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(IJIREV)**www.gaexcellence.com/ijirev**ARSSO: USER ACCEPTANCE OF AN AI-POWERED
AUGMENTED REALITY SMART SPATIAL
ORGANIZATION ASSISTANT FOR WORKSPACE
ORGANIZATION**Subashini Annamalai^{1*}, Tan Jun Wei²¹School of Multimedia Technology and Communication, Universiti Utara Malaysia, Sintok, Kedah, Malaysia subashini@uum.edu.my <https://orcid.org/0000-0003-3065-3099>²School of Multimedia Technology and Communication, Universiti Utara Malaysia, Sintok, Kedah, Malaysia tan_jun_wei3@smmtc.uum.edu.my <https://orcid.org/0009-0002-2978-5158>

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Abstract:

This study presents the design, development, and user acceptance evaluation of ARSSO, an AI-powered Augmented Reality Smart Spatial Organization Assistant developed to help users maintain organized environments that support productivity, concentration, and overall well-being. Many existing organization tools provide generic recommendations that do not account for individual preferences or environmental conditions. To address this gap, ARSSO integrates Artificial Intelligence and Augmented Reality technologies to support spatial organization through AR scanning, chatbot assistance, personalized recommendations, and task management features. Prior to user testing, the prototype was reviewed by one content expert and two User Interface (UI design experts on usability, interface design, and interaction quality, and their feedback informed refinements before evaluation. User acceptance was then assessed through a mixed-method approach: 31 participants completed a questionnaire adapted from the USE Questionnaire, which measures general usability and satisfaction, and the BUS-15 scale, which targets chatbot-specific interaction quality, while 10 participants took part in a focus group discussion. The evaluation covered Perceived Usefulness, Perceived Ease of Use, User Satisfaction, and AI and AR Interaction Experience. Findings showed high user acceptance across all constructs, with Perceived Ease of Use recording the highest mean score ($M = 4.36$, $SD = 0.76$, 86.4% agreement), followed by AI and AR Interaction Experience ($M = 4.12$) and User Satisfaction ($M = 4.08$). Participants responded particularly positively to the AR scanning feature, personalized recommendations, and chatbot assistance. Unlike existing organization tools that offer static, generic guidance, ARSSO demonstrates the potential of

combining AI-driven personalization, conversational chatbot support, and AR-based spatial visualization to deliver a more adaptive, context-aware approach to workspace organization, one that supports not just tidiness but the productivity and well-being it was designed to serve.

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Keywords:

Artificial Intelligence, Augmented Reality, Mobile Application, Spatial Organization, User Acceptance, Workspace



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Introduction

In modern lifestyles, advancements in digital technologies have significantly transformed the way people pursue comfortable, clean, technologically supported, and spacious living environments, including students, families, home offices, studios, schools, and other institutions (Coelho et al., 2022). Among these emerging technologies, Artificial Intelligence (AI) and Augmented Reality (AR) have gained considerable attention due to their ability to provide intelligent, interactive, and personalized user experiences (Jordan & Mitchell, 2015; Azuma, 1997). These technologies have become increasingly adopted across various domains such as education, healthcare, retail, productivity enhancement, and home management. This growing adoption inspired the idea of integrating AI and AR technologies to enable users to interact with digital information within real-world environments while receiving intelligent assistance that fulfils their specific needs. Such integration can also improve user experiences and, in turn, enhance lifestyle and productivity. Together, these developments show that AI and AR technologies offer new opportunities to improve users' lifestyles, efficiency, decision-making, and overall experience in everyday tasks (Nepal et al., 2025).

Maintaining an organized workspace has become an important factor in supporting productivity, focus, and well-being. Research has indicated that individuals generally prefer organized environments over cluttered areas because organization contributes to greater comfort and efficiency during work or study activities (Annes et al., 2023). In contrast, unorganized areas such as cluttered desks, rooms, or study spaces may negatively affect visual attention and reduce concentration, productivity, and motivation, leading to difficulties in maintaining focus on task-related activities (Manzi et al., 2019). These findings highlight the importance of workspace organization in supporting effective learning and working environments and point to the need for organization tools that assist people in organizing and maintaining their own workspaces. However, despite the availability of various organization

methods such as productivity tools and storage solutions, most existing approaches remain static and generalized. Traditional organization tools often provide generic recommendations without considering individual preferences and conditions (Nepal et al., 2025).

Consequently, users need appropriate solutions that address their unique situations effectively. Recent research by Nepal et al. (2025) has highlighted the importance of personalized AI-driven systems, including AI assistants, for their potential to improve user engagement, productivity, and decision-making through personalized recommendations and interactive guidance. At the same time, AR technology enables digital information and virtual objects to be visualized within real-world environments, allowing users to enjoy a more immersive interaction experience (Azuma, 1997). Previous studies have also demonstrated the effectiveness of AR technology in room design and furniture arrangement applications, where users can interact with and visualize objects within their actual environments before making decisions (Reuksupasompon et al., 2018; Yu et al., 2011). Similarly, the IKEA Place application has shown how AR technology can improve user confidence, engagement, and decision-making by allowing users to preview products in their own environments, creating an intuitive and interactive experience (Ozturkcan, 2021; Setiawan et al., 2025).

Building on these findings, this study introduces the AR Smart Spatial Organization Assistant (ARSSO), an AI-powered mobile application that integrates Artificial Intelligence (AI) and Augmented Reality (AR) technologies to assist users in organizing their workspaces and activity areas more effectively. The application enables users to scan their real-world environments using AR technology to identify spatial elements and objects, detect clutter levels, and receive personalized organizational recommendations generated through AI analysis. The system was developed to address the limitations of traditional organization methods by providing a more personalized and context-aware tool that fulfils users' needs. Following the development of the ARSSO application, formative and summative evaluations were conducted through expert review and user acceptance assessment. Drawing on the USE Questionnaire (Lund, 2001) and BUS-15 (Borsci et al., 2022), a mixed-method approach consisting of a questionnaire survey and a focus group discussion was conducted, focusing on user interface design, usability, usefulness, ease of use, satisfaction, AI and AR experience, and overall suggestions for improvement. The findings provide insights into the acceptance of the ARSSO application as a smart organization assistant and contribute to the growing body of research on AI- and AR-supported productivity applications.

Background of Study

Maintaining an organized workspace is important for supporting productivity, concentration, and overall well-being because an organized environment creates a more comfortable atmosphere for studying and working. Research by Annes et al. (2023) found that students generally performed better academically in organized environments, reporting greater focus and lower levels of stress when studying in tidy spaces. Similarly, Manzi et al. (2019) reported that cluttered environments may negatively influence individuals' attention, making it more difficult to concentrate on specific tasks. These findings suggest that organized environments play an important role in improving performance and concentration, and in creating positive working and learning environments.

As technology continues to evolve, users' expectations of digital solutions are increasing, with many hoping that digital technology can assist them in managing their environments more effectively. Artificial Intelligence (AI) has demonstrated significant potential in providing personalized recommendations and intelligent decision-making support informed by user preferences and contextual information. Nepal et al. (2025) showed that individuals rely more on personalized AI systems than on generalized solutions because of their potential to improve engagement and productivity by delivering suggestions tailored to individual needs. In addition, Augmented Reality (AR) is a powerful technology that enhances user interaction with digital content by visualizing virtual information within real-world environments, creating interactive experiences that combine physical and digital elements (Azuma, 1997). Previous studies have demonstrated the effectiveness of AR technology in spatial visualization and room design applications, enabling users to visualize furniture and layouts directly within their physical spaces and improve their decision-making (Reuksupasompon et al., 2018; Yu et al., 2011). Similarly, the IKEA Place application applies AR technology to allow users to preview products in their environments, improving user confidence, engagement, and decision-making (Ozturkcan, 2021; Setiawan et al., 2025).

Nevertheless, studies have found that available organization tools and productivity applications still provide generic recommendations that may not address individual user needs and environmental conditions (Nepal et al., 2025). Recent studies have also highlighted the growing demand for personalized recommendation systems capable of adapting to user preferences to provide more meaningful information and assistance (Liu et al., 2025). However, there has been limited research exploring the integration of AI and AR technologies to provide recommendations and spatial visualization, particularly for workspace organization purposes (Nepal et al., 2025).

Consequently, to address this gap, the AR Smart Spatial Organization Assistant (ARSSO) was developed as a mobile application that integrates AI and AR technologies to support workspace organization. The application enables users to scan their environments, identify cluttered areas, and receive personalized organization recommendations. By combining intelligent analysis with interactive scanning, the ARSSO application aims to provide a more practical, engaging, and user-centered approach to workspace organization. This study evaluates user acceptance of the ARSSO application using a mixed-method approach adapted from the USE Questionnaire (Lund, 2001) and BUS-15 (Borsci et al., 2022) to examine users' perceptions of usability, usefulness, ease of use, satisfaction, and AI and AR experience.

Problem Statement

Many individuals, particularly students, working adults, and designers, face challenges in maintaining efficient and organized environments. People often live and work in compact spaces where maintaining spatial order becomes increasingly difficult. Studying and working in cluttered environments can negatively affect concentration, productivity, motivation, and overall well-being. Previous studies by Manzi et al. (2019) have shown that cluttered environments may lead to cognitive overload, decreased motivation, and increased anxiety, whether individuals are engaged in academic or creative work. Additionally, previous studies have shown that disorganized spaces may increase distraction and demotivation, making it more difficult to focus on tasks, while organized spaces contribute to improved performance and comfort (Annes et al., 2023; Manzi et al., 2019).

Furthermore, many existing organization tools and productivity applications provide general recommendations that do not consider individual preferences and conditions. For example, existing organization-related applications such as IKEA Place, Houzz, Room Planner, and Tidy Up are primarily designed to support visualization and interior design planning (Reuksupasompon et al., 2018). While these applications provide visual or motivational features, some lack intelligent analysis. Most applications of this type provide visualizations or basic item placements, but lack adaptive technology capable of analysing real-time environments, understanding user demands and preferences, and generating personalized recommendations. As a result, individuals may struggle to identify suitable strategies for improving their activity areas effectively.

To address this gap, there is a need to design and develop an organization tool that integrates AI and AR technologies to provide personalized recommendations and real-time spatial assistance. Understanding user acceptance of such a tool is important for determining its effectiveness and potential for supporting workspace organization. Therefore, this study addresses this gap by developing the ARSSO application and evaluating its usefulness, ease of use, satisfaction, AI and AR interaction experience, and overall user acceptance.

ARSSO: An AI-Powered Mobile Application for Workspace Organization

The AR Smart Spatial Organization Assistant (ARSSO) was conceptualized as an AI-powered mobile application designed to assist users in improving the organization of their workspaces and activity areas through personalized suggestions. The development of the ARSSO application was motivated by research findings highlighting the importance of organized workspaces in supporting productivity, concentration, and overall well-being (Annes et al., 2023; Manzi et al., 2019). The application integrates Artificial Intelligence (AI) and Augmented Reality (AR) technologies to provide users with context-specific organizational guidance that addresses their individual requirements and workspace conditions. The design of the ARSSO application was guided by Mayer's principles of multimedia learning (Mayer, 2001), which emphasize the integration of visual and verbal information to support understanding and reduce cognitive load. The development also followed a user-centered design approach (Abrams et al., 2004) to ensure that the application's features and interface design aligned with users' expectations and preferences.

The AI recommendation system is the primary feature and central component of the ARSSO application, analysing conditions and providing personalized suggestions for users. Recent studies have reported that personalized productivity systems may improve user engagement and decision-making by providing recommendations aligned with individual contexts and situations rather than general solutions (Nepal et al., 2025). Therefore, the ARSSO application incorporates AI technologies to analyse and identify individual spatial conditions and generate personalized organizational suggestions. By analysing captured spatial images, the system assists users in identifying cluttered areas and objects, then recommends suitable organizational strategies that can help make activity areas more functional, comfortable, and aesthetically pleasing.

In addition to AI recommendations, the ARSSO application incorporates Augmented Reality (AR) technology to support workspace scanning and environment analysis. AR technology enables interaction with real-world environments through mobile devices, providing users with

an immersive experience (Azuma, 1997). Previous studies by Reuksupasompon et al. (2018) and Liu et al. (2025) demonstrated the effectiveness of AR technology in spatial applications such as interior room design, showing that it enhances user engagement and understanding of physical surroundings by improving the interaction between digital information and real-world environments. Inspired by these capabilities, the ARSSO application utilizes AR as an interactive scanning system that allows users to capture the conditions of their workspaces or activity areas and provide real-world environmental data for AI analysis. Through this process, the system can identify environmental elements and generate personalized organizational suggestions based on the user's actual environment.

The user interface of the ARSSO application was developed in a minimalist style, with consistent navigation structures, card-based content layouts, intuitive icons, structured spacing, and clear visual hierarchies to help users access application features efficiently and easily. The bottom navigation menu provides direct access to each primary module, including task management, scanning, chatbot interaction, notifications, and profile management. These design decisions were intended to provide good usability and support a seamless user experience across the different application functions. Figures 1(a) to 1(l) illustrate selected user interfaces of the ARSSO application, and Figure 2 illustrates the flowchart of the overall application flow.



Figure 1(a): Splash Screen



Figure 1(b): Intro Screen

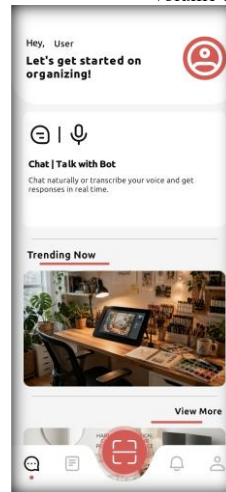


Figure 1(c): Main Screen



Figure 1(d): Trending New

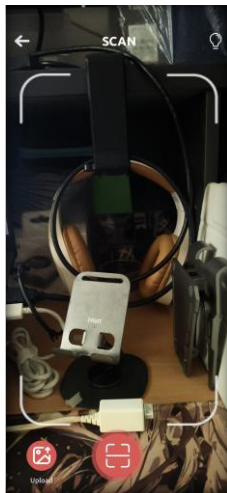


Figure 1(e): Scanning Screen



Figure 1(f): Chatbot Screen

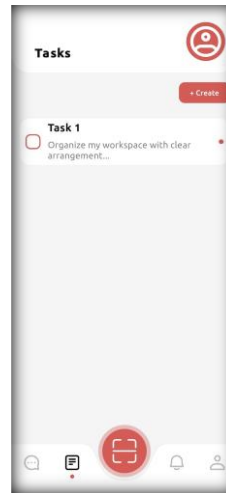


Figure 1(g): Tasks Screen

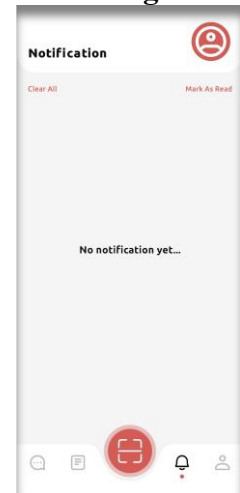


Figure 1(h): Notification Screen

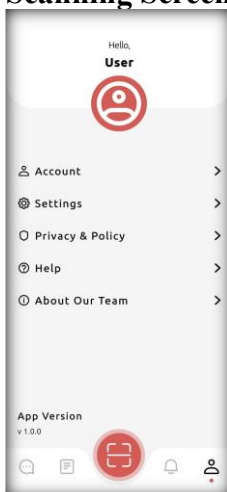


Figure 1(i): Profile Screen

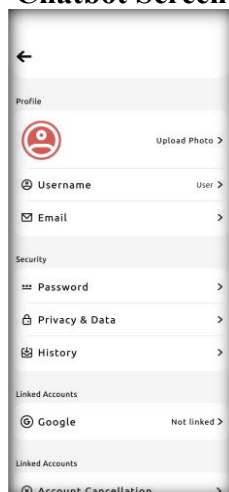


Figure 1(j): Account Settings

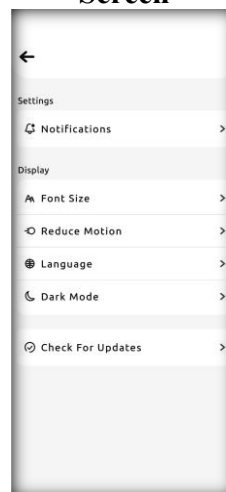


Figure 1(k): General Settings



Figure 1(l): Help Center

Figure 1: User Interfaces of the ARSSO Mobile Application

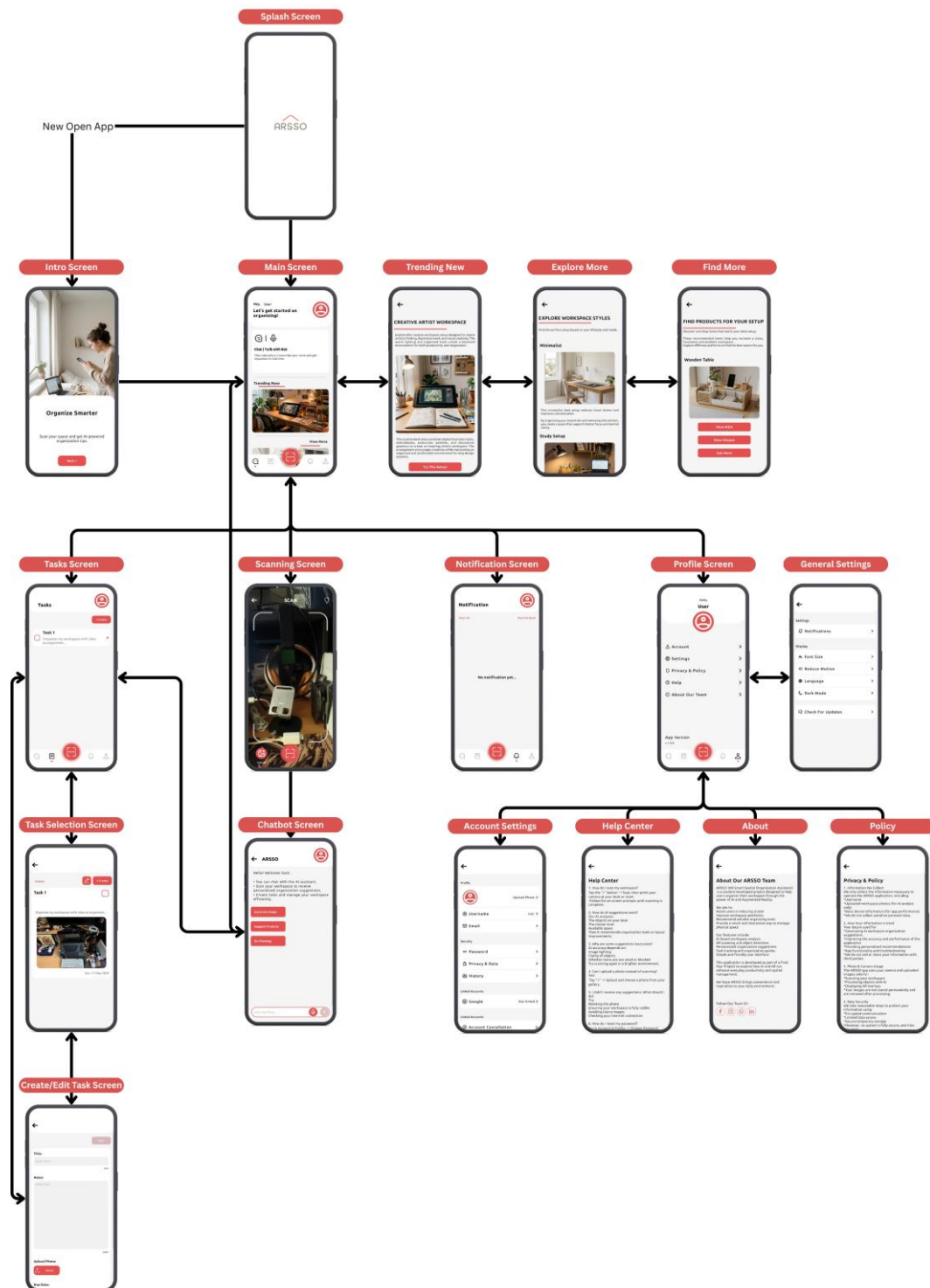


Figure 2: Flow And Structure Of The ARSSO Application

Technically, the ARSSO application was developed using the Unity Engine as the primary development platform. Firebase services were integrated to provide user authentication, cloud database management, personal data storage, and real-time synchronization. Gemini APIs were utilized to power the conversational chatbot, data analysis, recommendation features, and

image generation features, while AR Foundation and ARCore technologies were employed as Unity plugins to support the augmented reality functionalities. The interface of the ARSSO application was designed using Figma and then implemented in the Unity Engine to ensure visual design consistency. At the end of the development stage, the completed application was deployed as an Android mobile application to support accessibility and portability for everyday spatial organization activities.

Overall, the ARSSO application provides a combination of AI-powered recommendations, conversational assistance, task management, and AR scanning to support spatial organization. By combining these features, the application addresses the limitations of traditional organization tools and offers a more personalized and intelligent approach to improving users' actual environments. Furthermore, the application aims to enhance user motivation and productivity, supporting users in maintaining organized and aesthetically pleasing environments while encouraging long-term organizational habits.

Methodology

The user acceptance of the ARSSO application was examined through a summative evaluation employing a mixed-method approach to evaluate user perceptions of the application. This evaluation was conducted after the completion of the application development process to assess users' acceptance of the system and identify potential areas for future improvement. The mixed-method approach combined quantitative and qualitative data collection techniques to obtain a deep and comprehensive understanding of user perceptions and experiences with the application.

The summative evaluation involved a total of 31 participants in the quantitative questionnaire survey and 10 participants in the focus group discussion. Participants consisted primarily of university students and individuals who regularly use mobile applications and work in workspace environments for study or work-related activities. Participants were asked to download the ARSSO application and explore and interact with its main features, including workspace scanning, the AI chatbot, organization recommendations, task management, the notification system, and profile settings. Participants were then encouraged to provide feedback and suggestions regarding the usability, functionality, satisfaction, and overall experience of the application.

The quantitative evaluation was conducted using a structured questionnaire survey adapted from the USE Questionnaire developed by Lund (2001) and the Chatbot Usability Scale (BUS-15) proposed by Borsci et al. (2022). These frameworks guided the data collection in evaluating five dimensions of user acceptance: usefulness, ease of use, user satisfaction, AI and AR interaction experience, and overall user experience. A Likert scale was used to measure participants' level of agreement with each item. To complement the quantitative findings, qualitative data were collected through a focus group discussion. The discussion questions explored participants' experiences while using the application and their perceptions of the AI-generated suggestions, scanning features, chatbot interaction, navigation flow, and system usability. During the discussion session, participants were encouraged to share their opinions, suggestions, challenges, and overall impressions of the application.

Before the evaluation session, the high-fidelity ARSSO prototype, questionnaire survey, and focus group questions were prepared in advance to ensure the session could proceed smoothly. During the evaluation session, participants were first introduced to the objectives and functionality of the application before exploring and interacting with it independently. Participants were given the opportunity to interact with the full range of application features, such as AR scanning, the AI chatbot, task management, notifications, and profile management functions. After testing the application, participants completed the questionnaire survey, and those who participated in the focus group discussion shared their opinions, experiences, and suggestions regarding the application. This procedure enabled the collection of both numerical evaluation data and in-depth qualitative insights. The collected quantitative and qualitative data were analysed to identify user perceptions, satisfaction levels, usability issues, and improvement opportunities for the ARSSO application.

In addition to the summative evaluation, a formative evaluation was conducted through interview sessions with one content expert and two UI design experts, focusing on the evaluation of the high-fidelity prototype to identify usability issues, interface design weaknesses, interaction problems, and improvement opportunities. During the evaluation process, the experts were asked questions about usability, interface design, and interaction, adapted from the USE Questionnaire (Lund, 2001), BUS-15 (Borsci et al., 2022), and QUIS (Chin et al., 1988). The feedback collected from these experts was analysed and used as guidance for system refinement and interface improvement.

Findings

The summative evaluation of the ARSSO application yielded positive results across all measured dimensions: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), User Satisfaction, and AI and AR Interaction Experience. A total of 41 participants took part in the evaluation, with 31 participants completing the quantitative questionnaire survey and another 10 participating in the focus group discussion. Their responses and feedback demonstrated their acceptance of the application as a spatial organization assistant. The findings were derived from the questionnaire survey and focus group discussion, with questions adapted from the USE Questionnaire (Lund, 2001) and BUS-15 (Borsci et al., 2022). Table 1 presents the item-level descriptive statistics from the quantitative data analysis, Table 2 summarizes the descriptive statistics for each construct, and Table 3 presents the thematic summary of the focus group findings.

Table 1: Item-Level Descriptive Statistics For User Acceptance Of ARSSO

Construct	Item	Mean (M)	SD	% Agree / Strongly Agree
Perceived Usefulness (PU)	1. The application saves time during organization planning.	4.10	0.79	80.6%
	2. The organization recommendations are useful.	4.16	0.86	77.4%
	3. ARSSO improves my productivity during study or work.	3.71	0.74	54.8%

	4. ARSSO helps me organize my workspace more effectively.	3.94	0.81	71.0%
	5. The application makes organization tasks easier to accomplish.	3.77	0.96	54.8%
Perceived Ease of Use (PEOU)	1. ARSSO is easy to use.	4.45	0.77	90.3%
	2. The application interface is user-friendly.	4.52	0.63	93.5%
	3. The scanning process is easy to understand.	4.48	0.68	90.3%
	4. I can use the application successfully without confusion.	4.06	0.93	74.2%
	5. The features are easy to access.	4.29	0.74	83.9%
User Satisfaction	1. I am satisfied with ARSSO.	4.03	0.71	77.4%
	2. I enjoy using the application.	4.16	0.82	80.6%
	3. The application works as I expected.	3.94	0.85	74.2%
	4. I would recommend ARSSO to others.	4.03	0.91	74.2%
	5. The application provides a pleasant user experience.	4.23	0.76	80.6%
AI and AR Interaction Experience	1. The AI assistant provides relevant organization suggestions.	4.06	0.77	80.6%
	2. The AI assistant responses are easy to understand.	4.19	0.91	83.9%
	3. The AI assistant responds quickly to user requests.	3.90	0.98	67.7%
	4. The AR scanning helps me understand organization suggestions better.	4.10	0.75	77.4%
	5. The AI feature improves my overall user experience.	4.35	0.75	83.9%

Note: Items were rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) (N = 31).

Table 2: Summary Of Descriptive Statistics For User Acceptance Of ARSSO

Construct	Measure	Mean (M)	SD	% Agree / Strongly Agree	Description of Findings
Perceived Usefulness (PU)	Saves time, useful recommendations, improves productivity, supports workspace	3.94	0.84	67.7%	Participants generally agreed that the ARSSO application improved spatial organization

	organization, and facilitates task completion.				and productivity through its personalized recommendations and task support features.
Perceived Ease of Use (PEOU)	Ease of use, user-friendly interface, understandable scanning process, ease of navigation, and accessibility of features.	4.36	0.76	86.4%	Participants reported that the ARSSO application was easy to learn and use, with clear navigation and an intuitive interface that supported efficient interaction.
User Satisfaction	Satisfaction, enjoyment, expectation fulfilment, recommendation intention, and pleasant user experience.	4.08	0.81	77.4%	Most participants expressed positive experiences when using the ARSSO application and indicated satisfaction with its overall functionality and design.
AI and AR Interaction Experience	AI recommendation relevance, response clarity, response speed, AR scanning usefulness, and contribution to user experience.	4.12	0.84	78.7%	Participants positively evaluated the AI and AR features, particularly the AR scanning and AI-generated suggestions that enhanced the organizational experience.

Note: Items were rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) (N = 31).

Overall, the findings from the quantitative data indicated a positive level of acceptance across all evaluation constructs. Perceived Ease of Use (PEOU) recorded the highest mean score ($M = 4.36$, $SD = 0.76$), with 86.4% of participants agreeing or strongly agreeing that the application was easy to use. This finding illustrates that users found the application user-friendly, intuitive, easy to navigate, and simple to operate.

The AI and AR Interaction Experience achieved a mean score of $M = 4.12$ ($SD = 0.84$), with 78.7% of participants expressing positive perceptions of the AI-generated recommendations and AR scanning functionality, generally agreeing that these features contributed positively to their workspace experience. Perceived Usefulness also demonstrated a high level of acceptance ($M = 3.94$, $SD = 0.84$), with 67.7% of participants agreeing that the ARSSO application could help improve productivity, workspace organization, and task management. Similarly, User Satisfaction achieved a mean score of $M = 4.08$ ($SD = 0.81$), with 77.4% of participants expressing satisfaction with the overall performance and user experience of the application. These findings suggest that the ARSSO application was positively received and successfully

met its objective of supporting spatial organization through AI-assisted recommendations and interactive scanning features.

Table 3: Summary Of Focus Group Findings For User Acceptance Of ARSSO

Theme	Summary of Participant Feedback
Ease of Use and Navigation	Most participants reported that the ARSSO application was easy to use due to its simple interface, organized layout, and intuitive navigation structure. Participants also indicated that first-time users could understand the application without significant difficulty.
Usefulness of AR Scanning and AI Recommendations	Participants identified the scanning feature and AI-generated recommendations as the most useful components of the application. They appreciated that the personalized suggestions were generated based on their environmental conditions and found them relevant to their organizational needs.
Chatbot Interaction Experience	Several participants highlighted the AI chatbot as a useful feature for quickly obtaining organization advice and guidance. They also found the chatbot responses generally understandable and helpful.
Potential for Daily Use	Most participants expressed willingness to use the ARSSO application in their daily lives. They indicated that the application could assist them in maintaining organized workspaces and activity areas to improve their productivity through regular use.
Suggestions for Improvement	Participants recommended improving the AI response speed, navigation clarity, and scanning performance. They also suggested providing more AI-generated organization examples, workspace inspirations, customization options, and alternative organization recommendations.

Note: Themes were identified through thematic analysis of responses collected from 10 participants during the focus group discussion.

Overall, the focus group findings showed positive perceptions of the ARSSO application among participants, particularly regarding its ease of use, workspace scanning functionality, AI-generated recommendations, and chatbot assistance. Participants expressed interest in the AI assistant and scanning function, which could help them organize and maintain their workspaces with greater motivation and productivity, and indicated their willingness to use the application in their daily lives. Participants also suggested several areas for improvement, including AI response speed, navigation clarity, and scanning performance.

These findings show that the ARSSO application achieved a high level of user acceptance across all evaluated dimensions. The quantitative results and qualitative findings suggest that the ARSSO application has strong potential as an AI-powered workspace organization application, with the remaining room for improvement representing opportunities to develop ARSSO into an even more capable mobile application in the future. The positive responses from participants demonstrate that the integration of AI analysis and AR scanning with a

conversational chatbot assistant can effectively enhance user experience and contribute to improved spatial organization practices.

Discussion

The findings of this study indicate that the ARSSO application achieved high user acceptance across all evaluated dimensions, including Perceived Usefulness, Perceived Ease of Use, User Satisfaction, and AI and AR Interaction Experience. These findings show that participants engaged positively with the integration of Artificial Intelligence (AI) and Augmented Reality (AR) technologies, which can provide a more effective approach to supporting workspace organization activities. The positive responses demonstrate that users accepted the concept of scanning and AI assistance for producing personalized organizational recommendations through a mobile application.

Among the evaluation findings, Perceived Ease of Use recorded the highest mean score and the lowest standard deviation, indicating that the ARSSO application was easy for participants to learn, navigate, and use. This result demonstrates that the ARSSO application followed user-centered interface design, with a consistent navigation structure, clear visual hierarchy, intuitive icons, and organized content presentation. This positive usability outcome is consistent with Lund (2001), who found that systems with simple and understandable interfaces are more readily accepted by users. The focus group findings supported this result, with participants frequently highlighting that the application was simple and easy to navigate.

The findings also revealed positive perceptions of the usefulness of the ARSSO application. Participants agreed that the application could assist them in improving workspace organization, managing tasks, and increasing motivation and productivity through effective personalized recommendations. This result aligns with Nepal et al. (2025), who reported that AI-driven productivity systems can enhance user engagement and decision-making by providing recommendations that fit individual contexts. Unlike traditional organization tools that provide general guidance, the ARSSO application is able to analyse users' environments and generate organizational suggestions based on actual environmental conditions.

In addition, the AI and AR interaction experience received a high level of acceptance among participants, who appreciated the integration of AI-powered recommendations, chatbot assistance, and AR-based workspace scanning. The scanning feature was particularly useful because it allowed users to capture real-world environmental conditions and receive context-related recommendations without manually describing their environment to the AI assistant. This finding is supported by previous studies by Azuma (1997) and Reuksupasompon et al. (2018), which showed that AR technologies can enhance user engagement between digital and physical environments. The findings also showed that the chatbot provided useful organizational guidance that was well accepted by participants, consistent with Borsci et al. (2022), who found that conversational AI systems can improve user engagement and understanding.

Furthermore, the positive satisfaction scores obtained in this study indicate that the ARSSO application succeeded in meeting users' expectations. Participants generally enjoyed using the ARSSO application and focus group participants viewed it as a useful tool for maintaining an organized environment and improving daily productivity. These findings suggest that the

integration of AI-generated recommendations, chatbot assistance, task management, and AR scanning can create a comprehensive user experience that supports organizational activities.

Despite the positive findings, participants suggested several opportunities for future improvement, recommending enhancements to AI response speed, navigation clarity, scanning performance, and other refinements. These suggestions indicate that while this version of the ARSSO application achieved a satisfactory level of acceptance, future refinement could further improve its functionality, visual design, user experience, and effectiveness. The suggestions were collected for future review to guide subsequent development, which can focus on optimizing AI processing performance, expanding the recommendation database, refining the visual hierarchy and layout, enhancing the accuracy of the scanning feature, and adding features to provide greater engagement and a more complete mobile application.

Overall, the findings demonstrate that the ARSSO application has strong potential as an AI-powered spatial organization application. With a high level of acceptance from participants, the application achieved its objectives and target levels for its overall features and performance, including personalized AI recommendations, AR scanning, conversational assistance, task management, and other secondary features. These results also demonstrate that the integration of AI and AR technologies can positively support spatial organization and productivity enhancement, while providing opportunities for future innovation in smart organizational assistance systems.

Implications

The findings of this study contribute to the growing body of research on the application of Artificial Intelligence (AI) and Augmented Reality (AR) technologies for productivity enhancement and spatial organization, with both theoretical and practical implications. From a theoretical perspective, the positive user acceptance results support previous studies showing that AI-driven systems can improve user engagement and decision-making tailored to individual needs (Nepal et al., 2025). The high acceptance also indicates that AI and AR technologies are increasingly accepted by people as supports for improving productivity, motivation, and effectiveness. Similarly, the findings demonstrate the potential of integrating AR scanning with an AI assistant to create a more interactive and practical organizational support system.

From a practical perspective, the study demonstrates that the ARSSO application can serve as a useful tool for students, working professionals, and other individuals who seek to maintain organized and productive environments. The scanning and AI assistance features received positive perceptions from users, offering more intelligent and personalized support in managing their spatial conditions. Given the positive acceptance, the ARSSO application also offers users supportive enhancement in improving productivity and reducing the time spent deliberating over how to organize their workspaces and environments. Therefore, the integration of AI and AR technologies provides a promising approach for future productivity and organization-related applications.

Limitations and Future Work

Although the findings of this study demonstrated high acceptance of the ARSSO application, several limitations should be considered. First, the summative evaluation involved a small number of participants, with 31 respondents completing the questionnaire survey and 10 participants joining the focus group discussion. Although this sample size was sufficient for usability testing and user acceptance evaluation, a larger and more diverse participant group would provide broader insights into user perceptions and experiences. Second, the evaluation focused only on user acceptance and usability, without considering long-term behavioural changes or productivity outcomes. As a result, the findings reflect participants' perceptions immediately after interacting with the application rather than the actual long-term effectiveness of the ARSSO application in improving workspace organization habits. Third, the current implementation of the ARSSO application relies heavily on AI-generated recommendations and AR-assisted scanning, which may be influenced by factors such as environmental conditions, image quality, and device performance. These factors may affect the system's ability to produce consistent and accurate recommendations relevant to the environmental conditions and user needs.

Future research may focus on expanding the capabilities and evaluation scope of the ARSSO application. One potential improvement is enhancing the AI recommendation engine by incorporating more advanced machine learning techniques to generate more accurate and personalized organizational suggestions. Additional improvements could include customization options that allow the recommendations to better reflect user preferences, spatial types, and organizational goals. Future development may also improve the AR-assisted scanning feature by increasing object recognition accuracy and supporting a wider range of environments. Enhancements to the chatbot should include faster response generation and analysis, richer conversational capabilities, and more context-aware interactions to improve overall usability and user experience. Future researchers may also explore more suitable development tools to build an even more stable and powerful application. In addition, future studies should involve a larger and more diverse population to obtain more impactful and generalizable findings, and evaluations should examine the long-term impact of the ARSSO application on workspace organization behaviour, productivity, and user engagement, providing a deeper understanding of the effectiveness and sustainability of AI- and AR-supported organization assistance systems.

Conclusion

This study presented the development and evaluation of the AR Smart Spatial Organization Assistant (ARSSO), an AI-powered mobile application that integrates Artificial Intelligence (AI) and Augmented Reality (AR) technologies to support spatial organization through AR-assisted scanning, personalized recommendations, chatbot assistance, and task management. The application was developed to address the limitations of traditional organization tools by providing a more personalized and context-aware approach to managing and avoiding cluttered environments while improving individual productivity and motivation.

The findings from the summative evaluation indicated that the ARSSO application achieved high user acceptance across the evaluated dimensions of Perceived Usefulness, Perceived Ease of Use, User Satisfaction, and AI and AR Interaction Experience. Among these dimensions,

Perceived Ease of Use received the highest score, showing that users found the application intuitive, user-friendly, and easy to navigate. The qualitative findings supported the quantitative results, with participants expressing positive perceptions of the functionality of the ARSSO application, including spatial scanning, AI-generated recommendations, and chatbot assistance. Furthermore, participants indicated their willingness to use the application in their daily lives and identified its potential as an assistant tool to support spatial and workspace organization and productivity improvement.

Overall, these findings demonstrate that the integration of AI-powered recommendations and AR-assisted scanning can provide effective solutions to support users' organization activities. The positive user acceptance results also show the strong potential of the ARSSO application to become a smart organization assistant capable of helping users maintain their activity environments in a more organized, productive, and comfortable manner. This study contributes to the growing application of AI and AR technologies in productivity and organization-related systems while providing a foundation for future developments in intelligent workspace management solutions.

Declaration of AI-Generated Content

During the preparation of this manuscript, the authors used AI-assisted tool (Gemini) solely to improve the language, grammar, and readability of the written text. All research design, data collection, data analysis, and interpretation of findings were conducted independently by the authors. The authors reviewed and edited all AI-assisted content, take full responsibility for the accuracy and integrity of the final manuscript, and confirm that no AI or AI-assisted technology was used in the collection or analysis of data, or in generating the study's findings or concl

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- Ethics Statement:** This study was conducted in accordance with ethical research standards. All procedures involving human participants followed accepted ethical research guidelines. Informed consent was obtained from all participants prior to data collection. Participation was voluntary, and respondents were assured of confidentiality and anonymity. The data collected were used solely for academic purposes.
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References

- Abras, C., Maloney-Krichmar, D., & Preece, J. (2004). User-centered design. In W. S. Bainbridge (Ed.), *Berkshire encyclopedia of human-computer interaction* (pp. 445–456). Berkshire Publishing Group.
- Annes, C. K., Taylor, J. A., & Hallock, R. M. (2023). The effect of workspace tidiness on schoolwork performance of high school students. *Journal of Emerging Investigators*, 6. <https://emerginginvestigators.org/articles/22-219>
- Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments*, 6(4), 355–385. <https://doi.org/10.1162/pres.1997.6.4.355>
- Borsci, S., Malizia, A., Schmettow, M., van der Velde, F., Tariverdiyeva, G., Balaji, D., & Chamberlain, A. (2022). The chatbot usability scale: The design and pilot of a usability scale for interaction with AI-based conversational agents. *Personal and Ubiquitous Computing*, 26, 95–119. <https://doi.org/10.1007/s00779-021-01582-9>
- Chin, J. P., Diehl, V. A., & Norman, K. L. (1988). Development of an instrument measuring user satisfaction of the human-computer interface. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 213–218). ACM. <https://doi.org/10.1145/57167.57203>
- Coelho, C., Cordeiro, A., Alcoforado, L., & Moniz, G. C. (2022). Survey on student school spaces: An inclusive design tool for a better school. *Buildings*, 12(4), 392. <https://doi.org/10.3390/buildings12040392>
- Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. *Science*, 349(6245), 255–260. <https://doi.org/10.1126/science.aaa8415>
- Liu, X. C., Jia, D., Nie, T., Rosenberg, E. S., Interrante, V., & Chen, Z.-T. (2025). Can AR-embedded visualizations foster appropriate reliance on AI in spatial decision making? A comparative study of AR see-through vs. 2D minimap. *arXiv*. <https://arxiv.org/abs/2507.14316>
- Lund, A. M. (2001). Measuring usability with the USE questionnaire. *Usability Interface*, 8(2), 3–6.
- Manzi, A., Durmysheva, Y., Pinegar, S. K., Rogers, A., & Ramos, J. (2019). Workspace disorder does not influence creativity and executive functions. *Frontiers in Psychology*, 9, 2662. <https://doi.org/10.3389/fpsyg.2018.02662>
- Mayer, R. E. (2001). *Multimedia learning*. Cambridge University Press.
- Nepal, S., Hernandez, L., Massachi, M., Rowan, K., Amores, J., & Suh, J. (2025). From user surveys to telemetry-driven AI agents: Exploring the potential of personalized productivity solutions. *arXiv*. <https://arxiv.org/abs/2401.08960>
- Ozturkcan, S. (2021). Service innovation: Using augmented reality in the IKEA Place app. *Journal of Information Technology Teaching Cases*, 11(1), 8–13. <https://doi.org/10.1177/2043886920947110>
- Reuksupasompon, P., Aruncharathorn, M., & Vittayakorn, S. (2018). AR development for room design. In *2018 15th International Joint Conference on Computer Science and Software Engineering (JCSSE)* (pp. 1–6). IEEE. <https://doi.org/10.1109/JCSSE.2018.8457343>
- Setiawan, A. C., Setiawan, A., & Djajadikerta, H. (2025). Penerapan augmented reality sebagai alat pemasaran untuk meningkatkan keterlibatan dan loyalitas konsumen: Studi pada aplikasi IKEA Place. *SATESI: Jurnal Sains Teknologi dan Sistem Informasi*, 5(1), 117–126. <https://journal.yp3a.org/index.php/satesi/article/view/4172>

Yu, L.-F., Yeung, S. K., Tang, C.-K., Terzopoulos, D., Chan, T. F., & Osher, S. J. (2011). Make it home: Automatic optimization of furniture arrangement. *ACM Transactions on Graphics*, 30(4), Article 86. <https://doi.org/10.1145/1964921.1964981>