Journal of Theoretical and Applied Information Technology
15th November 2025. Vol.103. No.21

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

AIOT-DRIVEN WEARABLE ARCHITECTURE FOR INTELLIGENT GRAPHIC DESIGN AUTOMATION

TANAPEAK PEXYEAN[1] , PANIT THONGDEE[2] , CHUTIMA KETSA[3] , NATTAPON LONIN[4], PRACHYANUN NILSOOK[5], MAYKIN WARASART[6]

[1,3,4]Division of Information Technology and Digital Innovation, Bangkok Suvarnabhumi University, Bangkok, Thailand

[2]Department of Multimedia Technology, Rajamangala University of Technology Tawan-ok, Bangkok, Thailand

[5]Division of Information and Communication Technology for Education, Faculty of Technical Education, King Mongkut's University of Technology North Bangkok, Thailand

[6]iKNEX - Association for Interdisciplinary Knowledge Exchange (Thailand), Bangkok, Thailand King Mongkut's University of Technology North Bangkok, Thailand

E-mail: [1]tanapeak@bsu.ac.th, [2]panit_to@rmutto.ac.th, [3]chutima.k@bsu.ac.th [4]nattapon@bsu.ac.th, [5]prachyanunn@kmutnb.ac.th, [6]maykin@acm.org

ABSTRACT

The purpose of this research is to develop a graphic design system through automated wearables and to evaluate the suitability of a graphic design system through automated wearable devices. Phase 2 is the development of a graphic design system through automated wearable devices, which consists of Graphic Design Automation that works with smart wearable devices to support and optimize the graphic design process. The system consists of four main layers: the data import layer, the data processing layer, the integration layer, and the application layer, where the data from the user is transmitted through the wearable device to the processing layer, which processes data at both the edge computing and cloud computing levels using machine learning (ML) and artificial intelligence (AI) technologies such as gesture recognition and natural language processing (NLP). The system also provides user feedback through haptic feedback and user data analysis to improve the accuracy of automated commands in the future. In addition, data encryption is provided for security during data transmission as a new approach to digital design development by integrating wearable technology with an Intelligent Automation System. It improves ease of use and simplifies technical complexity for designers. The system can also be connected to professional graphic design software to increase productivity and create automated designs based on real-time sensor data. AI-driven design integrates IoT and user-centric design automation to increase speed, flexibility, and responsiveness to the needs of digital content creation. This integration facilitates efficiency, flexibility, and convenience in the design process. Supports the development and integration of various software effectively.

Keywords: *Wearable Devices, Artificial Intelligence Internet of Thing, Graphic Design Automation*

1. INTRODUCTION

In the digital era, where graphic design demands speed and efficiency, wearable devices have emerged as an innovative technology contributing to the transformation of design automation. These devices enable designers to interact with creative processes through gestures or voice commands,[1] reducing workflow complexity and enhancing productivity. Their integration supports faster design execution and minimizes manual operations, thereby improving operational standards within the graphic design field.

Wearable devices offer potential solutions for increasing design precision and responsiveness, especially in sectors such as fashion, advertising, and packaging, where flexible and adaptive designs are essential. [3] Designers can perform modifications through intuitive commands, while wearable-integrated systems can also support automated operations within production workflows, helping reduce time and cost [4]. By leveraging IoT connectivity, wearable devices can collect and process real-time environmental and user data, enabling adaptive design modifications that align with specific contexts and requirements [5]. This results in highly personalized and context-aware design outputs. Additionally, wearable devices can seamlessly integrate with 3D printers, smart displays and industrial machinery, making graphic design an integral component of automated production systems that emphasize speed, accuracy, and cost reduction. The continuous data collection and analytical capabilities provided by IoT-driven wearables allow designers to refine their creative processes dynamically,[6] paving the way for innovative, efficient, and trend-responsive design solutions. By incorporating IoT into wearable-based graphic design automation, the field can achieve greater adaptability and operational efficiency, transforming how design interacts with its environment in real-time. For instance, wearable devices equipped with various sensors such as temperature, light, sound, [7]and motion detection can use this data to autonomously adjust and refine design elements based on user behavior and environmental conditions.

Beyond real-time design adaptability, IoT By incorporating IoT with wearable technology, several challenges in traditional design workflows—particularly those related to speed, adaptability, and precision can be addressed. Real-time data from wearables allows systems to modify design elements based on user interactions and external stimuli, while also improving communication between design and production tools. Moreover, this integration supports trend-aligned customization and facilitates data-driven design decisions [8]. Despite advancements in Artificial Intelligence (AI), Internet of Things (IoT), and automation tools, graphic design workflows still rely heavily on traditional input devices and static software interactions. Current systems lack the capability to integrate wearable devices with AIoT to enable real-time, context-aware, and user-driven design adaptation.

This research explores the role of wearable devices in automated graphic design and examines the benefits and limitations of their implementation.[9] This research is relevant to graphic designers, HCI researchers, and software developers seeking to enhance design workflows through AIoT and wearable technologies. Moreover, industries such as fashion, advertising, and digital media production can benefit from the proposed architecture, as it provides real-time adaptability, reduces manual workload, and improves creative efficiency. By addressing current limitations in traditional input-based design tools, the study contributes not only to academic research but also to practical applications in creative industries.

1.1 Research Questions and Hypotheses

This study is guided by the following research questions:

• RQ1: How can AIoT-integrated wearable devices enhance efficiency and adaptability in graphic design automation?

• RQ2: To what extent does the proposed architecture demonstrate usability, flexibility, and performance based on expert evaluation?

Accordingly, the study proposes these hypotheses:

• H1: AIoT-driven wearable integration significantly improves design efficiency and adaptability compared with traditional approaches.

• H2: The proposed architecture will obtain high expert evaluation scores (mean $\geq$ 4.50, SD $\leq$ 0.50) in usability, flexibility, and system performance.

2. LITERATURE REVIEW

The author presents the essence of Wearable Devices in Graphic Design Automation, which occurs from the analysis and synthesis of relevant documents and research as follows.

2.1 Wearable Devices

Wearable devices have become a pivotal technology in bridging human daily life with the digital world. These devices, including smartwatches for health tracking, wearable sensors for biometric measurements, and smart glasses for enhanced visual experiences, have significantly improved convenience and efficiency in various applications. The current role of wearable devices has expanded beyond consumer applications to healthcare, sports, security, and industrial sectors. Technologies such as Apple Watch and Fitbit allow users to monitor heart rate, metabolism, and sleep patterns, while Microsoft's HoloLens enhances engineering and educational applications[10]. These advancements highlight how wearable devices have become integral to health monitoring, professional development, and interactive learning environments.

Wearable devices have significantly evolved, bridging physical activities with digital systems. Smartwatches, AR glasses, and sensor-based wearables have been widely adopted in

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

healthcare, industry, and safety monitoring. Studies show that such devices can track user behavior,[11] environment conditions, and biometric data in real time, facilitating proactive decision-making and remote operations. Integration with gesture recognition and voice command functions enables natural user interaction, which is essential in design workflows that require responsiveness and precision

In industrial environments, wearable devices improve worker safety and operational efficiency. Sensors embedded in wearables can track fatigue levels, environmental humidity, and abnormal movements, minimizing risks associated with workplace hazards. In healthcare, wearable technology has facilitated remote patient monitoring, allowing healthcare professionals to continuously track heart rate, respiratory function, and other critical health metrics. These capabilities contribute to early diagnosis, proactive treatment, and enhanced patient care, ensuring improved health outcomes and efficiency in medical practices. The future of wearable technology extends beyond monitoring and tracking functions. It is expected to play a crucial role in enhanced user experiences, such as augmented reality (AR) and gesture-based control systems. Smart glasses integrated with AR functionalities will provide real-time digital overlays, improving interaction with virtual environments. Gesture and voice-controlled wearables will enable users to operate devices and execute commands seamlessly, making technology more accessible and intuitive. As IoT connectivity becomes more pervasive, wearable devices will further enhance data-driven automation, creating personalized, efficient, and interactive digital experiences.

Wearable devices, which enable users to collect data, execute commands, and display information efficiently, are becoming essential in automated graphic design systems. These devices include smart glasses, smartwatches, and motion-tracking tools, which allow designers to interact with software and hardware dynamically. For instance, gesture-based commands can reduce design modification time, while environmental data collection can be used to generate adaptive graphic elements that respond to real-world conditions. The integration of wearable devices with IoT in automated graphic design represents a technological breakthrough in improving efficiency, speed, and accuracy in the design process. This advancement not only enables designers to create effortlessly but also enhances industrial production flexibility, allowing for rapid adaptation to new demands. Moreover, the adoption of wearable-assisted design automation creates new opportunities for various industries, enabling the application of advanced design technologies at a highly sophisticated level.

This transformation underscores the importance of wearable devices in enhancing creativity, optimizing design workflows, and fostering a more interactive and immersive digital design experience. As technology continues to evolve, the fusion of wearable devices, IoT, and artificial intelligence will pave the way for a new era in automated, intelligent, and adaptive graphic design systems. The integration of wearable devices and IoT in automated graphic design has the potential to reach advanced levels through the implementation of cutting-edge techniques, enhancing efficiency, precision, and interactivity. Several key technologies play a crucial role in this transformation 1) Gesture Recognition High-resolution motion sensors enable users to manipulate graphic designs through hand, arm, or head movements, eliminating the need for traditional input devices such as a mouse or keyboard. This enhances workflow continuity and provides a more immersive design experience, particularly in real-time interactive design environments. 2) AI and Machine Learning for Automated Design Adaptation The integration of machine learning with IoT allows wearable devices to learn user preferences, behaviors, and design styles. This capability enables the system to automatically generate or suggest design modifications tailored to individual users, thereby enhancing personalization and responsiveness in graphic design automation. 3) Eye Tracking for Precision Control – Smart glasses equipped with eye-tracking technology allow users to precisely select and modify graphic elements simply by gazing at them. This feature eliminates the need for physical touch, making design adjustments more intuitive, precise, and efficient, particularly in environments where hands-free operation is essential[12]. 4) Real-Time 3 D Modeling – Environmental and motion sensors embedded in wearable devices capture spatial and movement data, allowing users to design and manipulate 3 D models in real-time. This capability is particularly beneficial for applications requiring high accuracy and dynamic adjustments in real-world contexts, such as product visualization and architectural modeling. 5) Cloud-Based Processing and Data Storage – Cloud integration enables real-time data processing and remote access to design files. Wearable devices connected to IoT streamline collaboration in design teams by facilitating simultaneous file sharing and real-time co-editing, increasing overall efficiency and enabling designers to work from anywhere. 6)

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Augmented Reality (AR) Integration – The fusion of AR technology with wearable devices allows users to visualize and edit designs within real-world environments. This approach provides designers with a context-aware perspective, improving the accuracy of packaging, product design, and spatial composition, ensuring that the final output aligns seamlessly with physical surroundings. 7) User Interaction Data Logging and Analytical Insights – IoT-enabled wearable devices can record user interactions and behavioral patterns during the design process. This data can be analyzed to refine future design models and enhance automation capabilities, allowing the system to adapt to user needs dynamically and improve efficiency over time. 8) Voice Command Integration – AI-driven speech recognition technology enables users to control design parameters through voice commands, allowing for hands-free size adjustments, color selection, and layout modifications[13]. By incorporating these advanced techniques, wearable devices and IoT in graphic design automation create a more efficient, intuitive, and responsive creative process. These technologies enhance precision, reduce workflow complexity, and provide users with greater creative flexibility, allowing for seamless adaptation to diverse and dynamic design challenges. which the researcher synthesized as shown in the table.

Table 1: Composite table of Wearable devices in graphic design automation.

WEARABLE DEVICES IN GRAPHIC DESIGN AUTOMATION	Dai & Zhou, (2023) [14]	Canina, 2022) [15]	Romero-Perales et al., (2023) [16]	Schaar & Zeagler, 2021) [17]	Wenjie, Dai., Hongtao, Zhou. (2023) [18]	Raja, Schaar., Clint, Zeagler. (2021) [19]	Elena, Romero-Perales., Clara, Sainz, de, et al., (2023) [27]	Xinyi, Lu., Marcus, J., O' Reilly. (2024) [21]
Gesture Recognition	✓	✓	✓	✓		✓	✓	✓
AI	✓	✓	✓	✓	✓	✓	✓	✓
Eye Tracking	✓		✓	✓	✓			✓
Real-time 3D modeling		✓	✓	✓	✓		✓	✓
Cloud	✓	✓	✓	✓	✓	✓	✓	✓
Augmented Reality	✓	✓	✓	✓		✓	✓	
Usage logs and in-depth analysis	✓	✓	✓	✓	✓	✓	✓	✓
Voice Command Integration	✓	✓			✓		✓	✓

2.2 Artificial Intelligence Internet of Thing

Artificial Intelligence Internet of Things (AIoT)combines AI technology with IoT technology in healthcare. Improving the processing of patient data through wearable medical devices, this combination improves efficiency. [22] It is also a great way to improve the quality of life in the world, personalization, and healthcare standards while addressing challenges such as data security and future research opportunities. The integration of artificial intelligence (AI) and the Internet of Things (IoT) in wearable devices has opened up new opportunities to create and improve the automated graphic design process. Wearable devices with sensors and data processing capabilities can collect data from movement. When connected to an AIoT system,[23] this data is sent to the AI system to analyze and create graphic designs that respond to user movements or needs in real-time. [24] The application of this technology can be seen in projects such as Google's Project Jacquard [25] , which combines sensors with fabric to create interfaces that respond to user touch and gestures, by designing an efficient AIoT architecture to support fast and accurate data processing in wearable devices. Integrating AIoT with wearables in automated graphic design not only increases productivity, but also opens up new opportunities to create designs that respond effectively to users.[26] Collaboration between AIoT (Artificial Intelligence of Things) Wearable Devices in Graphic Design Automation have the following important steps: 1) Data collection by wearable devices such as smartwatches, smart glasses, or sensors in clothing. Data from these sensors, such as movement, posture, 2) Data Processing by relying on edge computing. [27] Complex data is sent to a cloud server for in-depth processing, such as pattern recognition or AI-based image processing. 5) Feedback Loop: AIoT sends the designed graphics back to the wearable device[28], such as displaying images on smart glasses screens or vibrating to alert the user. The integrated collaboration between AIoT and Wearable Devices in Graphic Design Automation enables systems to intelligently and accurately create graphics that align with user needs and behaviors[29].

2.3 Graphic Design Automation

The automation of graphic design is transforming the creative landscape by incorporating artificial intelligence. [30] Incorporating AI and machine learning (ML) into the design process not only improves productivity. It provides wider access to the latest design tools, such as hierarchical layout generation (HLG) and automated layout algorithms. It demonstrates the potential of AI to generate complex graphic elements from disorganized design elements[31]. This reduces manual workload for designers. Key innovations in automated graphic design Based on the principle of hierarchical layout (HLG), this method allows graphic elements to be created without a predefined order, increasing creative flexibility. Automated Layout Algorithm These algorithms improve the accuracy of graphical language recognition, facilitate better design of visual communications. [32] Because automation is repetitive tasks, designers are encouraged to develop soft skills such as negotiation and facilitation. [33] Instead of focusing solely on technical ability. The future of design education. The integration of AI necessitates the re-evaluation of design curricula to prepare students for automated landscapes. While automation has significant advantages, it raises concerns about the diminished role of human creativity in design, balancing the use of technology and maintaining artistic integrity.[34] Graphic design automation has progressed through the use of AI-based layout tools, generative design algorithms, [35] and image processing engines. Tools such as hierarchical layout generators (HLG) and rule-based visual composition engines help reduce the manual workload of designers. However, these tools still rely heavily on screen-based interaction using mouse, keyboard, or stylus input, which limits flexibility and contextual adaptability. Although AI-assisted tools exist within design software, their integration with real-world user input from wearable sensors remains underexplored [36].

2.4 Identified Research Gap

While existing studies address wearable device capabilities and AIoT integration, they seldom extend into the creative and dynamic field of graphic design. Most wearable-based systems focus on static data acquisition or safety applications rather than real-time interactive control of creative tools. Additionally, current graphic design automation research lacks mechanisms for user-driven design adaptation based on physical gestures, biometric states, or real-time context sensing. Therefore, there is a clear research gap in developing a system architecture that integrates wearable devices with AIoT technologies to enable real-time, context-aware automation in graphic design workflows. This gap includes both technical challenges (e.g., data processing at the edge, gesture-to-command mapping) and user experience challenges (e.g., feedback loops, system responsiveness, interface adaptation). Unlike earlier studies that mainly addressed wearable devices for static monitoring (e.g., healthcare, safety) or AI-assisted automation in traditional design software, this study introduces an integrated AIoT-driven wearable architecture specifically for real-time, context-aware graphic design automation. The novelty lies in combining multimodal wearable inputs (gesture, biometric, motion) with AI/ML processing and seamless integration into professional design software. This extends prior research by shifting from passive data acquisition toward active, user-centered design automation.

3. RESEARCH AND DISCUSSION

This study follows a design-science research (DSR) approach aimed at (1) designing and implementing an AIoT-driven wearable architecture for graphic design automation, and (2) empirically evaluating its suitability and performance. The research comprised two complementary phases: artifact development and empirical evaluation.

3.1 System development

The system architecture was designed based on prior literature and requirements analysis. It consists of four layers: the Input Layer, Data Processing Layer (edge and cloud computing), Integration Layer (RESTful APIs and WebSocket), and Application Layer. Wearable devices provide multimodal inputs (motion, biometric, and gesture data), which are processed using AI/ML techniques such as gesture recognition and natural language processing. Processed commands are integrated with graphic design software (e.g., Adobe Photoshop, Illustrator) to automate design tasks. The system also includes haptic feedback and data encryption mechanisms to ensure usability and security.

3.2 Study design

An expert evaluation study was conducted to examine the suitability of the proposed system. Experts were selected through purposive sampling, including professionals and academics in wearable technology, artificial intelligence, IoT, HCI, and graphic design. A total of N = 15 experts participated in the evaluation. Each expert received a demonstration of the system, supporting documentation, and access to the prototype interface before completing the evaluation form.

3.3 Evaluation instrument

The instrument was structured around system attributes, covering dimensions such as architectural completeness, system flexibility, computational performance, AI-driven automation, data security, user-centric design, and real-time integration. Responses were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The instrument also included open-ended questions to capture qualitative feedback and improvement suggestions.

The results in Table 1 showed mean scores ranging from 4.43 to 4.83 (SD = 0.21–0.68) with an overall mean of 4.72 (SD = 0.39), indicating a Very Good level of agreement. Similarly, Table 2 reported mean scores between 4.31 and 4.83 (SD = 0.21–0.68) with an overall mean of 4.60 (SD = 0.36), also classified as Very Good

3.4 Data analysis

Quantitative data were analyzed using descriptive statistics (mean and standard deviation). Internal consistency of the instrument should be assessed using Cronbach's alpha (α = 0.87) to ensure reliability. For interpretation, mean values were classified using predefined thresholds (e.g., 4.21–5.00 = Very Good, 3.41–4.20 = Good, etc.). Qualitative data from open-ended responses were analyzed thematically to support and triangulate the quantitative findings.

3.5 Ethical considerations

All expert participants provided informed consent. Data were anonymized and securely stored to ensure confidentiality.

3.6 Limitations

The evaluation relied on expert judgment, which provides valuable insights into system architecture and usability but does not fully capture end-user interaction in real-world contexts. Future studies should include usability testing with designers and quantitative performance metrics (e.g., task completion time, error rate, SUS scores) to strengthen empirical validation.

The study employed a design science research (DSR) framework, which is consistent with prior studies on wearable system evaluation and intelligent architecture validation (e.g., Wenjie & Zhou, 2023; Romero-Perales et al., 2023). Similar to these works, this study followed two phases: artifact development and expert-based evaluation. However, the present research extends earlier designs by integrating AIoT-driven real-time processing with graphic design automation, which has not been systematically investigated in previous literature.

Based on the study of internet of things, the Wearable Devices in Graphic Design Automation, the author summarizes and presents examples of articles and research on interesting educational developments towards smart campus management. The architecture system is as follows.

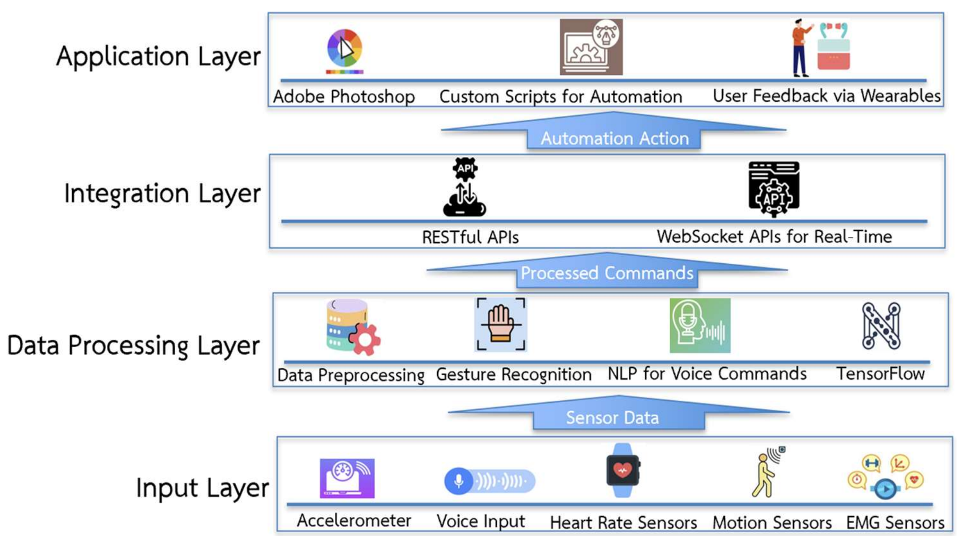


Figure 1: System Architecture for Wearable Devices in Graphic Design Automation

The system architecture for Wearable Devices in Graphic Design Automation consists of four main layers that work together in a systematic manner: the Input Layer, the Data Processing Layer, the Integration Layer, and the Application Layer to support the graphic design process using wearable devices [37]. All data is transmitted through the communication module (Bluetooth, Wi-Fi) to the Data Processing Layer which is responsible for basic data processing (Edge Computing) and advanced

Journal of Theoretical and Applied Information Technology
15th November 2025. Vol.103. No.21

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

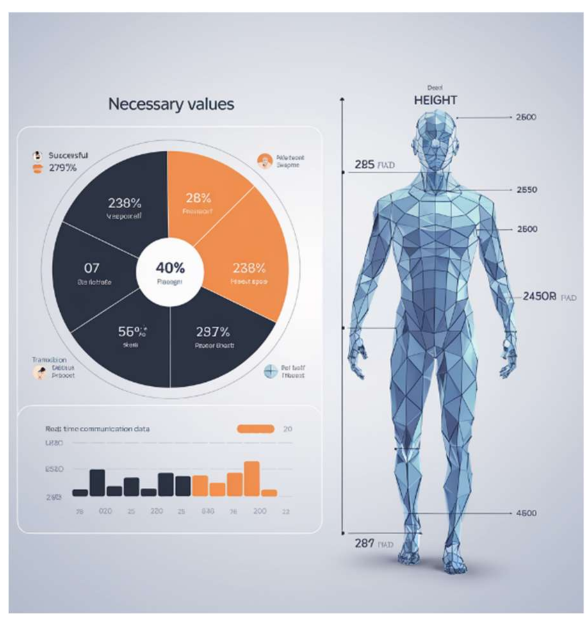
data processing (Cloud Computing) and convert the data into the right format. Cloud computing uses machine learning (ML) technology and artificial intelligence (AI) models such as Gesture Recognition and Natural Language Processing (NLP) for voice commands [38]. Once the data has been processed, it is sent to the Integration Layer, which acts as an intermediary to transfer the data to graphic design software using RESTful APIs and [39] WebSocket APIs to enable real-time communication. Sending data from the Integration Layer to the Application Layer is a defined command, such as adding a new layer to the design software. Changing colors, adding effects, or drawing objects that correspond to commands given by the user's gestures or speech. In the application layer, graphic design software works with SDKs or automation tools such as Custom Scripts to perform actions related to graphic design [40]. The system also provides a function of displaying back to the user through the wearable, such as vibration (Haptic Feedback) to confirm the receipt of the command. It also provides user data and in-depth analysis using ML models to increase the accuracy of automated orders and improve future designs [41]. All of these systems require data security by encrypting the transmission of data between the device and the server[42]. To prevent unauthorized access. This architecture promotes collaboration between users and AI/ML technologies to make graphic design performance easier and faster. It is highly flexible to support development and integration with various design software [43].

The results of the designed architecture are used by experts and experts to evaluate the architecture before designing the system and screens used for display as well as communicating with users

Table 2: System Performance Evaluation Results.

Assessment List	Evaluation Results		
	(χ)	S.D	Results
1. Analysis and Requirements			
1.1 Architectural Coverage and System Completeness	4.78	0.31	Very good
1.2 Compliance with Wearable Device Standards	4.79	0.45	Very good
1.3 System Flexibility and Scalability	4.81	0.27	Very good
1.4 Computational Performance and Efficiency	4.75	0.36	Very good
2. System Architecture and Technological Integration			
2.1 Data Security and System Integrity	4.62	0.33	Very good
2.2 AI-driven Automation	4.43	0.57	Good
2.3 User-Centric Design	4.82	0.53	Very good
2.4 Connecting to IoT Sensors	4.79	0.29	Very good
Overall average score in all aspects	4.72	0.39	Very good

The evaluation of the Wearable Devices in Graphic Design Automation system architecture yielded an overall mean score of 4.72, classified as Very Good, with an overall standard deviation (S.D) of 0.39, indicating a high level of agreement among expert reviewers. The highest-rated aspect, User-Centric Design ($\bar{\chi}$ = 4.82, S.D = 0.53), reflects the system's strong emphasis on usability and intuitive interaction, ensuring seamless user experience. Conversely, the lowest-rated component, AI-driven Automation" ($\bar{\chi}$ = 4.43, S.D = 0.57), suggests that while the system incorporates artificial intelligence, further refinements are necessary to enhance automation capabilities. The findings underscore the system's architectural flexibility ($\bar{\chi}$ = 4.81, S.D = 0.27) and computational efficiency ($\bar{\chi}$ = 4.75, S.D = 0.36), demonstrating its potential scalability and performance. However, security aspects ($\bar{\chi}$ = 4.62, S.D = 0.33) require continuous improvement to address potential vulnerabilities in wearable device integration. These results suggest that while the proposed system is well-structured and effectively aligned with industry standards, enhancements in AI-driven functionalities, cybersecurity measures, and real-time processing efficiency would further optimize its overall efficacy [44]. Future research should focus on refining AI-driven automation techniques and expanding empirical testing to ensure robustness across diverse real-world applications.



Journal of Theoretical and Applied Information Technology
15th November 2025. Vol.103. No.21

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Figure 2: Dashboard displaying Wearable Devices in Graphic Design Automation

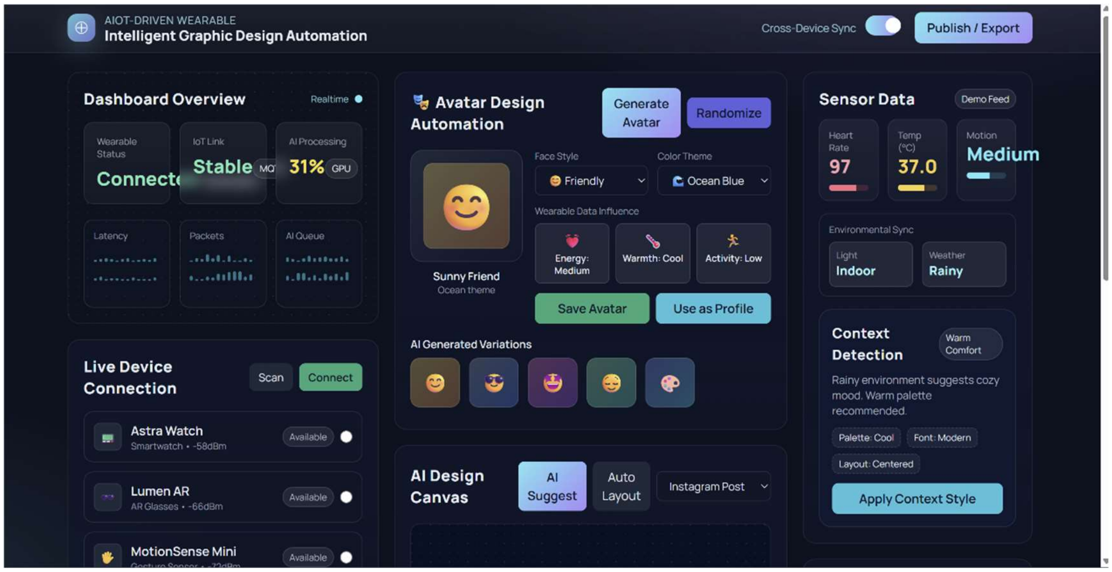


Figure 3: Screenshot of the dashboard user interface (UX/UI) in the AIoT-Driven Wearable Intelligent Graphic Design Automation system

Graphical Interface for Wearable Devices Automation for Graphic DesignThe working principle of the graphical interface for wearable devices in automation for graphic design the presented graphical interface is designed to display data from wearables in real-time and integrate with automated graphic design processes. This designed screen serves as a central platform for gathering. This may include biometric sensors, motion sensors, and AR/VR devices to help automate and streamline the design process [45]. The 3D Digital Human Model displays the user's physical values, such as height, this allows the graphic design to be tailored to the user's interaction with the system [46]. The pie chart and graph sections below also allow users to analyze statistical data and trends in biological values, which can be used to improve the design process. The system relies on IoT and AI technology to process data from wearable devices, and the system operates through a Hybrid Computing [48] Architecture that combines edge computing and cloud computing to efficiently handle data in real time. The data obtained from the wearable device's sensors is sent to the edge device for initial processing and latency reduction [49], and then the obtained data is forwarded to the cloud server for advanced analysis using artificial intelligence (AI) and machine learning algorithms

In addition, the system has the ability to connect to automated graphic design software. Graphic Design Automation Software makes it possible to modify design elements based on the information received from the wearable [50] automatically, for example, if the user's motion sensor detects a pose that requires high accuracy. The system can customize the interface to support detailed operations on the fly, or in the event of an increase in heart rate, the color of the interface may be adjusted to suit the user's conditions [51]. The application of AI and machine learning technologies allows the system to learn user behavior and improve the operation of the interface to respond more accurately. As a result, this designed interface is considered an innovation that allows graphic design to be automated, flexible, and customizable to the user in real-time, which is an important step in the application of Human-Computer Interaction (HCI) and Wearable Technology in digital design in the future.

Table 3: Suitability of wearable device systems in automated graphic design.

Assessment List	Evaluation Results		
	(χ)	S.D	Results
1. System Clarity and Completeness			
1.1 Layer Explanation	4.83	0.28	Very good
1.2 System Structural Completeness	4.79	0.32	Very good
1.3 Layer Interoperability	4.77	0.21	Very good
1.4 Wearable Device Integration	4.78	0.26	Very good
1.5 Data Accuracy	4.83	0.22	Very good
1.6 System Responsiveness	4.79	0.39	Very good

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

1.7 UI Usability	4.61	0.68	Very good
2. Architecture and Technology			
2.1 System Structure	4.62	0.43	Very good
2.2 Flexibility of Design Components	4.71	0.37	Very good
2.3 Integration with Design Software	4.41	0.33	Good
2.4 Real-time Interaction with IoT Devices	4.83	0.23	Very good
2.5 Machine Learning in Graphic Automation	4.42	0.40	Good
2.6 AI-driven Design Optimization	4.69	0.31	Very good
3. Data and Data Management			
3.1 Real-time Data Processing	4.79	0.31	Very good
3.2 Data History and Storage	4.77	0.30	Very good
3.3 Predictive and Analytical Insights	4.79	0.21	Very good
3.4 Integration with Cloud Storage	4.35	0.23	Good
3.5 AI-driven Data Interpretation	4.33	0.31	Good
3.6 Data Synchronization	4.41	0.42	Good
3.7 Use of NoSQL Databases	4.39	0.56	Good
3.8 Big Data Storage Capabilities	4.44	0.61	Good
3.9 Data Visualization Effectiveness	4.48	0.53	Good
4. Security and Data Protection			
4.1 Encryption of Design Data	4.64	0.23	Very good
4.2 Access Control and User Rights	4.69	0.32	Very good
4.3 Cybersecurity Measures	4.38	0.31	Good
4.4 Data Backup and Recovery	4.62	0.38	Very good
5. Adaptability and Scalability			
5.1 Support for New Wearable Devices	4.77	0.33	Very good
5.2 Flexibility in Adding Features	4.58	0.28	Very good
5.3 Multi-Sensor Compatibility	4.71	0.29	Very good
5.4 System Expansion for Multiple Users	4.68	0.31	Very good
5.5 Adaptive Learning for User Behavior	4.39	0.38	Good
5.6 Integration with Future AI Models	4.37	0.32	Good
6. System Maintenance and Support			
6.1 Software Updates and Patch Management	4.68	0.37	Very good
6.2 Proactive System Monitoring	4.61	0.53	Very good
6.3 Technical Support Availability	4.64	0.41	Very good
6.4 User Training and Documentation	4.64	0.37	Very good
6.5 Automated Error Detection	4.63	0.54	Very good
6.6 Performance Monitoring	4.42	0.31	Good
6.7 Cloud-based System Management	4.31	0.38	Very good
7. Cost and Value Assessment			
7.1 Development and Implementation Costs	4.43	0.38	Good
7.2 Cost of Wearable Devices	4.77	0.35	Very good
7.3 System Maintenance Costs	4.47	0.37	Good
7.4 Upgrade Costs	4.33	0.49	Good
7.5 Long-term Cost Efficiency	4.79	0.42	Very good
7.6 Improvement in Automation Efficiency	4.69	0.28	Very good
Overall average	4.60	0.36	Very good

From Table 1, The results indicate that the proposed system architecture was well-received by experts across all criteria, with particular strengths in User-Centric Design and System Flexibility. The only criterion evaluated as “Good” rather than “Very Good” was AI-driven Automation, suggesting further opportunities for improving the intelligence of automated design tasks. Based on this interpretation criterion, the expert evaluation results in Table 1, with mean scores ranging from 4.43 to 4.83, were classified as Good to Very Good, with an overall mean of 4.72 (Very Good). Similarly, Table 2 reported mean scores between 4.31 and 4.83, resulting in an overall mean of 4.60 (Very Good). These findings confirm that the proposed AIoT-driven wearable architecture is perceived as highly suitable in terms of usability, system flexibility, and integration performance.

4. DISCLUSION

This study highlights the potential of Wearable Devices in Graphic Design Automation to revolutionize the graphic design industry by integrating wearable technology with automation systems. The proposed system enables the real-time acquisition of biometric and behavioral data, enhancing precision and responsiveness in interaction with design software. The research findings indicate that the system architecture is well-structured, providing clarity and seamless interoperability among layers. Moreover, the integration of wearable devices with graphic design software facilitates user convenience and reduces technical complexities in adjusting design elements, particularly through automated customization based on sensor-derived data. This capability enhances workflow efficiency and fosters a more intuitive user experience in digital design environments.

Although the system demonstrates significant advancements, certain areas require further enhancement. One critical aspect is the implementation of artificial intelligence (AI) in analyzing and processing complex data, which would enable intelligent adaptation and automated design optimizations. Additionally, the system necessitates a robust data infrastructure to support efficient storage and retrieval mechanisms. Enhancing database technologies and cloud integration would significantly improve the management of large-scale datasets, ensuring scalability and operational efficiency. Moreover, data security and access control remain crucial considerations, as securing wearable-generated data is paramount to maintaining system reliability and user trust. Strengthening encryption protocols and implementing advanced cybersecurity measures would further enhance the system's resilience against potential security threats.

5. CONCLUSIONS

This research presents the potential of Wearable Devices in Graphic Design Automation as a transformative technology in the field of digital design by integrating wearable technology with automation systems. The proposed system enables real-time acquisition, analysis, and application of biometric and behavioral data, allowing for precise and intelligent adjustments in design workflows. The findings indicate that the system architecture effectively supports seamless integration with wearable devices, enhancing usability and reducing the technical burden on designers. Moreover, the system's capability to interact with graphic design software facilitates workflow optimization, particularly through automated design customization based on real-time sensor data. This integration signifies a shift towards AI-driven, IoT-enabled, and user-centric design automation, which improves efficiency, adaptability, and responsiveness in digital content creation.

Based on these findings, future research should focus on enhancing the system's capabilities to support more complex design applications, such as 3D interactive graphics, generative design, and AI-assisted creative workflows. Furthermore, integration with industry-standard design software—including Adobe Creative Suite, Blender, and Autodesk Maya—would broaden the system's usability and professional applicability. Additionally, a cost-effective and modular upgrade strategy should be implemented to allow for system expansion without requiring fundamental architectural changes, ensuring long-term sustainability. This study establishes a foundational framework for integrating wearable technology into graphic design automation, paving the way for future innovations in AI-driven design, human-computer interaction (HCI), and intelligent digital content creation.

REFERENCES:

[1] Monalika, M., Khan, R. A., & Fatima, S. (2022). Assistive interaction using gestures and voice commands. International Journal for Innovative Engineering and Management Research, 592–600. https://doi.org/10.48047/ijiemr/v11/i06/38

[2] Designing Adaptive Organizations. (2023). Cambridge University Press. https://doi.org/10.1017/9781108762441.

[3] Ohki, Y., & Yamaguchi, Y. (2005). 2D drawing system with seamless mode transition (pp. 206–217). Springer, Berlin, Heidelberg. https://doi.org/10.1007/11536482_18.

[4] Vogel, S. L. (2024). Design-process automation using functional process blocks. 581–600. https://doi.org/10.1515/9783111341996-036.

[5] Pexyean, T., Saraubon, K., & Nilsook, P. (2022, August). IoT, AI and Digital Twin For Smart Campus. In 2022 Research, Invention, and Innovation Congress: Innovative Electricals and Electronics (RI2C) (pp. 160-164). IEEE..

[6] Pexyean, T., Saraubon, K., & Nilsook, P. (2023, August). IoT, 6G and Digital Twin For Smart Campus. In 2023 Research, Invention, and Innovation Congress: Innovative Electricals and Electronics (RI2C) (pp. 46-50). IEEE.

[7] Southornwiboon, P., Sriprasertpap, K., & Nilsook, P. (2025). Simulation game-based learning for cognitive apprenticeship development: a focus on processing speed. Cogent Education, 12(1), 2449280.

[8] PEXYEAN, T., SARAUBON, K., & NILSOOK, P. (2024). DIGITAL TWIN ENERGY MANAGEMENT SYSTEM WITH ARTIFICIAL INTELLIGENCE INTERNET OF THING TO SMART CAMPUS. Journal of Theoretical and Applied Information Technology, 102(17).

[9] Modh, N. N., & Modi, P. S. (2024). The Impact of Wearable Technology on Health Monitoring: A Data-Driven Analysis with Real-World Case Studies and Innovations. Journal of Sustainable Solutions.,1(4),131–137. https://doi.org/ 10.36676/j.sust.sol.v1.i4.44.

[10] K. Kuribayashi, Y. Miyake, K. Rikitake, K. Tanaka and Y. Shinoda, "Dynamic IoT Applications and Isomorphic IoT Systems Using WebAssembly,", *2023 IEEE 9th World Forum on Internet of Things (WF-IoT)*, Aveiro, Portugal, 2023, pp. 1-8.

[11] Gracia, B., Ponsam, G., A, P., & Tr, D. (2024). Integrating Real-Time Health Data with Emergency Services for Improved Outcomes. 1–6.https://doi.org/10.1109/icpects62210.2024.10780142.

[12] Wearables to Improve Efficiency, Productivity, and Safety of Operations (pp. 75–90). (2022). CRC Press eBooks. https://doi.org/10.1201/9781003186670-9.

[13] Chowdhury, S., Rahman, M. M., Dristy, A. R., Yeara, R. S., Uddin, M. F., Hasan, M., & Uddin, M. R. (2024). An IoT-Based Wearable Healthcare Monitoring Device and Medical Emergency Response System. 10, 1–6. https://doi.org/10.1109/sces61914.2024.10652507.

[14] Wenjie, Dai., Hongtao, Zhou. (2023). 2. Wearable Design Innovations Enabled by Artificial Intelligence: A Technical Review. doi: 10.1145/3614008.3614056.

[15] Maria, Rita, Canina. (2022). 3. Wearable Devices: A Design Approach Through Biodesign and Ergonomics. AHFE international, doi: 10.54941/ahfe1001242.

[16] Elena, Romero-Perales., Clara, Sainz, de, Baranda, Andújar., Celia, Lopez-Ongil. (2023). 4. Electronic Design for Wearables Devices Addressed from a Gender Perspective: Cross-Influences and a Methodological Proposal. Sensors, doi: 10.3390/s23125483.

[17] Raja, Schaar., Clint, Zeagler. (2021). 5. Predicting Inclusive Futures: Wearables, Automation, and Design Speculation. doi: 10.1007/978-3-030-80829-7_20.

[18] Imdahl, C., Hoberg, K., & Schmidt, W. (2021). Targeted Automation of Order Decisions Using Machine Learning. Social Science Research Network. https://doi.org/10.2139/SSRN.382213.

[19] Raja, Schaar., Clint, Zeagler. (2021). 5. Predicting Inclusive Futures: Wearables, Automation, and Design Speculation. doi: 10.1007/978-3-030-80829-7_20

[21] Elena, Romero-Perales., Clara, Sainz, de, Baranda, Andújar., Celia, Lopez-Ongil. (2023). 4. Electronic Design for Wearables Devices Addressed from a Gender Perspective: Cross-Influences and a Methodological Proposal. Sensors, doi: 10.3390/s23125483.

[21] Xinyi, Lu., Marcus, J., O'Reilly. (2024). 1. Applying User-Centered Design Principles to the Development of Wearable Technology in Fashion Design. Studies in art and architecture, doi: 10.56397/saa.2024.06.03.

[22] Wasswa, Shafik. (2024). 2. Artificial Intelligence-Enabled Internet of Medical Things (AIoMT) in Modern Healthcare Practices. Advances in medical technologies and clinical practice book series, doi: 10.4018/979-8-3693-2703-6.ch003

[23] Gyasi, Emmanuel, Kwabena., Mageshbabu, Ramamurthy., Akila, Wijethunga., P., Swarnalatha. (2021). 3. Wearable Technology as a Source of Data-Generation Tool for Artificial Intelligence. doi: 10.4018/978-1-7998-3335-2.CH002.

[24] Yuanji, Zhu. (2024). 2. The Interaction of Big Data and AI Intelligent Technology in Visual Design Systems. doi: 10.1109/icdcot61034.2024.10516055

[25] Wenjie, Dai., Hongtao, Zhou. (2023). 4. Wearable Design Innovations Enabled by Artificial Intelligence: A Technical Review. doi: 10.1145/3614008.3614056

[26] David, Díaz-Jiménez., Javier, Medina-Quero., Macarena, Espinilla. (2023). 5. Unifying Wearable Data: A Novel Architecture Integrating Fitbit Wristbands and Smartphones for Enhanced Data Availability and Linguistic Summaries. doi: 10.1007/978-3-031-48590-9_13.

[27] Xia, Zhou. (2021). 8. Research on Wearable Intelligent Product Design Based on Internet of Things Technology. doi: 10.1007/978-3-030-70042-3_100.

[28] Menachem, Domb. (2019). 10. Wearable Devices and their Implementation in Various Domains. doi: 10.5772/INTECHOPEN.86066.

[29] Heo, Seunghyuck., Ha, Dayun. (2020). 9. Wearable electronic device for visual objects adaptively changing according to workout level, method therefor, and computer-readable medium.

[30] Yutao, Cheng., Zhao, Zhang., Maoke, Yang., Hui, Nie., Chunyuan, Li., Xinglong, Wu., Jie, Shao. (2024). 1. Graphic Design with Large Multimodal Model. arXiv.org, doi: 10.48550/arxiv.2404.14368.

[31] Weiyi, Meng. (2023). 3. Research on Teaching of Visual Communication Design Based on Automatic Layout Algorithm of Graphic Language. doi: 10.1109/icdiime59043.2023.00047.

[32] Farrokhi, Alireza, et al, "Application of Internet of Things and artificial intelligence for smart fitness: A survey", *Computer Networks,* Vol. 189 2021, pp. 107859.

[33] Shi, Qiongfeng, et al, "Progress in wearable electronics/photonics—Moving toward the era of artificial intelligence and internet of things", *InfoMat,* Vol. 2, No. 6, 2020, pp. 1131-1162.

[34] T. Pexyean, K. Saraubon and P. Nilsook, "IoT, AI and Digital Twin For Smart Campus," *2022* Research, *Invention, and Innovation Congress: Innovative Electricals and Electronics (RI2C),* Bangkok, Thailand, 2022, pp. 160-164.

[35] Esam, Ibrahim, Mohammed, Al-Kubisy. (2024). 4. Artificial intelligence in automation and graphic design. doi: 10.35560/jcofarts1446

[36] T. Pexyean, K. Saraubon and P. Nilsook, "IoT 6G and Digital Twin For Smart Campus," 2023 Research, Invention, and Innovation Congress: Innovative Electricals and Electronics (RI2C), Bangkok, Thailand, 2023, pp. 46-50.

[37] Renyu, Liu., Hongjun, Zhou., Zedong, Nie. (2024). 1. Wearable device Bluetooth data processing platform based on MATLAB App Designer. doi: 10.1117/12.3038168.

[38] Xinyi, Lu., Marcus, J., O'Reilly. (2024). 2. Applying User-Centered Design Principles to the Development of Wearable Technology in Fashion Design. Studies in art and architecture, doi: 10.56397/saa.2024.06.03.

[39] Song, Junsup, et al, "Process Algebraic Approach for Probabilistic Verification of Safety and Security Requirements of Smart IoT (Internet of Things) Systems in Digital Twin", *Sensors,* Vol. 24, No. 3, 2024, pp. 767.

[40] S. Phuengrod, P. Wannapiroon and P. Nilsook, "Intelligent Collaborative Supply Chain Management (iCSCM)", *IEEE International Conference on Cybernetics and Innovations (ICCI)*, Chonburi, Thailand, 2024, pp. 1-6.

[41] Imdahl, C., Hoberg, K., & Schmidt, W. (2021). Targeted Automation of Order Decisions Using Machine Learning. Social Science Research Network. https://doi.org/10.2139/SSRN.3822131.

[42] Zhao, Y., Zhuang, G., Ji, C., Li, Y., Zou, Z., & Li, H. (2020). Data transmission method, electronic device, server and storage medium.

[43] Kim, S. C., & Ryu, J. M. (2020). Data securing method server thereof and apparatus thereof.

[44] Pandy, G., Pugazhenthi, V. J., Murugan, A., & Jeyarajan, B. (2025). AI-Powered Robotics and Automation: Innovations, Challenges, and Pathways to the Future. European Journal of Computer Science and Information Technology, 13(1), pp. 33-44. https://doi.org/10.37745/ejcsit.2013/vol13n13344.

[45] Babadoğan, B. (2024). Exploring the Role of AI in Automating Content Marketing: Unlocking Opportunities and Navigating Challenges. 8(1), 67. https://doi.org/10.62802/gkj6f352.

[46] Kurnia, S., & Nawaningtyas, N. (2024). Analisis Interaksi Pengguna dalam Desain User Interface dan User Experience yang Lebih Baik Menggunakan Metode Heuristik. Jurnal Teknik Mesin, Industri, Elektro Dan Informatika, 3(4), 113–119. https://doi.org/10.55606/jtmei.v3i4.4433

[47] Li, Na, et al., "Design and Optimization of Smart Campus Framework Based on Artificial Intelligence", *Journal of Information Systems Engineering and Management,* Vol. 8, No. 3, 2023, pp. 23086.

[48] King, J., Bernoudy, W., Boothby, K. T. R., & Pérez, P. (2020). Systems and methods for hybrid algorithms using cluster contraction. https://patents.google.com/patent/US20200234172A1/en.

[49] Li, H., & Chen, Y. (2022). Hybrid Logic Computing of Binary and Stochastic. IEEE Embedded Systems Letters, 14, 171–174. https://doi.org/10.1109/LES.2022.3170457

[50] Heo, J. (2019). Wearable device and method for providing information in a wearable device.

[51] Weingerl, P. (2024). Automated Image-Based User Interface Color Theme Generation. Applied Sciences. https://doi.org/10.3390/app14072850.