



INTERACTIVE PRINTING KIOSK FOR AEMILIANUM COLLEGE INC.

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Abstract

The study focused on the development of an Interactive Printing Kiosk specifically tailored for Aemilianum College Inc., with specific objectives to address the printing needs of students, faculty, and staff. The system was designed to facilitate document printing for PDF and Word formats. Users could upload their files via supported storage devices and select specific options for their printing needs. These options included document type (black and white or colored), paper size (long or short), and specific page selection, providing flexibility and efficiency. The system is also integrated a coin-operated payment mechanism using a coin selector. This ensured accurate and straightforward transactions by accepting exact amounts for the chosen printing options. Thirdly, the study prioritized developing a user-friendly interface to ensure accessibility for all users. The interface featured intuitive navigation, allowing users to easily upload files, configure print settings, and complete transactions with minimal assistance. The kiosk was evaluated using ISO 25010 standards. The evaluation criteria included functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. This comprehensive assessment provided insights into the system's overall effectiveness and ensured alignment with international standards. The development of this Interactive Printing Kiosk addressed the challenges of limited and inconvenient printing services while offering a streamlined, cost-effective, and user-centric solution for the Aemilianum College Inc. community.

The findings of the study, derived from the development, testing, and evaluation phases of the Interactive Printing Kiosk, reveal several key insights. Firstly, it highlights the pressing need for a reliable and efficient printing solution that caters to the specific requirements of students, faculty, and staff at Aemilianum College Inc. The system effectively addresses these needs by enabling users to print documents in PDF and Word formats with options for black-and-white or colored outputs, long or short paper sizes, and specific page selections, offering a high degree of flexibility and convenience. Secondly, the study underscores the importance of integrating a straightforward payment mechanism. The kiosk's coin-operated system, using a coin selector, ensures accurate transactions by accepting exact amounts for the selected printing services, thereby streamlining the payment process for users. Thirdly, the findings emphasize the value of a user-friendly interface. The system's intuitive design allows users to easily upload files, select their preferred printing options, and complete transactions without requiring technical assistance, making it accessible for all levels of users. Lastly, the evaluation of the system's quality characteristics by diverse evaluator groups, including IT experts, college students, and professors, revealed high ratings across various metrics. These metrics include functional suitability, performance efficiency, compatibility, usability, reliability, and security. Additionally, the system demonstrated satisfactory maintainability and exceptional portability, further validating its overall effectiveness and

suitability as a solution for the printing needs of Aemilianum College Inc.

In conclusion, the findings of this study underscore several key points regarding the development and implementation of the Interactive Printing Kiosk for educational environments. Firstly, the study highlights the necessity of a reliable and efficient printing solution tailored to meet the specific requirements of students, faculty, and staff at Aemilianum College Inc. The kiosk's ability to handle document printing in PDF and Word formats, with options for black-and-white or colored outputs, long or short paper sizes, and specific page selections, ensures flexibility and user satisfaction. Secondly, it emphasizes the importance of an integrated payment mechanism. The system's coin-operated feature, utilizing a coin selector, simplifies transactions by accepting exact amounts, providing a seamless and hassle-free payment process. Thirdly, the study underscores the critical role of a user-friendly interface in ensuring accessibility and ease of use. The kiosk's intuitive design allows users to navigate the printing process effortlessly, reducing the need for technical assistance and enhancing overall usability. Finally, the evaluation of the system's quality characteristics by diverse evaluator groups, including IT experts, college students, and professors, yielded high ratings across various metrics, such as functional suitability, performance efficiency, compatibility, usability, reliability, and security. Additionally, the system's satisfactory ratings for maintainability and exceptional ratings for

Introduction

In an increasingly digital world, the demand for convenient and accessible printing services remains essential, especially in educational institutions like Aemilianum Colleges Inc. (ACI). As a researcher, the researcher has observed the persistent challenges students and faculty face when trying to access printing services during odd hours or in remote locations. The development of an Interactive Printing Kiosk seeks to address these issues, providing a

portability confirm its effectiveness and suitability for the institution's printing needs. These results affirm the Interactive Printing Kiosk's success in addressing the challenges of traditional printing services and enhancing operational efficiency within the educational setting.

Based on the conclusions drawn from this study, several recommendations have been formulated to guide future improvements in the system. To ensure smooth operation under all conditions, it is recommended to address minor performance issues through periodic updates and optimization, maintaining system efficiency. Strengthening security measures, particularly for payment processing, is crucial; integrating stronger encryption protocols and additional security features would help protect user data from breaches or misuse. Enhancing user experience by incorporating features like multi-language support and mobile app integration for remote printing would make the system more accessible and flexible. Lastly, ongoing monitoring, testing, and updates should be implemented to address emerging issues and incorporate user feedback, ensuring the system continues to evolve and perform effectively over time.

Keywords. *Aemilianum College Inc., Interactive Printing Kiosk, Printing Station, Student Printing Services, Aemilianum Colleges Printing Kiosk, User-Friendly Printing Interface, Student Printing Needs*

solution that aligns with the fast-paced demands of modern academic life.

On an international level, the integration of self-service kiosks has become a staple in various industries, offering services such as ticketing, banking, and retail transactions. These systems enhance efficiency and accessibility, allowing users to perform tasks independently without relying on staffed services. According to a report by Grand View Research (2020), the global

market for interactive kiosks is expected to grow significantly, driven by advancements in technology and the increasing need for automation in public services. This trend highlights the relevance and potential impact of similar technologies in educational settings worldwide.

Nationally, the Philippines has been progressively adopting self-service technologies across various sectors. The rise of interactive kiosks in transportation, banking, and public services reflects a shift towards greater efficiency and user empowerment. In the educational sector, there is a growing need to adopt similar technologies to streamline processes like printing, which remain crucial for academic and administrative tasks. A study by Buenaventura and David (2021) emphasizes the importance of accessible technological solutions in enhancing the operational efficiency of educational institutions in the Philippines.

Locally, in Region V and Sorsogon Province, the availability of 24/7 printing services is limited, particularly in areas surrounding educational institutions like Aemilianum Colleges Inc. Students often

face the inconvenience of traveling long distances or waiting in long queues to access printing services, especially during peak periods. This issue is compounded by the limited operating hours of nearby computer shops. As highlighted by Dela Cruz (2022), there is a pressing need for localized technological solutions that cater to the specific needs of communities in more remote regions of the Philippines.

The development of the Interactive Printing Kiosk system for Aemilianum Colleges Inc. is crucial in addressing these local challenges. By providing a user-friendly, 24/7 accessible printing service within the campus, the kiosk will significantly improve the convenience and efficiency of document processing for students, faculty, and staff. This initiative is not only necessary but also timely, as it aligns with the broader trends of technological adoption in both international and national contexts. The kiosk will serve as a model for similar implementations in other educational institutions across the region, demonstrating the practical benefits of localized, automated service solutions.

Specific Objectives

Specifically, the study aimed to:

1. Develop the interactive printing kiosk integrating functionality and accessibility.
 - 1.1. Ensure the kiosk allows users to print files 24/7, providing continuous access to printing services without interruption.
 - 1.2. Implement a user-friendly interface that is accessible to all users, including those with varying levels of technical proficiency.
2. Include Cost Computation
 - 2.1. Integrate a robust pricing calculation system that accurately computes the cost of printing services based on:
 - a. The number of pages printed.

- b. The type of document: in color or black ink
 - c. Implement secure payment options that allow users to pay for their printing services seamlessly.
3. Incorporating User Interface Design
 - 3.1. Develop an intuitive and easy-to-navigate user interface that includes:
 - a. Clear options for selecting print preferences (e.g., in color or black ink).
 - b. A straightforward file upload process that supports docs and pdf file formats and provides real-time previews.

- c. Simple transaction completion steps.
 - d. Ensure that the interface includes accessible help options, such as FAQs or on-screen guidance, to assist users throughout the printing process.
4. Evaluate the developed system using ISO 25010 standards in terms of:

- 2.1. Functional Suitability
- 2.2. Performance Efficiency
- 2.3. Compatibility
- 2.4. Usability
- 2.5. Reliability
- 2.6. Security
- 2.7. Maintainability
- 2.8. Portability

Scope and Delimitations

The study included the design and development of a prototype Interactive Printing Kiosk specifically tailored for Aemilianum Colleges Inc. (ACI). The kiosk allowed users to print documents independently by reading Word and PDF files from flash drives. It featured a coin-operated billing system that calculated the cost of the printing service based on the number of pages printed and the type of document (e.g., color or black and white). The kiosk also included a user-friendly touchscreen interface, accessible to individuals with varying levels of technical proficiency. The study evaluated the system using ISO 25010 standards, focusing on functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability,

and portability. Once developed, the system was evaluated by ten (10) IT Professionals, ten (10) ACI Faculty and Staff, and ten (10) ACI students to ensure it met the necessary requirements.

However, the study did not cover certain aspects, including the acceptance of paper bills as a payment method, the provision of printed receipts for transactions, and support for double-sided printing. Additionally, the kiosk was designed for compact spaces and did not include features such as scanning or copying, limiting its functionality to printing only. These exclusions were made to maintain the focus on developing a streamlined and efficient printing service that addressed the most immediate needs of the ACI community.

Gap Bridged by the Study

The reviewed systems highlighted a wide range of kiosk applications across industries, focused on enhancing user convenience and efficiency through self-service technology. Globally, companies like Kiosk Information Systems, Meridian, Redyref, and LamasaTech offered solutions for retail, healthcare, and outdoor services, integrating features like biometric scanners, remote management, and electric vehicle charging. Locally, projects like the FITS Kiosk in Camiguin and the Philippine

Normal University Information Kiosk emphasized information dissemination and community service. Similarly, studies on printing kiosks, such as those in Falcon et al., aligned with the goal of Aemilianum College's printing kiosk by providing convenient on-campus printing to reduce the need for external services. Other examples, such as McDonald's NXTGEN and systems from Laguna State Polytechnic University, highlighted the role of kiosks in improving service speed, accessibility, and user

satisfaction. These comparisons illustrated how interactive kiosks, despite varying applications, shared the common goal of enhancing efficiency and accessibility tailored to specific environments and user needs.

The presented study on the Interactive Printing Kiosk for Aemilianum Colleges Inc. aimed to bridge specific gaps identified in the reviewed systems by tailoring the kiosk specifically for educational environments. Unlike the existing systems that catered to broad sectors such as retail and tourism, this kiosk focused on improving internal processes in a college setting, particularly on tasks like document printing and student

Requirement Planning

The initial phase of RAD focused on identifying and analyzing the system requirements through collaborative discussions with stakeholders, including students, faculty, and administrative staff. This phase involved surveys to gather insights into

User Design

The User Design phase emphasized iterative prototyping, where system modules were developed and continuously refined based on stakeholder feedback. This stage involved creating wireframes and mockups for the kiosk interface, highlighting essential features such as file upload, print preview, pricing options, and payment methods. Stakeholders actively participated in testing

Construction

The Construction phase involved the actual development of the system based on the finalized prototype. Software components, such as the user interface, file management system, and payment gateway, were integrated with hardware components like printers and coin selectors and arduino. This stage also included rigorous system testing, where

transactions. What set this study apart was its emphasis on seamlessly integrating printing services with user-friendly navigation, designed to be accessible for students and staff alike. It also addressed the needs of a smaller institution by providing a cost-effective solution that enhanced operational efficiency without the high costs and complexity of the kiosks reviewed. The system was unique in its direct application to academic operations, ensuring that it met the specific demands of a learning institution, which made it a significant advancement in terms of educational self-service technology.

the current challenges in printing processes. The primary objective was to document functional and non-functional requirement given in ISO 25010. These insights guided the overall project scope and objectives, ensuring alignment with the needs of the end users

these prototypes, allowing for immediate feedback and adjustments. The iterative cycle - build, demonstrate, refine - ensured that the system's user experience and functionality were optimized to meet expectations. This collaborative approach minimized risks and enhanced the system's adaptability to user requirements.

stakeholders participated in functional and stress testing to identify and resolve bugs or inefficiencies. The modular nature of RAD allowed for rapid development and seamless integration of new features without disrupting the core functionalities.

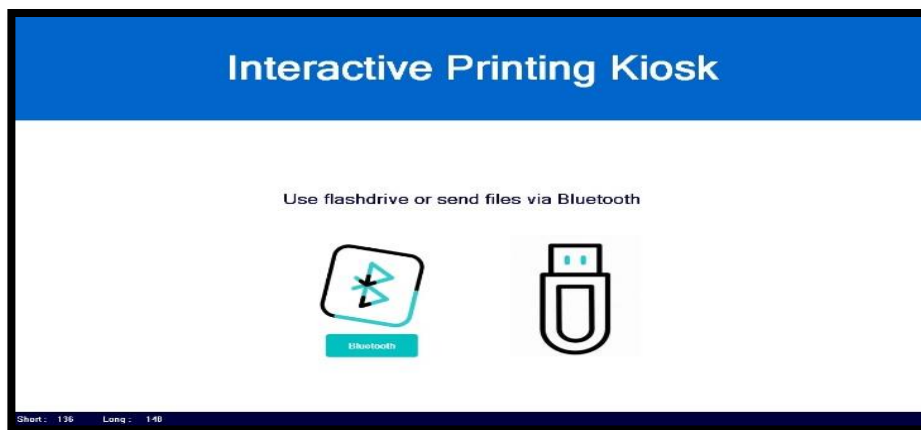


Figure 4.1. Initial Screen

Figure 4.1 showcases the initial screen of the "Interactive Printing Kiosk for Aemilianum College Inc.", prioritizing user-friendly design and intuitive navigation. By presenting clear and concise options for file-receiving transactions, users can easily choose their preferred method of file transfer: Bluetooth or USB flash drive. This approach caters to a wider range of user preferences and technical capabilities, ensuring accessibility and ease of use for all.

Furthermore, this initial screen design effectively streamlines the user experience by minimizing potential confusion and reducing the steps required to initiate a printing transaction. The prominent placement of the two file transfer options, coupled with visually distinct icons or buttons, allows users to quickly grasp the available choices and proceed with their desired action. This efficient design not only enhances user satisfaction but also contributes to a smoother and faster printing process overall.



Figure 4.2. File Selection

Figure 4.2 provides a glimpse into the streamlined file selection process of the "Interactive Printing Kiosk for Aemilianum College Inc." This screen empowers users with the ability to effortlessly browse and select their desired print file, presented in a clear and organized manner. By supporting commonly used formats like PDF and Word documents, the kiosk caters to the majority of student and faculty needs, ensuring a seamless printing experience. The straightforward selection and confirmation process minimizes

potential errors and allows for quick and efficient printing.

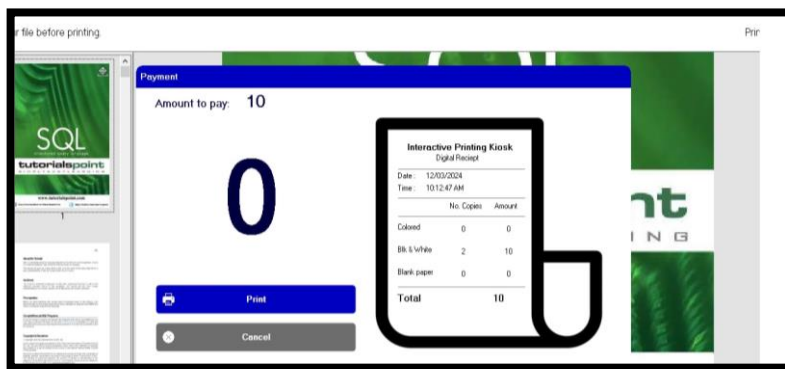
However, limiting the kiosk to only PDF and Word formats might inadvertently exclude users with files in different formats. Consider expanding supported file types to include commonly used formats like .jpeg, .png, and .txt to enhance accessibility and cater to a broader range of printing needs. This inclusivity would further solidify the kiosk's user-friendly design and position it as a valuable resource for the entire Aemilianum College community.



Figure 4.3. File Preview

Figure 4.3 displays the File Preview of the 'Interactive Printing Kiosk for Aemilianum College Inc.' This screen provides a preview of the selected file,

allowing users to verify its content before proceeding with the print job. It ensures that the file is correctly formatted and ready for printing in PDF or Word format.



ment

The Payment of the for Aemilianum enables users to using the coin slot insert the required payment before job.

Cutover

The final Cutover phase represented the transition from system development to deployment. This critical stage involved installing the kiosk system at designated locations within the campus, ensuring its functionality in the intended environment. To maximize adoption and efficiency, staff members were trained on system usage, emphasizing hands-on demonstrations and addressing potential questions. A pilot test was conducted to evaluate the system's performance in real-world scenarios, enabling the identification and resolution of any remaining issues.

Feedback from users during this phase was integral to refining the system, ensuring reliability, and enhancing usability. To support the system's smooth adoption, comprehensive documentation and user guides were developed. These resources provided step-by-step instructions, troubleshooting tips, and best practices for effective use. Furthermore, periodic evaluations were scheduled to

maintain compliance with ISO 25010 standards, ensuring the system's quality and sustainability over time.

The evaluations conducted during this phase involved three distinct groups of evaluators: 10 college students, 5 professors, and 10 IT experts. Feedback was collected through a structured survey designed to assess overall satisfaction using a numerical rating scale. The scale ranged from 1 to 5, with 1 representing "Not Applicable," 2 as "Slightly Applicable," 3 as "Applicable," 4 as "Very Applicable," and 5 as "Highly Applicable." This approach ensured a comprehensive assessment of the system's effectiveness and user experience. The diverse composition of evaluators provided a well-rounded perspective, capturing insights from both technical and non-technical users. Their input was instrumental in identifying areas for improvement and validating the system's readiness for full deployment.

Findings

During the development and after testing and evaluation of the developed system the following findings have been established:

1. The interactive printing kiosk effectively provides round-the-clock printing services with a user-friendly interface, ensuring accessibility for users of all technical skill levels.
2. The system efficiently calculates printing costs based on document specifications and integrates secure payment options,

enhancing accuracy and transaction security.

3. The intuitive user interface, featuring clear print options and real-time previews, simplifies the printing process and improves overall user experience.
4. With compliance to key ISO 25010 standards and an overall evaluator rating of 4.3, the developed system demonstrates high efficiency, reliability, and user satisfaction

Conclusions

Based on the findings of this study the following conclusions were formulated:

1. The kiosk met the key objective of providing 24/7 printing services with an

accessible and user-friendly interface. It catered effectively to users with varying levels of technical expertise.

2. The developed system accurately computed the cost of printing services based on user selections and document specifications, while securely processed payments.
3. The intuitive design of the user interface ensured ease of use, facilitating a smooth and efficient experience for users. The inclusion of real-time previews and on-

screen guidance was especially beneficial for first-time users.

4. The system met most of the ISO 25010 standards for functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, confirming its overall effectiveness.

Recommendations

Based on the conclusions drawn from this study, the following recommendations were formulated:

1. Regular system updates and performance optimizations should be conducted to ensure uninterrupted 24/7 printing services and maintain usability for all users.
2. Enhancing security measures, such as stronger encryption for payment transactions, is recommended to further protect user data and prevent potential security threats.

3. Additional user-friendly features, such as multi-language support and mobile integration, should be considered to improve accessibility and convenience.
4. Continuous monitoring, user feedback collection, and periodic evaluations should be implemented to ensure the system remains efficient, reliable, and aligned with evolving user needs.
5. Expanding compatibility with more file formats and cloud storage services would further enhance user flexibility and accessibility.

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