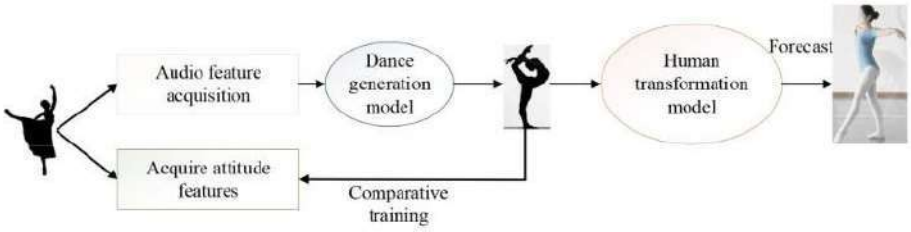

Figure 4. Process of Using Deep Learning Technology in Dance Movements.
Source: https://www.frontiersin.org/journals, accessed September 20, 2024

Other data to generate accurate insights and predictions and process movement analysis are namely as a digital assistant, automatic body and face detection. This method allows identification of complex movement patterns with better accuracy. The latest Deep Learning algorithms can automatically extract movement features from video and sensor data. OpenPose is one of the most popular multi-person pose estimation algorithms. Like many bottom-up methods, this method first detects the coordinates of the key points of allpeople in the image, and then assigns the detected key points to each associated person.

5. Interactive 3D Visualization, according to Calvert et al (2005), Interactive 3D Visualization is the process of creating a 3D model that allows users to interact with graphs and diagrams. Its visualization allows users to change variables in the visualization parameters to find new insights or access in-depth information. Calvert et al (2005) also said that currently pouring ideas in the form of dance could use DanceForm2 software fromCreado Interactive. This software is designed for dance teachers and choreographers to support the visualization of a movement

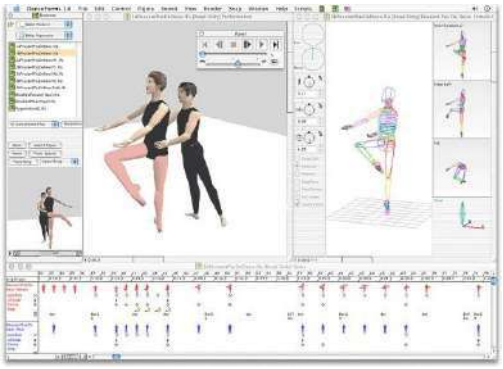

Figure 5. Process of Using 3D DanceForm2 Software for Dance Visualization.
Source: Art Management & Technology Laboratory, https://amt-lab.org/reviews/2020/3/lets-get-digital-visualizing-movement-in-dance, accessed September 22, 2024

This visualization software uses the latest 3D motion that allows for intuitive visual interaction and analysis. Users can rotate, change perspectives, and analyse dancer movements interactively.

6. Integration with IoT and other technologies, Ji & Tian (2024) explain that IoT-based dancemovement recognition is a system that uses Internet of Things technology to recognize dance movements when someone dances. This system uses sensors to detect movement and sends data to an analysis engine that can recognize various movements and produce records. This system can be used to educate dancers, assess the performance of professional dancers, and even for games. This system can also provide real-time feedbackto dancers, helping them improve their technique. One of the IoT systems that works using Residual Connection is creating images that help bridge the gap between the generator andthe discriminator by allowing the generator to utilize information from the discriminator to produce better images.

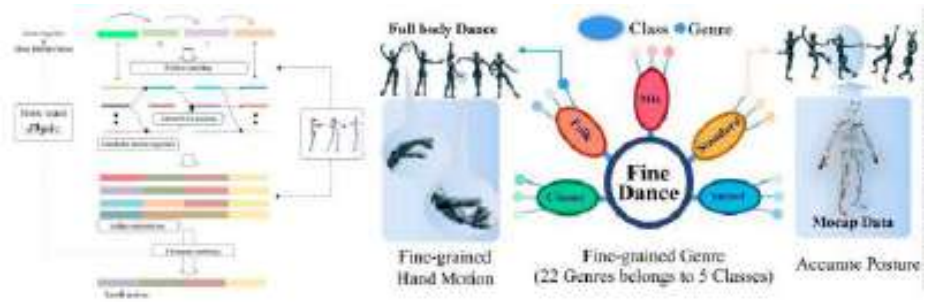

Figure 6. Scheme of IoT Usage in Dance Arts.
Source: https://www.mdpi.com/2076-3417/14/19/9084, accessed September 20, 2024

Current dance movement analysis systems can be integrated with Internet of Things (IoT)technology, Cloud Computing, and other smart devices. This allows for centralized and scalable collection, processing, and analysis of movement data.

Digital technology has brought about major changes in the way dance artists create and present their work. Rheingold (2000) stated that technologies such as Augmented Reality (AR),Virtual Reality (VR), and Motion Capture allow dance artists to explore movement in new dimensions, creating a more immersive experience for the audience. In some modern dance productions, digital technology allows the audience to interact with the performance, changing visuals or sounds in real time based on the dancer's movements.

The Use of Artificial Intelligence in the Creative Process of Dance

Based on findings from interviews with choreographers and dancers involved in the useof AI in dance, AI is used in various stages of the creative process, from creation to performance. One of the main ways AI is used is through movement data analysis, where AI can identify common or rare movement patterns then produce new and unique movement variations. AI is trained using thousands of existing dance movement recordings, both from dance performance videos and Motion Capture data. This allows choreographers to use AI as a movement experimentation tool, opening up possibilities for more innovative and varied choreography (McCormack et al., 2020).

In addition, AI has also been used to create choreography independently with minimalhuman intervention. For example, AI can generate choreography based on specific instructions such as music or a particular dance theme, which is then modified by the choreographer or dancer. A real-world example of this use case is where an AI algorithm generates choreographyfor a contemporary dance performance based on the analysis of human body movement data matched to specific musical elements (Cook & Colton, 2018).

However, AI is not just a tool that generates mechanical movements. Some choreographers emphasize that AI can be a creative experimental tool that allows artists to pushthe boundaries of what is possible with the human body. By harnessing AI's ability to think outside of traditional movement patterns, choreographers can create movements that may be considered unconventional or experimental, but still have strong aesthetic appeal (Sykes, 2024).

The Role of Artificial Intelligence as a Collaborator in Dance Artworks

AI is not only a tool used to help choreographers create new movements but also has the potential to be a creative collaborator in dance. Cook & Colton (2018) noted that AI can provide feedback to dancers in real-time, interact with them on stage, and even generate new movements based on direct analysis of the dancers' movements. This creates opportunities fordance artists to explore the interaction between humans and machines in an artistic context.

The collaboration between AI and dance artists opens up a new dimension in the creative process. AI not only produces movements based on human instructions but also makes an independent contribution to creating unique and innovative works of art. McCormack et al.,(2020), emphasize that AI as a creative collaborator can present new perspectives in dance, allowing dancers and choreographers to push the boundaries of human movement.

One successful project between traditional dance experts and technology experts in analysing dance is the Cirebon mask dance digitalization project led by Harry Nuriman, a lecturer at the Faculty of Fine Arts (FSRD) of the Bandung Institute of Technology (ITB). In this project, he explained that Motion Capture technology was used to document the movements of the Cirebon Mask Dance. This project aims to preserve traditional Indonesian dances so that they do not become extinct along with the loss of the successors of the culture (Nuriman, 2018). Motion Capture allows dance movements to be recorded digitally and savedas 3D files, which can be analysed from various angles, unlike ordinary video recordings.

Figure 7. Digitalization of Cirebon Mask Dance Movements.
Source: Digitalizing the Motion of Traditional Dance, Harry Nuriman Uses Motion Capture Technology - Institut Teknologi Bandung (itb.ac.id), accessed September 24, 2024

This collaboration involves not only technology experts, but also dance maestros suchas Irawati Durban to ensure the authenticity of the documented movements. This project beganin 2016 and was successfully patented in 2017. With digital documentation, the younger generation and the global community can now study the Cirebon Mask Dance in a more accessible and affordable way (Koran Jakarta, 2018).

Another project worked on by Nuriman (2018) is the use of motion capture technology for preservation, education, and performances by documenting the movements of the Indonesian martial art Silat Tuo (Tiger Silat) from Minangkabau, West Sumatra, and exploring the possibility of its use for performances. With a database of these movements, these movements can be studied without time and place constraints and can minimize costs for performance production.

Figure 8. Digitalization of Silat Tuo Dance Movements.
Source: https://journal.unesa.ac.id/index.php/jsm/index accessed September 24, 2024

Using the recording of dancers' movements with markers attached to them to create a 3D digital body model. The use of a digital body greatly helps overcome the limitations of an artist's expression; the resulting digital files will later be used to run and move various charactermodels that have been previously created in 3D applications. However, how do the body and technology—in this case digital technology—work together? When a moving body, or a dancing body, is codified into a 3D image, there will be a shift or change. This shift includes what is most important in the process of integrating technology and the body.

Figure 9. Use of the Maengket Dance Application.
Source: https://ejournal.unsrat.ac.id/v3/index.php/informatika/article/view/16976/16509, accessed September 23, 2024

Another example as in Figure 9 is the use of Augmented Reality (AR) and Virtual Reality (VR) in the introduction and preservation of traditional dance carried out by Rambing (2017) at Sam Ratulangi University using 360-degree video with a focus on immersive culturalpreservation by creating an application of Minahasa traditional dance known as Tari Maengket. The method used is the Interactive

Multimedia System of Design and Development (IMSDD) and Google Cardboard as a device in video visualization. The aim is to make my interest in studying dance in Minahasa culture more interesting.

Another activity is a project by Fajri et al. (2020) entitled The Design of Interactive Media for the Patih Mask Dance in Malangan Mask Wayang using the Kinect Sensor using the R&D method, the final result of which is a dance simulator application. Malangan Mask Wayang is a form of traditional East Javanese art that is thick with cultural and spiritual values. The patih figure in the mask puppet is presented with strong and dynamic movement characters, and technology such as Kinect allows for visualization and analysis of these movements innovatively.

Figure 10. Interactive Media Description of the Patih Mask Dance in the Malangan Mask Puppet. Source: https://www.researchgate.net/journal/INVOTEK-Jurnal-Inovasi-Vokasional-dan-Teknologi-2549-9815, accessed September 23, 2024.

Another work is the work of Ismiati et al. (2021) on the use of Augmented Reality technology in identifying basic Sundanese dance movements through the application of basic Sundanese dance movement cards which aims to design and test the feasibility of applicationsthat can be used as learning innovations. This application is a combination of ordinary cards with Augmented Reality technology. Markers are a complement to ordinary cards with the Quick Response code (QRC) type so that the combination of these technologies can lift an object that was previously flat as if it were real. This study uses the ADDIE model, namely analysis, design, development, implementation, and evaluation. The results of the application were tested to be very suitable for use.

Another activity is the creation of a 3D animation of the Riau Malay Offering Dance using Motion Capture technology that also uses special markers (Marker-Based Motion Capture). In this project, the movements of the Riau

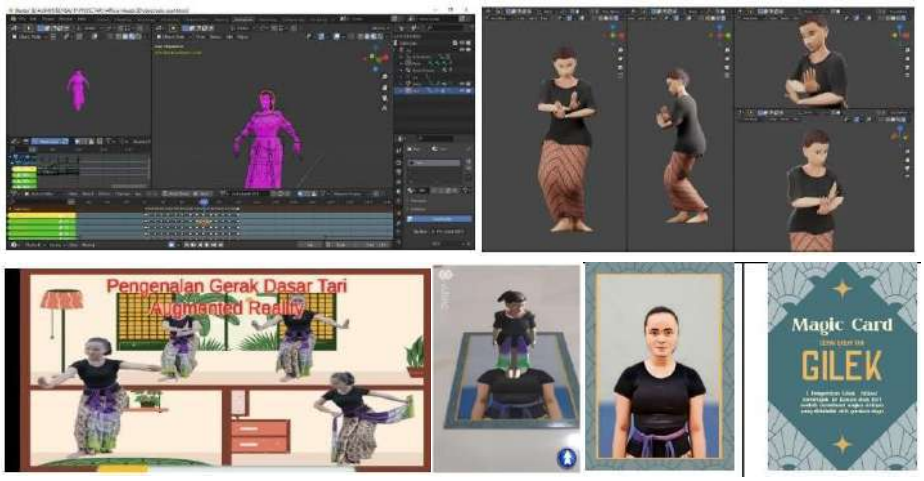

Figure 11. Use of the Sundanese Dance Basic Movement Card Application. Source: https://jurnal.untirta.ac.id/index.php/JPKS/article/view/12909, accessed September 20, 2024.

Malay Offering Dance were recorded andtranslated into a 3D animation model using software such as OptiTrack and Blender. This project aims to introduce the Riau Malay Offering Dance to the wider community, especially the younger generation, with a more modern approach through animation.

Figure 12. Overview of Making 3D Animation of Malay Offering Dance Using Motion Capture. Source: https://opac.lib.pcr.ac.id/index.php?p=show_detail&id=14113&keywords=, accessed September 15, 2024.

There are still several examples of similar successful collaborative projects between traditional experts and technology experts in analysing dance such as the Javanese Dance project between Professor Waridi (a Javanese Dance expert) and a team from the UGM Faculty of Engineering by utilizing a depth camera / or Depth Camera to analyse movement patterns. There is also a 3D Animation work of the Cokek Dance using the optical-based Motion Capture method from Gunadarma University. According to CNN in Ratmono (2023), there is an activityaimed at preserving the Lengger Lanang Dance originating from Central Java using Motion Capture carried out by Australia through the Victorian College of the Arts (VCA) in collaboration with Indonesian dancers and choreographers Rianto and his friends. They aim toensure that the dance, which is hundreds of centuries old, does not become extinct. This dancehas

a spiritual meaning for Central Javanese people in the past. Even the dancers are worshiped for their ability to embody femininity and masculinity during performances.

Key Challenges in Integrating AI into the Creative Process of Dance in Indonesia

Although AI offers many benefits in dance, several significant challenges dance artists face in integrating this technology into their creative process, especially in Indonesia. First, limited technology and infrastructure are the main obstacles. Many art studios in Indonesia do not have adequate access to advanced AI technology. Even the cost of adopting AI technology, including the cost of implementing this technology, both hardware and software, is very expensive, making many people reluctant or unable to use it (Yi et al., 2024)

Second, there are challenges related to the technical skills needed to use and operate AI in dance. Many dance artists in Indonesia do not have a technology background or experience in working with AI software or algorithms. This creates a skills gap that needs to be addressed through training and education. Several choreographers have expressed that the process of learning to understand how AI works is quite complex and requires collaboration with technologists and programmers (Choi, 2023).

Third, there are also cultural challenges that hinder the adoption of AI in dance. Some artists have expressed concerns that AI could remove the humanistic element from dance, which should be an expression of human emotion, feeling, and individuality. These concerns mainly arise from artists who adhere to highly personal dance traditions. According to Herdiani(2020), dance is seen as a representation of human subjectivity and inner experience, which often cannot be translated by AI technology. Artists feel that AI only copies movement patterns without understanding the deep emotions or philosophy involved in dance, especially Bedhaya dance or other dances that have spiritual meaning in every movement.

In addition, an opinion article from literasiaktual.com written by Darmayanti (2024) entitled The Transformation of Dance in the AI Era: innovation, preservation, and Ethical Challenges highlights that artists are concerned that AI can reduce the role of individuality in dance, especially improvisation-based dance, which relies heavily on the dancer's expression, and AI technology, which works based on pattern data, risks creating uniform works and doesnot provide space for individual creativity. Fitriani's research (2023) also revealed that AI presents ethical and philosophical challenges related to the authenticity

of art. Some artists argue that this technology can lead to homogenization, reducing the space for improvisation and the emotional connection between the dancer and the audience.

Dance Community Responses to the Use of AI in Artworks

The dance community's response to the use of artificial intelligence in Indonesia is varied. On the one hand, there is enthusiasm for the potential of this technology to expand creative boundaries and bring innovations to the world of dance. Many young choreographers are interested in experimenting with AI, seeing it as an opportunity to create more complex and interactive works. They see AI as a tool that allows them to explore dimensions of movement that they have never thought of before (Sykes, 2024).

However, on the other hand, there is scepticism and resistance to the use of AI, especially among more traditional dance artists. Some artists' feel that AI can damage the essence of dance, which relies heavily on human expression, they feel that technology, although useful, should not take over the central role of humans in the creative process. This raises a broader discussion about authenticity and emotionality in dance in the digital age.

Conclusion

This study shows that artificial intelligence has great potential to enrich the creative process of dance in the digital era. AI not only functions as an aid but also as a creative collaborator that can produce new, innovative movements. However, challenges such as limited technological infrastructure, technical skills, and cultural resistance to technology still need to be overcome so that AI can be more widely adopted in dance in Indonesia. The findings of this study open up opportunities for further development of artificial intelligence in dance. The adoption of AI in dance is still in its early stages, but the potential to create innovative and interactive works is enormous. Further research is needed to explore how AI can be used more effectively in dance, as well as how artists can overcome the challenges involved.

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THE USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN DESIGNING WAYANG BEBER MOTIFS

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Abstract: Wayang beber is the art of puppetry in the form of sheets. Wayang beber has a high value because of its uniqueness and contains moral teachings. Designing wayang beber motifs is an interesting and potential innovation to preserve and develop traditional Indonesian art. The use of Artificial Intelligence (AI) technology in the fashion industry is used to increase productivity. The methods used in this research are qualitative methods and fashion design research methods. This research examines two objectives, namely 1) creating innovative and interesting motif design variations; 2) reducing time and effort in motif design. The stages used in the creation of motifs are brainstorming, making motifs, and applying motifs to fabrics and analysis. The utilization of AI in designing motif designs opens the opportunity to maintain traditional art while encouraging creativity and innovation. It facilitates the creation of unique and culturally appropriate artworks, and enables collaboration between traditional elements and modern technology. This research shows that AI helps increase the effectiveness of the brainstorming process without compromising the values of creativity and originality.

Keywords: Motif Design, Wayang Beber, Artificial Intelligence; Brainstorming

Introduction

Wayang Beber is one of the oldest Javanese traditional arts in Indonesia, using cloth scrolls as a medium to convey stories. *Wayang Beber* is different from *wayang kulit* and *wayang golek*, as it uses the medium of cloth or leather scrolls. *Wayang Beber* consists of three main styles: Pacitan, Wonosari, and contemporary. *Wayang Beber* of Pacitan and Wonosari tell *Panji* stories, a special tale originating from Java. On the other hand, contemporary *Wayang Beber* is more about the social life of today's society, with more diverse and modern characters compared to traditional *Panji* stories. Unfortunately, the existence of *Wayang Beber* is declining, and there are fewer and fewer artists who are proficient in this art.

Technological development, especially artificial intelligence (AI), presents new opportunities to digitize and develop this traditional art. AI, which is a system designed to understand, process, and use external data effectively, allows the design process of *Wayang Beber* motifs to be faster and more efficient, while maintaining its traditional authenticity and beauty (Goralski et al, 2020). Through algorithm such as machine learning, new motifs can be created based on old motif patterns, providing variety without losing cultural roots. While AI is highly beneficial for industries to improve performance; the role of humans remains crucial. This concept is known as human-centred AI, which prioritizes human aspirations, participation, and rights in AI design. Advanced technologies such as AI are proving to be useful in areas such as education, industry, tourism, and healthcare (Guillermo et al, 2020). But the success of AI remains highly dependent on collaboration with humans, keeping human participation at the centre of this technology's development.

Creative industries are fields that rely on individual creativity, skills and talents to create wealth and employment. The use of Artificial Intelligence (AI) technology is now an effective strategy to revive traditional arts and give new dimensions to art practices, such as introducing *wayang beber* to a wider and more diverse audience. One popular application of AI is in industry, where AI supports work

through robots and smart devices. (Abdi Chistia et al, 2024). AI also plays a supporting role in the early stages of idea exploration or brainstorming, but the responsibility of design development and implementation remains with the creator. With AI support, *wayang beber* motifs inspired by traditional Javanese wedding stories can be designed, contributing to the development of modern *wayang beber*.

The results of AI work and prompt instructions will be related to the level of aesthetic understanding and visual creativity of its users. Visual creativity is the ability to produce new, original, and interesting works of art or design, which can be expressed through various media such as painting, sculpture, graphic design, photography, and film. Several theories try to explain visual creativity, one of which is Guilford's (1950) theory, which discusses the structure of a person's intelligence that affects creativity. Guilford explains intelligence as a person's ability to respond to current situations, based on past experiences, and anticipates future events (Guillermo et al, 2020).

Innovation is defined as a new solution to a problem to make it more sustainable, effective, and efficient (Granstrand et al, 2020), or as a pre-existing solution but with added value. Innovation is also often associated with the involvement of various parties in dealing with social change, including in the 5.0 era (Singh et al, 2020). Therefore, innovation is essential in a society that continues to evolve towards progress. The definition of innovation continues to evolve, following the spirit of the times (zeitgeist), especially in the current 5.0 society (Fukuda, 2020).

The result of this research is a *wayang beber* motif design that can be used for formal occasions. This exploration facilitates the creation of unique and culturally appropriate artworks, and enables collaboration between traditional elements and modern technology. The stages used in the creation of motifs are brainstorming, making motifs, applying motifs to fabrics and analysis. This research shows that AI helps increase the effectiveness of the brainstorming process without compromising the values of creativity and originality (Putra et al, 2022). Artificial intelligence technology can assist artists in presenting new ideas while maintaining traditional values. AI technology not only facilitates the creative process, but also has the potential to document and preserve motifs that are increasingly rare, so that *Wayang Beber* remains relevant and can be enjoyed by future generations.

Research Method

2. Qualitative With Case Study

The method used in this research is a qualitative method with a case study (Hancook, D. and Algozzine, 2014). This case study was chosen so that the creation of motif designs focused more on *wayang beber*, the story raised about the traditional process of *panggih temanten*. The process of making motifs, previously conducted a literature study to obtain information about the outline of *wayang beber* and the *panggih temanten* traditional ceremony. *Wayang beber* is usually in the form of sheets, which are then explored into motifs for clothing. The contemporary *wayang beber* style was chosen to match the imagination of the creator. The type of contemporary *wayang beber* is then examined further about the visual appearance or physical appearance that will be made into a *wayang beber* motif that tells the story of *panggih temanten*.

2. Fashion Design Research

Fashion is part of the world of design, which is close to the elements of problems in design and the demands of needs and problem solving in consumer society, such as economic, political, socio-cultural, technological, artistic, environmental factors, and others. Research in fashion design is divided into two types, namely primary research and secondary research. Primary research covers the new and specific process of creating batik motif designs, from brainstorming, sketching, colour selection, fabric type determination, to finished garments. This primary research is supported by secondary research, which gathers information from pre- existing sources (Ezinma Mbonu, 2014). The motifs created are expected to become unique and sustainable icons. Both methods were used to strengthen the experience and perspective of traditional actors in the *temu manten* ceremony. The resulting design must be innovative, authentic and meaningful.

Discussion and Results

Contemporary puppetry is a developmental form of classical puppetry, which emerged from artists' ideas to maintain public interest in puppetry. In addition to a wider variety of characters, the storyline has also changed. While classical ***wayang*** usually features the Mahabharata and Ramayana stories, contemporary *wayang* deals more with the themes of modern life. In every performance, contemporary *wayang* has an important function in responding to and criticizing the current conditions of society, such as in the fields of politics, government, economy, development, and socio-culture (Tabrani, 2018:173).

Contemporary art itself was born from the development of traditional art influenced by modernization. The term "contemporary" refers to an attempt to connect the past with meaning in the present, as well as reflecting those values for the future (Sujarno, 2003). This type of wayang forms a popular character

Figure 1. Examples of Contemporary Wayang Beber

that reflects criticism of the state of society in the areas of politics, government, economics, development and socio-culture. Thus, contemporary *wayang* is an attempt to preserve *Wayang Beber* and has the potential to be more popular because it is closer to the lives of modern people. *Wayang Beber* Contemporary was initiated by Dani Iswardana in 2005.

The oldest *Wayang Beber* has pictures that tell Panji stories. The oldest Pacitan version of *Wayang Beber* is titled "Joko Kembang Kuning," while the Wonosari version is titled "Remeng Mangunjoyo." In the manufacturing process, *Wayang Beber* uses the sungging colouring technique (Muhammad et al, 2018). In contemporary *Wayang Beber*, the stories presented are closer to everyday life. Contemporary *Wayang Beber* emerged as an artist's response to maintain the public's interest in wayang performances, with the main difference being the stories presented. While Classical *Wayang Beber* tells stories from the Ramayana and Mahabharata, Contemporary *Wayang Beber* is more flexible in its story topics and in accordance with the social circumstances of the community.

Figure 2. Wayang Beber Pacitan

Figure 3. Wayang Beber Wonosari Version

Figure 4. Panggih Manten "Wiji Dadi" Procession"

The *temu manten* tradition is one of the traditions practiced by people in Central Java and Yogyakarta. This tradition is held when someone wants to marry off his or her child. Javanese traditional marriage includes various rituals, including the *panggih* or *temu manten* ceremony, which is a meeting between the bride and groom at the bride's residence. The *Temu Manten* tradition has deep spiritual meaning and value. In Javanese culture, the marriage ceremony is considered important because its main purpose is the formation of a new, independent family. In addition, marriage is also interpreted as a means of strengthening kinship and a symbol of the unity of husband and wife. From the point of view of human culture, marriage plays a role in regulating human biological needs. Various ways are done by the Javanese community to reflect the values of life in the marriage ceremony, including through the symbol of *sindur* cloth in the wedding party.

According to Geertz (1992:11), the *panggih* tradition and ceremony symbolizes the first meeting between the bride and groom who are each in a state of purity and legitimacy as husband and wife. The word "*panggih*" is taken from a ritual that is part of the cultural values that have become guidelines for the community in dealing with various life problems. These traditions and rituals can function

as a public guide if the symbols, both physical and in the form of actions, are interpreted deeply in a social context. In this case, cultural interpretation is one of the theories and methods used to reveal and show the meaning behind the symbols that are the object (Faiz, 2003:20).

According to (Tilaar, 2004:191) humans are called active beings in the transmission of culture because of creativity, innovation, enculturation, and acculturation. The ability of human creativity and activity is part of the educational process, so it can be concluded that education and culture are interrelated with each other. The lack of public appreciation of traditional rituals makes this research interesting to rise in order to preserve culture through fashion collaboration with AI.

The stages in making motifs with AI are as follows:

1. Brainstorming Process

This process is carried out to determine the research boundaries. This step includes determining the theme to be created and then analysing it. The chosen *wayang beber* motif is about the *panggih temanten* custom that involves several ritual ceremonies. The meanings of the Javanese traditional wedding rituals include: 1) Throwing betel nut: teaches respect and responsibility in the household, 2) Washing the feet: symbolizes honesty, 3) *Injak telur*: symbol of hope and loyalty, 4) *Sikepan sindur*: reflects a strong and inseparable love rope, 5) *Pangkuan*: sharing love fairly, 6) Kacar-kucur: symbol of prosperity in the household, 7) *Dulang-dulangan*: depicts help and harmony, and 8) *Sungkeman*: a form of respect for parents or elders.

2. *Wayang Beber* Motif Making Process

At this stage, the motif to be created has been determined, namely the *wayang beber* motif with the theme of the *panggih temanten* story. The next step is to create the motif using the Playground.com software available online. Playground.com is a tool that combines AI with art, providing new insights into possible visual creations. The process begins by entering keywords or descriptions of the desired motif into a text prompt. After that, the desired illustration style is selected. The AI technology will then generate an image of the *wayang beber* motif online in just seconds. If required, selecting other options can change the illustration style. The prompts entered can be simple descriptions or more complex sentences that include details about the visual style, composition, or subject of the image. The results generated by the AI are analysed and modified to generate *wayang beber* motifs with the theme of *panggih temanten*, using previously collected and studied *wayang beber* images.

Here are some tips on how to get the best AI images:

a. "Specific in Description", the more detailed the description, the better the AI can capture the desired vision, according to the atmosphere, colour, theme, and main elements.
b. "Composition", specifying a preference, either for an elegant minimalist look or rich and detailed visuals, will help the AI in creating the desired composition.
c. "Readjustment", if the initial result is not suitable, makes adjustments and requests a readjustment. Experimenting with variations of descriptions can fine-tune the image to your liking.

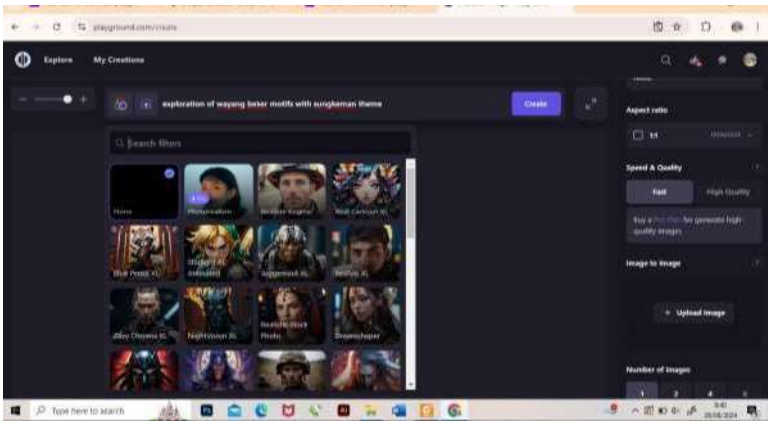


Figure 5. Attribute Setting Process

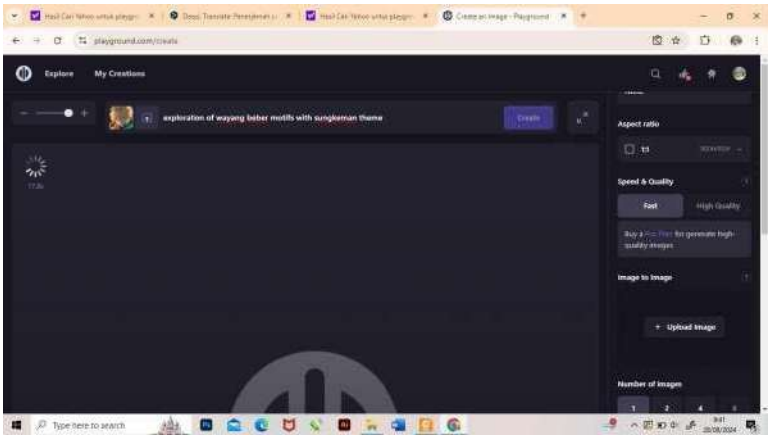


Figure 6. Playground.com Motif Making Process

3. Application of Motifs to Fabric

The next step is to make an overall panel according to the size of the fabric. This panel is made to adjust the fabric edge decoration. The motif that has

been made is then made a layout by arranging the motif design that has been made according to the wishes of the pattern made. After the process of making fabric motifs, the process of simulating the application of fabric to clothing is carried out. The combination of colours creates a visual harmony that can be balanced, awake, and elegant.

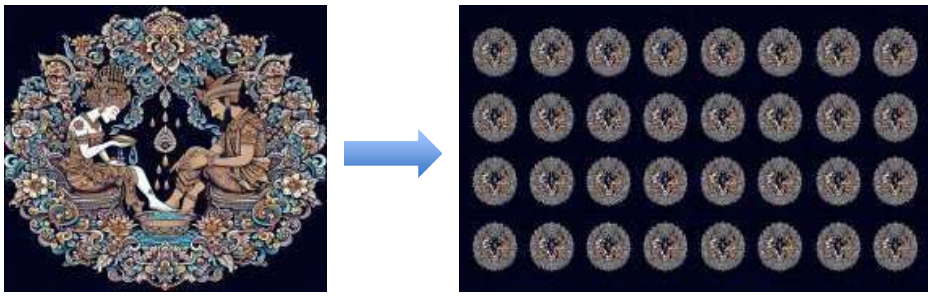


Figure 7. Egg Stepping Ceremony, Wiji Dadi, Wijikan or Ranupada

Style: Pastel Dream
Text Prompt: The exploration of the *wayang beber* motif design tells the story of the procession of washing the feet of the groom and bride in Javanese wedding customs **Description:** This procession depicts an illustration after which a chicken egg is broken at the groom's feet and the bride washes the groom's feet with clean water. This washing reflects the wife's devotion to her husband for a happy and harmonious household characters don't look alike

Style: Retro Dreamscape
Text Prompt: The exploration of the *wayang beber* motif design tells the story of the procession escorting the groom to meet the bride in Javanese wedding customs
Description: In this procession the bride and groom stand side by side and join hands while linking little fingers, the woman on the left and the man on the right. The bride and groom then walk together to the aisle.

Style: Pastel Dreams
Text Prompt: Exploration of *wayang beber* motif design tells the story of a bride who is feeding the groom in Javanese bridal customs
Description: The groom makes three fists of yellow rice and places them on a plate held by the bride. And witnessed by the groom, the bride eats one by one the fist of rice. Then the groom gives the bride a glass of water. This procession illustrates the harmony of husband and wife will bring happiness in the family.

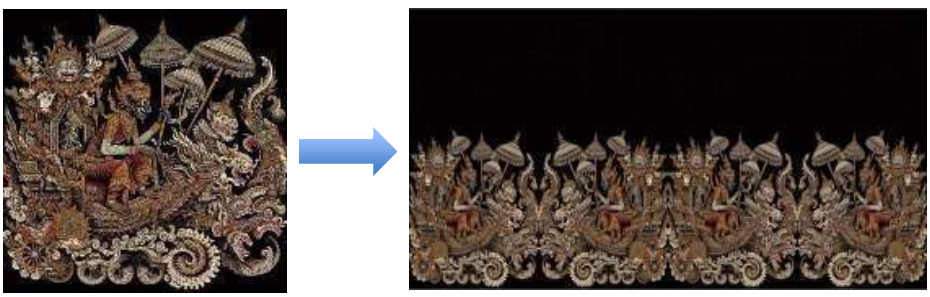


Figure 10. Procession Feeding the Groom

Style: Pure Visualization
Text Prompt: Exploration of *wayang beber* motif design tells the story of a bride who is feeding the groom in Javanese bridal customs
Description: At this stage the mother of the bride wraps the arms of the bride and groom in *sindur* cloth. After that the bride and groom walk slowly to the bridal seat, followed by the parents.

Figure 11. Procession Of Javanese Bride and Groom Walking Down the Aisle

Style: Retro Charm.
Text Prompt: *Wayang beber* motif design tells the story of the procession of Javanese bride and groom walking down the aisle
Description: The ceremony is performed from opposite directions, about two meters apart. The groom throws the *gantal* at the bride's forehead, chest and knees. The bride then throws the *gantal* at the groom's chest and knees. This ritual aims to throw affection on each other.

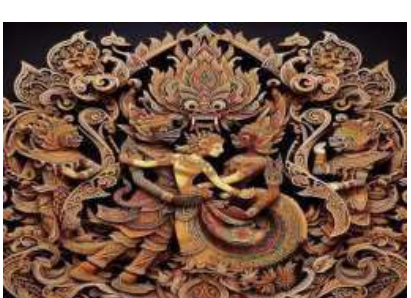


Figure 12. Kanthen Asto
Hand in Hand Ceremony

Style: Pure Visualization
Text Prompt: Exploration of *wayang beber* motif design tells the story of the bride's father is holding the bride on his lap with the groom accompanying him
Description: The next stage in the Javanese wedding procession is the *kanthen asta*. In this stage, the bride and groom stand side by side and hold hands with intertwined little fingers of the bride on the left side and the groom on the right side. Together, they then walk towards the aisle.

Mockup

Figure 13. Results Mockup

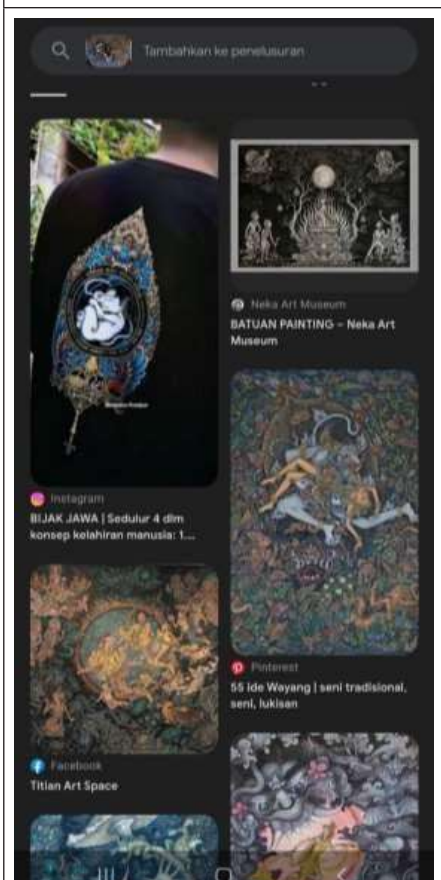
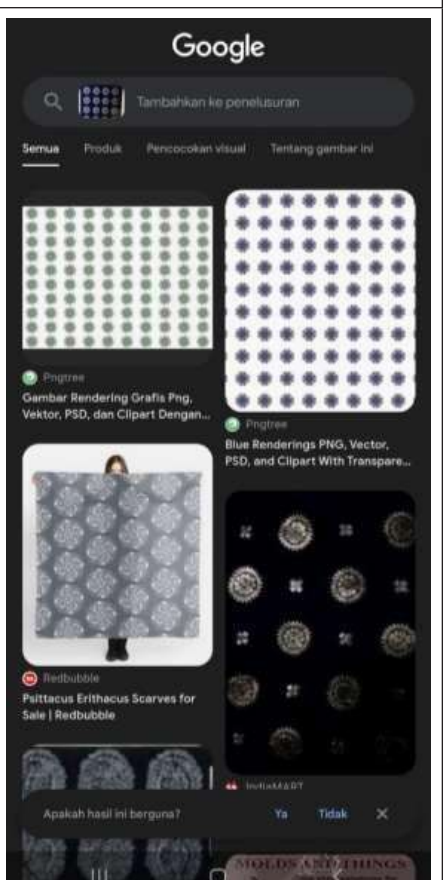
This fashion design is a women's *kebaya* suit, with a front skirt split. The menswear design is an asymmetrical suit combined with plain fabric. The colour chosen is a combination of milk chocolate and navy blue. The motif on the outfit tells the story of the *wiji dadi* procession, *mbasuh sukerta* (washing the feet). This traditional procession reflects the wife's devotion to her husband for a happy and harmonious household. Making this design using software CorelDraw.

4. Analysis

Based on this, there is no design that is the same as the initial and final motif design results. This shows that the motifs produced by *artificial intelligence* are original. The final process in this research is the analysis process with validation. The validation process is carried out to evaluate the motifs created to ensure the originality of the resulting motifs. The validation process was carried out using Google Lens. The Google facility allows researchers to validate the results of artificial images. The validation process is carried out on

small size and large size motif images to ensure precise results.

Table 1. Motive Analysis

Analysis	
Small Size	**Large Size**
	

Conclusion

Efforts to preserve and develop culture in society can be done through the exploration of motif creation applied in fashion. Exploration is an alternative means to develop motifs to be more diverse. One example is the *wayang beber* motif with the theme *temu manten*, which aims to introduce and preserve the traditional Javanese wedding ritual. It also serves to increase public awareness that every ritual contains moral values in every stage. This research focuses on the creation of *wayang beber* ornamental motifs by utilizing artificial intelligence

(AI) technology through several stages, namely brainstorming, motif creation, application to fabric, and analysis. The brainstorming process is used to determine the research topic. Motif creation was done with playground.com software using text prompts. The motifs created were analysed and described the moral values in each procession performed. Furthermore, the motifs that have been made are developed and applied to *kebaya* suits and suits using CorelDraw software. The application of ornamental motifs to the fabric is done in accordance with the existing design aspects, so that the resulting products can be produced in large quantities using the batik cap or printing technique. Both methods allow for efficient workmanship and are capable of producing many *wayang beber*-patterned fabrics in a short period of time. The existence of AI is a means of collaboration to produce unique motif designs.

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LEVERAGING ARTIFICIAL INTELLIGENCE FOR SMART CITY DEVELOPMENT: SOCIAL AND GOVERNANCE IMPACTS IN JAKARTA

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ABSTRACT: The interaction between people and technology is inseparable and use to continuous repetitive daily action. The term of artificial intelligence generally development of technology in conduct daily activity can be easier. This study reveals the extent to which the use of artificial intelligence can affect social life in the people of the Special Region of Jakarta in benchmarking of smart cities too. Data sources are obtained from social media, electronics, Youtube, regulations and others that are considered legitimate in data collection and relevant to be studied. The findings reveal that artificial intelligence integration is most successful when ethical frameworks and transparent data practices are prioritized. Collaboration between artificial intelligence developers and stakeholders is crucial in addressing biases and enhancing the trustworthiness of artificial intelligence systems. The study provides actionable recommendations for improving artificial intelligence adoption while safeguarding ethical standards. A holistic and inclusive approach is needed, including increasing digital literacy, establishing clear regulations regarding the use of data, and closer collaboration between governments, technology developers, and the public. In this way, the use of artificial intelligence in Special Region of Jakarta can run more fairly, transparently, and benefit all level society.

Keywords: Artificial Intelligence; Social Life; Technological Developments; Special Region of Jakarta

Introduction

The interaction between people and technology is inseparable and use to continuous repetitive daily action. The term artificial intelligence generally means development of technology conducting daily activity can be easier. The post-pandemic worldwide has accelerated the application of artificial intelligence (AI). McKinsey & Company (in Alexander et al., 2021) claims that the post-pandemic has seen most large companies shift to a hybrid work model that combines remote work with the help of technology such as artificial intelligence and working at the company's location. For example, before the pandemic, around 62% of employees preferred working at the company's location, but after the pandemic, only 37% showed their preference for working at the company's location. With the use of artificial intelligence, employees work faster, more effectively, and more efficiently (Ayu Gusti et al., 2024).

Technological advancement allows automation in almost all fields. New technologies and approaches that combine the physical, digital, and biological worlds will fundamentally change the pattern of human life and interaction (Gaol, 2021). Artificial Intelligence has been implemented globally. Furthermore, many nations have developed artificial intelligence with a variety of applications and functions. For example, Venezuela has implemented an innovative smart card identification system called the 'carnet de patria'. This identification card integrates government databases associated with social programs, potentially facilitating governmental surveillance of individuals' financial records, medical backgrounds, and electoral participation (European Parliament: Directorate-General for External Policies of the Union & Ünver, 2024). The use of artificial intelligence (AI) in Special Region Jakarta is increasing in line with the city's efforts to become a smart city. However, while artificial intelligence offers a wide range of potential to improve efficiency and quality of life, its implementation in Jakarta faces several significant challenges. artificial intelligence technologies have significant impacts on the way we learn, particularly due to the rapid transformation, development, innovation, and emergence of learning technologies (Margono et al., 2024).

First, the problems of the digital divide where some people still lack understanding or access to artificial intelligence technology. This is exacerbated by the low level of digital literacy among certain circles, which causes inequality in the use of this technology. As a result, not all levels of society can experience the benefits of artificial intelligence equally, thus creating a social gap.

Second, the problem of bias in artificial intelligence data and algorithms is also a concern. Many of the artificial intelligence algorithms used today are built on data that may not fully represent the social and cultural diversity of Jakarta. This bias can lead to inaccurate or unfair results, which in turn can exacerbate existing inequalities.

Third, there are also concerns regarding data privacy and security. Many Jakartans are concerned about the misuse of their personal data, especially when it is collected without explicit permission or used for non-transparent purposes. The lack of strict regulation and adequate legal protection exacerbates public distrust of artificial intelligence technology. In exploring how e-government public service provision influences public trust, understanding the dynamics of institutional trust is crucial for evaluating the effectiveness and impact of digital governance initiatives on the citizen-state relationship (Fadrial et al., 2024).

Finally, there are challenges in terms of collaboration between technology developers and local stakeholders. While artificial intelligence has the potential to improve various public services, its implementation often lacks active participation from the community and relevant stakeholders, resulting in solutions that are less responsive to local needs and conditions.

To address these issues, a holistic and inclusive approach is needed, including increasing digital literacy, establishing clear regulations on data use, and closer collaboration between governments, technology developers, and the community. In this way, the use of artificial intelligence in Special Region Jakarta can run more fairly, transparently, and benefit all.

In conclusion, Jakarta's efforts to implement artificial intelligence (AI) as part of its smart city initiatives show promise in addressing urban challenges, such as traffic management, public safety, and healthcare. However, realizing artificial intelligence's full potential requires overcoming significant social and governance challenges, including the digital divide, data privacy issues, and algorithmic bias. Addressing these challenges demands a collaborative approach involving the government, private sector, academia, and local

communities to ensure fair and inclusive artificial intelligence benefits for all. Increasing digital literacy, establishing clear data regulations, and fostering stakeholder collaboration are essential to align artificial intelligence advancements with Jakarta's broader social and governance goals, creating a more resilient, responsive, and sustainable urban environment. This study reveals the extent to which the use of artificial intelligence can affect social life in the people of the Special Region of Jakarta in benchmarking of smart cities too.

Statement of Problem

1. How to analyse artificial intelligence function for supporting social living in the Urban People in Jakarta?
2. What are the obstacles and challenges in implementing artificial intelligence in Jakarta from the perspective of new institutionalism?

Research Method

This research approach uses qualitative method with descriptive analysis techniques. Data sources are obtained from social media, electronics, Youtube regulations and others that are considered legitimate in data collection and relevant to be studied.

A narrative analysis examines the stories and experiences conveyed in a text, focusing on how these narratives are constructed, their meaning, and their impact on the audience. Based on the article "Leveraging Artificial Intelligence for Smart City Development: Social and Governance Impacts in Jakarta" here's a step-by-step method to perform a narrative analysis.

Result and Discussion

A crucial component of artificial intelligence, deep learning, has advanced significantly across a variety of applications. By building and training deep neural networks that are capable of identifying intricate patterns and separating important pieces of data, this strategy focuses on machine learning (Safitra et al., 2024). Artificial Intelligence can succeed when technological development is sustainable across all aspects. In Indonesia, technology adoption has recently started to exploit improvements in AI to improve services. The fourth industrial revolution and the development of society 5.0, particularly in Indonesia, make it possible for future expansion, even though the conditions still need to be optimum. The Industrial Revolution 4.0 gave rise to technological disruption, which ultimately created a new culture in every aspect of life. With the development of technology and the internet, which is increasingly widespread, its use is in great demand by the world community. AI applications are proven

to help humans work more quickly and efficiently (Helmiatin et al., 2024). The background of the study on leveraging artificial intelligence (AI) for smart city development in Jakarta emphasizes the critical role of artificial intelligence in transforming urban environments and improving daily life efficiency. However, this transformation faces challenges, including digital literacy disparities, data privacy concerns, and algorithmic biases. The study highlights the need for inclusive digital policies and active collaboration among the government, private sectors, and civil society to address these issues. Through such cooperation, artificial intelligence integration can lead to a more equitable, transparent, and sustainable development, setting Jakarta as a model smart city in Southeast Asia. Since implementation development technology in other country ASEAN can be display from this figure below that :

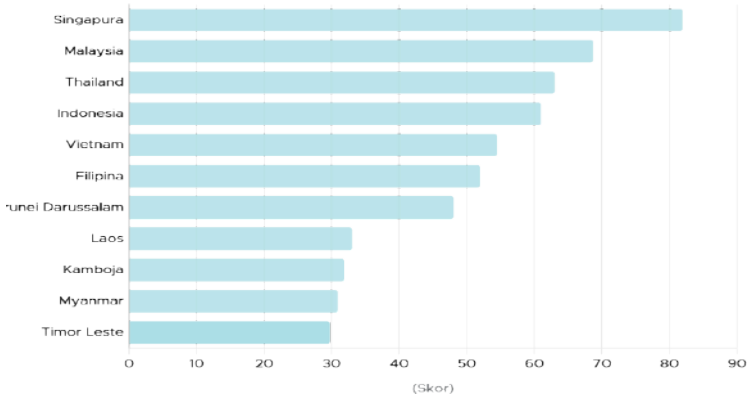

Figure 1. Implementation of Artificial Intelligence in ASEAN Countries in 2023 (Source: Rafli, 2024).

The portrait of technology development in the integration of various services was proclaimed through integrated digitalization. such as in Special Region Jakarta City has implemented several facilities for the use of the area both transportation, licensing and public services that use one integrated application. This reduces the existence of great opportunities in building the construct of society 5.0 society assuming smart cities become a strong foundation in lifestyle development and socialization of people who are able to use technological developments as support for their activities (Syah et al., 2023).

To achieve the goal of becoming a smart city, the capital city of Jakarta uses various Internet of Things (IoT) applications. The following are five main IoT applications, including:

1. Jakarta One Card, is a “smart card” that can be used as an e-KTP, payment tool and BPJS card when shopping.
2. City Surveillance System Around 6,000 CCTV cameras will be installed

throughout the city of Jakarta to monitor traffic and crowds.

3. Dump Truck Tracker Every government waste truck must have a GPS sensor that can be monitored for 24 hours.
4. Heavy Equipment Tracker, special sensors will also be installed on heavy equipment owned by the Special Region Jakarta Provincial Government. Not only can these sensors identify their location, but they can also be used to track routine maintenance and replacement of parts.
5. Smart Street Lighting System, this system will replace 90,000 lights in Special Region Jakarta to reduce electricity consumption (Kristiadi et al., 2022; Puspitasari, 2021).

In other media Channel Youtube can be state deeply the main problem traffic lights have used artificial intelligence with an Intelligence Traffic System with a system called the Network Operation System through the control of the Transportation Office. This system can read the density of the vehicle queue through the calculation of the effective green light duration and the red light will also adjust (Pemprov DKI Jakarta, 2023).

For now, traffic lights with artificial intelligence technology are installed at 20 intersections with a high level of congestion. Since its implementation in April 2023, this system has been observed to be efficient, reducing vehicle queues by around 20%. The plan is that in the future, the Transportation Department will add to 40 points with a high level of congestion through this traffic artificial intelligence system (Pemprov DKI Jakarta, 2023).

From the other side, CEO & Co-Founder of Nodeflux, Meidy Fitranto in Youtube Broadcast CNBC Indonesia, (2023), views the application of artificial intelligence technology as one of the solutions to solve congestion, including detecting various violations and encouraging discipline of road users. However, the success rate still needs to be evaluated. In line with Nodeflux, Public Policy Observer, Trubus Rahadiansyah sees the potential of AI as a strategy to overcome congestion but must be accompanied by policies that encourage the level of discipline of road users. Currently, AI has been implemented in the transportation sector within the urban setting of Jakarta, Indonesia. This utilization has been documented by Solihati & Indriyani, (2021), who have identified several specific applications. The uses of applications are for (1) identifying a vehicle's plate number, (2) counting people by computes to identify human movement within specific regions, (3) counting and categorizing various types of vehicles systematically, including motorcyclists, as they pass through a given area (the system can categorize a total of 23 distinct variations of motor vehicles), and (4) calculating and estimating the duration for which a

vehicle will come to a halt at a particular location.

The findings reveal that artificial intelligence integration is most successful when ethical frameworks and transparent data practices are prioritized. Collaboration between artificial intelligence developers and stakeholders is crucial in addressing biases and enhancing the trustworthiness of artificial intelligence systems in Jakarta.

Based above this fig can be represented Implementation of artificial intelligence in Special Region Jakarta with contributions from Local Government and Society it can be describe Jakarta, as the capital city of Indonesia, is actively

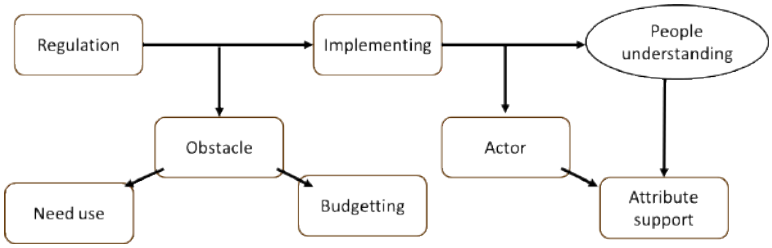

Figure 2. Causality between Artificial Intelligence Implementation and Contributor The Actors

embracing technological innovations, including Artificial Intelligence, to address various urban challenges and improve governance. The integration of artificial intelligence into Jakarta's infrastructure and public services is a multifaceted endeavor, with significant contributions from local government, private sector, academia, and civil society.

1. Role of Local Government

The local government of Jakarta plays a central role in the implementation of artificial intelligence. Under the leadership of the city's governor and relevant agencies like Jakarta Smart City (JSC), artificial intelligence has been incorporated into various sectors:

a. Smart City Initiatives : Jakarta has implemented artificial intelligence-driven solutions to optimize traffic management, reduce congestion, and improve public transportation. The city uses artificial intelligence for real-time traffic monitoring, rerouting, and predicting traffic patterns. JSC employs artificial intelligence to analyze data from millions of vehicles to generate solutions for traffic problems in one of the world's most congested cities.
b. Public Safety and Surveillance : artificial intelligence -powered surveillance systems have been deployed to enhance public safety. By integrating facial recognition and real-time analytics, these systems can monitor crowd activities, detect unusual behavior, and alert authorities to potential security threats. The local government has also used artificial intelligence

to monitor environmental conditions such as air quality and flooding risks, which are critical issues in Jakarta.

c. Healthcare Services: During the COVID-19 pandemic, Jakarta's government utilized artificial intelligence in telemedicine services and data analytics to track and predict the spread of the virus. Artificial Intelligence helped the government allocate resources more effectively, ensuring that hospitals and healthcare facilities were adequately equipped.

2. Contribution from Society and the Private Sector

Civil society and private actors in Jakarta have also contributed to the implementation of Artificial Intelligence:

a. Startups and Technology Companies : Several artificial intelligence-based startups and large tech companies ae working in collaboration with the government to offer solutions. For example, private companies have developed artificial intelligence- driven platforms for public service optimization, ranging from smart transportation apps to healthcare platforms that use machine learning for medical diagnostics.

b. Education and Research Institutions : Universities and research centers in Jakarta contribute significantly to the development and implementation of artificial intelligence. Collaboration between the government and academia has led to research on urban issues that can be addressed with artificial intelligence, such as flood management and smart mobility.

c. Community Involvement : The success of artificial intelligence implementation in Jakarta is partly due to community involvement. Civil society groups, local residents, and advocacy organizations have voiced their concerns and provided feedback on artificial intelligence initiatives. This collaboration ensures that artificial intelligence solutions meet the needs of the public and respect ethical standards, particularly in areas like privacy and data protection.

3. Challenges and Future Directions

While there are many promising artificial intelligence initiatives in Jakarta, there are also challenges. These include:

a. Data Privacy and Security: With increased use of artificial intelligence, there is a growing concern about how data is collected, used, and protected. Both the government and private companies must ensure that personal data is handled responsibly.

b. Digital Divide: artificial intelligence technologies require access to digital infrastructure, and there is a need to ensure that all segments of society can benefit from artificial intelligence solutions, not just the affluent or tech-savvy communities.

c. Ethical Concerns: As artificial intelligence becomes more embedded in governance and daily life, concerns about surveillance, discrimination in artificial intelligence algorithms, and decision-making transparency are gaining importance.

Looking forward, Jakarta is expected to continue expanding its use of artificial intelligence across more sectors, with the ongoing support of local government policies, societal feedback, and collaboration with the private sector. The success of artificial intelligence implementation in Jakarta will largely depend on how well these various actors can align their efforts to create a smart city that is both technologically advanced and socially inclusive.

In summary, the implementation of artificial intelligence in Jakarta showcases a collaborative effort between the local government, the private sector, academia, and society at large. Together, these actors are paving the way for a more efficient, responsive, and sustainable urban environment, making Jakarta a leader in artificial intelligence innovation in Southeast Asia.

Conclusion

The ever-growing city of Jakarta will face many problems that can be solved with the right use of technology. Due to human limitations, artificial intelligence can help optimize performance that is more efficient and effective.

The understanding of the people of Jakarta in the use of artificial intelligence is still minimal, of course, this makes the focus of attention for various parties, both government and private, in optimizing the insight into the needs of the people of Jakarta.

The integration of artificial intelligence in Jakarta offers promising solutions to urban challenges, particularly in the development of a smart city. While artificial intelligence has already contributed to improving traffic management, public safety, and healthcare, its full potential can only be realized through the collective efforts of government, private sectors, academia, and civil society. However, challenges such as the digital divide, data privacy concerns, and algorithmic bias must be addressed. A holistic and inclusive approach—focused on increasing digital literacy, clear regulations, and stakeholder collaboration—will ensure that artificial intelligence benefits all segments of society in Jakarta. The future success of artificial intelligence in Jakarta will largely depend on continued efforts to align technological advancements with the city's social and governance needs.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EMOTIONAL EXPRESSION IN ART

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Abstract: Artificial Intelligence (AI) has permeated various aspects of human life, including art. This research aims to explore how AI affects emotional expression in art, both in terms of creation and analysis of artworks. Using a literature review method, this study examines existing literature to understand the extent to which AI can imitate or replace human emotional expression in art. The results show that while AI can create technically and visually appealing artworks, authentic emotional depth remains an area of knowledge rather than experience. Additionally, AI has the potential to analyse and reveal emotional patterns in human artworks, which can open up new perspectives in art studies. However, the issue of authenticity and the genuineness of emotions in AI-generated artworks remains a matter of debate.

Keywords: Artificial Intelligence, Emotional Expression, Art, Authenticity

Introduction

The development of Artificial Intelligence (AI) has transformed various aspects of human life, including art. AI, with its analytical and machine learning capabilities, is now able to create complex artworks that mimic human artistic styles. However, an important question arises about the extent to which AI can express human emotions through art. Emotions are fundamental elements in art, where artists express their feelings and experiences through their works. Human-created artworks are often laden with emotional meaning, as they stem from the artist's life experiences and personal perceptions.

In this context, research on the impact of AI on emotional expression in art remains very limited. Most studies focus on AI's technical ability to create art or on AI's potential to automate the creative process. However, very few address the authenticity and depth of emotion in AI-generated artworks. This study aims to fill this gap by exploring how AI affects emotional expression in art, both in the creative process and in the analysis of artworks.

In this research, we use a literature review method to examine the existing literature on the role of AI in art, with a particular focus on the emotional aspect. Through this review, we aim to understand the extent to which AI can replace human roles in expressing emotions through art, and whether AI-generated works possess the same emotional depth as those created by humans. Additionally, this study will discuss the potential of AI in analysing human artworks and identifying emotional patterns that may go unnoticed by humans.

This study is important as it provides new insights into the relationship between technology and art, and how AI may influence our understanding and creation of art. By understanding the impact of AI on emotional expression in art, we can be more critical in assessing AI's role in the art world and how this technology should be used to support, rather than replace, human creativity.

Literature Review

Art and emotion have been widely discussed topics in literature. Emotional expression in traditional art is seen as a manifestation of the artist's personal experience, which creates an emotional connection with the audience (Dewey, 1934: 45). According to Tolstoy (1897: 52), art is a means of transferring emotions from the artist to the audience, where these emotions form the essence of authentic art.

With the advent of AI, this discourse has changed. AI is recognized for its ability to create technically impressive artworks, but the issue of authenticity and emotional depth remains debated. Some researchers, such as McCormack et al. (2019: 102), state that AI can mimic emotional patterns but cannot truly understand or experience emotions. Gervais et al (2020, 2015) reinforce this idea arguing that AI-generated artworks may have an emotional impression but lack a foundation of genuine emotional experience.

Other studies highlight AI's potential in analysing human artworks. One example is the research conducted by Elgammal et al. (2017: 364), which used AI to analyse thousands of paintings and identify emotional patterns that were not consciously recognized by the artists. This research shows that AI can provide new insights into how emotions are expressed in art, even though it lacks the capacity to feel the emotions itself.

Despite various perspectives on AI's role in art, the general consensus is that AI can be a useful tool in analysing and creating art, but there are still limitations in terms of authentic emotional expression. Bender et al. (2021: 84) note that AI-generated artworks often lack the "soul" typically found in human-created art, reflecting deep life experiences and feelings.

Methodology

This research employs a literature review method to examine and analyse existing literature on the impact of AI on emotional expression in art. Data were collected from various academic sources, including scholarly journals, books, and relevant conference articles. The selection of literature was based on the relevance and quality of the sources, with a focus on research discussing the relationship between AI, art, and emotion. The literature analysed includes theoretical and empirical perspectives, aiming to obtain a comprehensive understanding of this topic.

Discussion

Based on the literature review conducted, the impact of AI on emotional