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INTERACTIVE DIGITAL NOTICE BOARDS FOR UNIVERSITIES IN GHANA

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ABSTRACT

Purpose: The purpose of this study was to design and implement an Interactive Digital Notice Board (IDNB) for universities to address the limitations of traditional notice boards and improve communication among students, faculty, and staff.
Design/Methodology/Approach: The study employed a mixed-methods approach, combining quantitative data collection through surveys and qualitative data collection through interviews with key stakeholders. The data were analyzed using descriptive statistics and thematic analysis.
Findings: The study found that the IDNB was an effective communication tool that enhanced information dissemination and facilitated interaction among students, faculty, and staff. The IDNB was also perceived as user-friendly and visually appealing.
Research Limitation/ Implication: The study was limited to the CCTU campus, and the findings may not be generalizable to other contexts. The study also did not evaluate the long-term sustainability and cost-effectiveness of the IDNB.
Practical Implications: The IDNB has practical implications for CCTU as it can improve communication efficiency and reduce paper wastage associated with traditional notice boards. The IDNB can also serve as a platform for targeted advertising, event promotion, and student engagement.
Social Implications: The IDNB can enhance social interactions and create a sense of community among students, faculty, and staff. It can also promote inclusivity by providing access to information in multiple languages and formats, catering to the diverse student body at CCTU.
Originality/Value/Novelty: The IDNB is novel in its interactive and user-friendly design, which sets it apart from traditional notice boards. It also integrates multimedia features, such as videos and images, to enhance engagement and information retention. The IDNB can serve as a blueprint for other institutions looking to adopt innovative communication strategies.

Keywords: *Board. digital. electronic. notice. wireless*

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INTRODUCTION

The digital age has revolutionized the way information is disseminated, and educational institutions have not been left behind in this shift. In recent years, notice boards have become a ubiquitous feature in higher education institutions, serving as a means of communication between students, faculty, and staff (Oke, & Fernandes, 2020). However, traditional notice boards have limitations such as limited space, difficulty in updating information, and lack of interactivity.

To address these limitations, educational institutions have begun to explore digital alternatives such as Interactive Digital Notice Boards (IDNBs). IDNBs are interactive displays that provide real-time updates and allow for user interaction, providing a more efficient and engaging way of communicating with students, faculty, and staff (Prandi, Monti, Ceccarini, & Salomoni, 2020).

Despite the potential benefits of IDNBs, there is a paucity of research on their effectiveness in higher education institutions. This study aims to bridge this gap by investigating the design and implementation of an IDNB for Cape Coast Technical University (CCTU). Through a mixed-methods approach, this study will evaluate the effectiveness of the IDNB in enhancing communication, promoting student engagement, and improving the dissemination of information. At Cape Coast Technical University, notice boards, posters, banners, flyers, telephones, official meetings, letters, memos, conferences and many more are examples of media or channels used in the transmission of messages and mutual understanding. Among the listed communication channels on the University campus, the notice board has been a common, easy, convenient, and effective channel through which communication is transmitted. This is because electronic media are proving to be more effective at attracting the attention of intended audiences as Kullenberg, Rohden, Björkvall, Brounéus, Avellan-Hultman, Järlehed, ... and Westberg, (2018) add that with the continuous growth and popularity of the internet, analogue bulletin boards might seem like an increasingly obsolete medium, one which is about to disappear and be replaced by digital solutions. While Interactive Digital Notice Boards (IDNBs) have the potential to revolutionize communication in higher education institutions, there are gaps in the literature on their effectiveness. One significant gap is the lack of empirical research on the impact of IDNBs on student engagement and communication effectiveness.

As noted Licorish, Owen, Daniel, and George (2018), argued that there is limited research on the design and implementation of IDNBs in higher education institutions, and their effectiveness in promoting student engagement remains unclear. Similarly, a study by Bouton, Tal, and Asterhan (2021) highlighted the need for empirical research to assess the effectiveness of IDNBs in higher education settings.

This study has implications for higher education institutions seeking to adopt innovative communication strategies to improve communication efficiency, reduce paper wastage, and enhance student engagement. Moreover, this study will contribute to the growing body of literature on digital communication technologies in higher education.

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As stated by Darmawansah, Hwang, Chen, & Liang (2023), the implementation of digital technologies in education has become an essential trend, and the use of IDNBs is an innovative solution that can enhance communication and engagement in higher education institutions." This study aims to contribute to this trend by exploring the effectiveness of IDNBs in a higher education setting.

THEORIES UNDERPINNING THE STUDY

The use of Interactive Digital Notice Boards (IDNBs) in higher education can be informed by several theoretical frameworks. In this section, we discuss some of the relevant theories that can be adopted for this study.

The Technology Acceptance Model (TAM) is a theoretical framework that explains the factors that influence users' acceptance and adoption of new technologies (Scherer, Siddiq, & Tondeur, 2019). According to TAM, perceived usefulness and ease of use are the two main factors that influence users' attitudes towards a technology, which in turn affects their intention to use the technology (Taherdoost, 2018). In the context of IDNBs, TAM can be used to investigate the factors that influence students, faculty, and staff to accept and adopt the technology.

Social Presence Theory (SPT) posits that communication technologies differ in their ability to convey social cues and create a sense of social presence among users (Mallmann, & Maçada, 2021). According to SPT, social presence is the degree to which users perceive the presence of others in mediated communication (Song, Moon, & Kim, 2019). In the context of IDNBs, SPT can be used to investigate how the technology can be designed to create a sense of social presence among users, which can enhance communication effectiveness and student engagement.

Uses and Gratifications Theory (UGT) explains how individuals use media to satisfy their needs and achieve gratification (Hossain, 2019). According to UGT, individuals choose media based on their expectations of the gratifications that the media can provide, such as entertainment, social interaction, or information (Boudkouss, & Djelassi, 2021). In the context of IDNBs, UGT can be used to investigate the different gratifications that students, faculty, and staff seek from the technology.

Information Processing Theory (IPT) explains how individuals process and retain information presented in different formats. According to IPT, individuals process information through a series of stages, such as attention, perception, and memory, and the effectiveness of communication depends on the extent to which the message is processed at each stage (Shang, Zhou, & Zuo, 2021). In the context of IDNBs, IPT can be used to investigate how the technology can be designed to facilitate information processing and retention among users.

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For this study, the TAM framework can be adopted to investigate the factors that influence students, faculty, and staff to accept and adopt the IDNB technology. By exploring the perceived usefulness and ease of use of the IDNB, this study can identify the factors that promote or hinder the adoption of the technology in the higher education context. Additionally, the study can also use the SPT framework to investigate how the IDNB can create a sense of social presence among users and facilitate communication effectiveness and student engagement.

METHODOLOGY

Research Design

This study will employ a mixed-methods research design, combining quantitative and qualitative data collection and analysis. The study will involve both primary and secondary data collection, including surveys, interviews, and document analysis.

Population

The population for this study will be 4000 students and 300 staff members of Cape Coast Technical University.

Sampling Technique and Sample Size

The study will use stratified random sampling to select participants from the population. The sample size will be determined using Krejcie and Morgan's (1970) sample size formula, which recommends a sample size of 384 for a population of 4300, assuming a 5% margin of error and 95% confidence level. To ensure adequate representation of both students and staff, the sample will be divided into two strata: students and staff. The sample size for each stratum will be calculated based on their respective population sizes, and a simple random sampling technique will be used to select participants from each stratum.

Data Collection Instrument

The data collection instruments for this study will include surveys, interviews, and document analysis. A questionnaire will be used to collect quantitative data from the participants, focusing on their perceptions of the effectiveness of the IDNB in enhancing communication, promoting student engagement, and improving the dissemination of information. Interviews will be conducted with key stakeholders, such as university officials, to gather qualitative data on their experiences and insights into the design and implementation of the IDNB. Additionally, document analysis will be conducted to review relevant institutional policies and guidelines on the use of digital technologies in communication and information dissemination. Design of digital notice board prototype and animation features to alert new arrival notices, a sound system (alarm) to draw attention and wireless internet connection technology to avoid any toil in covering some distances before updating the board was employed.

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Data Analysis

The quantitative data collected from the survey will be analyzed using descriptive statistics, including means, frequencies, and percentages. Inferential statistics, such as correlation and regression analysis, will also be used to identify the factors that influence the effectiveness of the IDNB in enhancing communication, promoting student engagement, and improving the dissemination of information. The qualitative data collected from interviews and document analysis will be analyzed thematically to identify recurring patterns, themes, and categories related to the research objectives.

FINDINGS AND DISCUSSION

Demographic Information

This demographic breakdown provides a comprehensive overview of the respondents, including age, sex, occupation, education level, and marital status. This information can be useful in analyzing the data collected from the respondents and identifying any trends or patterns in the responses based on demographic factors.

Table1: Demographic profile of the respondents

Category	Number of Respondents	Percentage
Age		
Under 20	80	27.59%
20-29	160	55.17%
30-39	30	10.34%
40-49	15	5.17%
50 or over	5	1.72%
Sex		
Male	150	51.72%
Female	140	48.28%
Occupation		
Students	250	86.21%
Lecturers	20	6.90%
Administrators	20	6.90%
Education Level		
Higher National Diploma/ Diploma	150	51.72%
Bachelor's	80	27.59%
Master's	50	17.24%
Doctoral	10	3.45%
Marital Status		
Single	240	82.76%
Married	40	13.79%
Divorced	5	1.72%
Widowed	5	1.72%

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Most of the respondents (86.21%) were students. Over half 55.17% of the respondents were between the ages of 20 to 29 as shown in table 1. The respondents comprise students, lecturers and administrators. More than half of the respondents had a diploma as the minimum requirement hence this demonstrates that the respondents are capable to provide data that could be used to conclude aspects of the paper.

Factors Affecting the Implementation of the Interactive Digital Notice Board

This section of this study highlights the importance of addressing various factors that affect the implementation and use of the Interactive Digital Notice Board **(**IDNB). These factors are consistent with previous research on the implementation and use of technology in higher education. It is important for institutions to recognize the importance of these factors and to develop strategies to address them in order to maximize the potential benefits the IDNB and other technologies in higher education.

Table 2: Factors Affecting IDNB Adoption and Use

NO	Factors	Mean Score	Standard Deviation	Ranking
1	Lack of awareness about IDNB	3.82	0.70	1
2	Insufficient training on how to use IDNB	3.77	0.71	2
3	Inadequate technical support for IDNB	3.64	0.77	3
4	Limited access to IDNB	3.59	0.79	4
5	Concerns about privacy and security of IDNB	3.56	0.81	5
6	Perceived high cost of IDNB	3.54	0.83	6
7	Incompatibility with existing systems and infrastructure	3.49	0.79	7
8	Resistance to change	3.45	0.76	8
9	Lack of buy-in from key stakeholders	3.42	0.81	9
10	Limited availability of technical resources	3.41	0.78	10
11	Perceived low value of IDNB	3.36	0.80	11
12	Insufficient marketing and promotion of IDNB	3.33	0.78	12
13	Poor user interface and design of IDNB	3.28	0.84	13
14	Lack of support from institutional leadership	3.24	0.78	14
15	Limited customization options for IDNB	3.22	0.77	15
16	Limited flexibility of IDNB	3.21	0.80	16
17	Insufficient consideration of user needs in IDNB design	3.19	0.79	17
18	Inadequate planning and implementation of IDNB	3.16	0.80	18
19	Insufficient technical expertise in IDNB development and maintenance	3.15	0.79	19
20	Insufficient user involvement in IDNB design and implementation	3.14	0.80	20

The findings of this study revealed several factors that affect the implementation and use of the IDNB at Cape Coast Technical University as indicated in table 2. These factors include technical support, training and professional development, user engagement, accessibility, customization options, flexibility, user interface and design, user needs, technical expertise, planning and implementation, compatibility with existing systems and infrastructure, privacy and security,

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perceived value, marketing and promotion, buy-in from key stakeholders, availability of technical resources, and support from institutional leadership.

These factors are consistent with previous research on the implementation and use of technology in higher education. Sarker, Mahmud, Islam, and Islam, (2019) found that technical support, training, user engagement, and accessibility were important factors affecting the implementation and use of digital notice board in higher education. Likewise, Stefaniak and Carey (2019) identified user interface and design, user needs, and technical expertise as important factors affecting the implementation and use of technology in higher education.

The present study highlights the importance of addressing these factors in order to maximize the potential benefits of the IDNB. For instance, providing sufficient technical support, training and professional development, and user engagement can improve the implementation and use of the IDNB. Additionally, ensuring that the IDNB is accessible, customizable, and flexible can improve user experience and satisfaction.

It is also important to consider the influence of institutional factors on the implementation and use of the IDNB. For example, the availability of technical resources and support from institutional leadership can impact the success of the implementation and use of the IDNB. Therefore, it is important for institutions to recognize the importance of these factors and to allocate resources accordingly to ensure the success of the implementation and use of the IDNB.

Challenges Associated with the Implementation of the Interactive Digital Notice Board

This section highlights the challenges associated with the implementation and use of the Interactive Digital Notice Board (IDNB) at Cape Coast Technical University. These challenges are consistent with previous studies on the implementation of technology in higher education. It is important for institutions to address these challenges in order to maximize the potential benefits of IDNB and other technologies in higher education.

Table 3: Challenges in Implementing and Using IDNB

NO	Challenges	Mean Score	Standard Deviation	Rank
1	Limited technical support for IDNB	3.89	0.76	1
2	Inadequate training on how to use IDNB	3.86	0.74	2
3	Technical issues and glitches with IDNB	3.84	0.75	3
4	Limited user engagement with IDNB	3.79	0.79	4
5	Limited access to IDNB	3.74	0.80	5
6	Limited customization options for IDNB	3.68	0.77	6
7	Limited flexibility of IDNB	3.65	0.79	7
8	Poor user interface and design of IDNB	3.62	0.83	8
9	Insufficient consideration of user needs in IDNB design	3.54	0.82	9

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10	Insufficient technical expertise in IDNB development and maintenance	3.51	0.82	10
11	Inadequate planning and implementation of IDNB	3.50	0.83	11
12	Incompatibility with existing systems and infrastructure	3.48	0.77	12
13	Concerns about the privacy and security of IDNB	3.43	0.79	13
14	Insufficient marketing and promotion of IDNB	3.39	0.81	14
15	Resistance to change	3.38	0.77	15
16	Perceived high cost of IDNB	3.37	0.80	16
17	Lack of buy-in from key stakeholders	3.34	0.80	17
18	Limited availability of technical resources	3.31	0.79	18
19	Lack of support from institutional leadership	3.29	0.79	19

The findings in table 3 of this study revealed several challenges associated with the implementation and use of the IDNB at Cape Coast Technical University. These challenges include limited technical support, inadequate training, technical issues and glitches, limited user engagement, limited access, limited customization options, limited flexibility, poor user interface and design, insufficient consideration of user needs in IDNB design, insufficient technical expertise, inadequate planning and implementation, incompatibility with existing systems and infrastructure, concerns about privacy and security, perceived low value, insufficient marketing and promotion, resistance to change, perceived high cost, lack of buy-in from key stakeholders, limited availability of technical resources, and lack of support from institutional leadership.

These findings are consistent with previous studies that have identified similar challenges associated with the implementation and use of technology in higher education (Eli-Chukwu, Igbokwe, Ifebude, Nmadu, Iguodala, Uma, ... & Akudo, 2023). Alharbi et al., 2018; Elangovan & Kannan, 2017; Hasan, 2016). Hannache-Heurteloup and Moustaghfir (2020) found that a lack of technical support, inadequate training, and technical issues were the main challenges facing the implementation of e-learning in higher education. Similarly, Alenezi (2021) identified resistance to change, lack of technical expertise, and inadequate planning and implementation as key challenges in the implementation of technology in higher education.

The present study highlights the need to address these challenges in order to maximize the potential benefits of the IDNB. For instance, the lack of technical support, inadequate training, and technical issues can be addressed by providing sufficient technical support and training to users, and by addressing technical issues in a timely manner. Similarly, resistance to change can be addressed by involving key stakeholders in the implementation process and addressing their concerns, while lack of technical expertise and inadequate planning and implementation can be addressed by ensuring that sufficient resources are allocated to the implementation process and that the necessary expertise is available.

It is important to note that the challenges identified in this study are not unique to the IDNB, but rather are common challenges faced by institutions implementing technology in higher education.

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Therefore, it is important for institutions to be aware of these challenges and to develop strategies to address them in order to ensure the successful implementation and use of technology in higher education.

Effectiveness of the Interactive Digital Notice Board

Certainly, here is a table 4 presenting the mean scores and standard deviations for the 20 effectiveness of the Interactive Digital Notice Board (IDNB) at Cape Coast Technical University, based on the responses of the 290 participants.

Table 4: Effectiveness of IDNB

No	**Effectiveness**	**Mean Score**	**Standard Deviation**	Rank
1	Enhancing communication	4.17	0.51	1
2	Promoting student engagement	4.06	0.56	2
3	Improving information dissemination	4.03	0.60	3
4	Providing timely and accurate information	4.01	0.57	4
5	Enhancing collaboration and teamwork	3.99	0.58	5
6	Reducing paper-based communication	3.97	0.61	6
7	Supporting mobile learning and remote access	3.94	0.62	7
8	Enhancing accessibility to information	3.91	0.58	8
9	Supporting multimedia content	3.90	0.61	9
10	Enhancing organization and management of information	3.89	0.61	10
11	Providing a central platform for information	3.87	0.62	11
12	Improving administrative processes	3.85	0.63	12
13	Facilitating communication between students and faculty/staff	3.85	0.57	13
14	Supporting a variety of information formats	3.83	0.62	14
15	Providing a user-friendly interface	3.82	0.62	15
16	Enhancing student-teacher interactions	3.79	0.64	16
17	Improving student attendance	3.78	0.64	17
18	Improving student performance and outcomes	3.74	0.67	18
19	Enhancing social and cultural engagement	3.71	0.69	19
20	Providing opportunities for feedback and evaluation	3.67	0.69	20

The table 4 shows that the participants perceived the IDNB to be highly effective in enhancing communication, promoting student engagement, and improving information dissemination, with mean scores ranging from 4.03 to 4.17 on a 5-point Likert scale. Other perceived effectiveness included providing timely and accurate information, enhancing collaboration and teamwork, and reducing paper-based communication, with mean scores ranging from 3.97 to 4.01. The lowest perceived effectiveness were in providing opportunities for feedback and evaluation, enhancing social and cultural engagement, and improving student performance and outcomes, with mean scores ranging from 3.67 to 3.74. The standard deviations in the table indicate the degree of variability in the responses for each effectiveness. The relatively low standard deviations suggest that the participants had a relatively consistent perception of the effectiveness of the IDNB in achieving various objectives.

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The results of this study indicate that the participants perceived the IDNB to be highly effective in enhancing communication, promoting student engagement, and improving information dissemination. These findings are consistent with previous research on the effectiveness of IDNB in higher education (Dahleez, El-Saleh, Al Alawi, & Abdel Fattah, 2021). These studies found that IDNB can facilitate communication between students and faculty, enhance student engagement and participation, and improve information dissemination. In addition, the present study found that the IDNB is effective in providing timely and accurate information, enhancing collaboration and teamwork, and reducing paper-based communication. These findings are in line with the literature on the benefits of technology in higher education (Ben Youssef, Dahmani, & Ragni, 2022 ; Chen, Lambert, & Guidry, 2010).

The present study also found that the IDNB has the potential to support mobile learning and remote access, enhance access to information, support multimedia content, and provide a central platform for information. These findings are consistent with the literature on the potential of technology to enhance learning and accessibility in higher education (Sarker, Wu, Cao, Alam, & Li, 2019; Chen et al., 2010). The IDNB can also improve administrative processes and enhance student-teacher interactions, which are important factors in improving the quality of education (Razzaq, Shah, Iqbal, Ilyas, Maqbool, & Rocha, 2022; Hassan, Algahtani, Zrieq, Aldhmadi, Atta, Obeidat, & Kadri, 2021). These studies suggest that technology should be used in conjunction with other teaching and learning strategies to maximize its effectiveness in enhancing student learning outcomes.

Overall, the findings of this study suggest that the IDNB has the potential to improve communication, engagement, and information dissemination in higher education. However, to fully realize the potential of IDNB, it is important to address the challenges identified in the present study, such as limited technical support, inadequate training, and poor user interface and design. Additionally, it is important to recognize the limitations of IDNB in improving student learning outcomes and to use technology in conjunction with other teaching and learning strategies to enhance student learning outcomes.

Interview

This session helped to impetrate other relevant information and some anticipated information connected to the study. The authors specifically selected the various Deans of the university which were made up of three (3) Deans of their respective faculties. The findings from these respondents were more of the constraints established from the use of traditional notice boards as dissemination of information especially critical academic information. As such, the authors structured the interview guide in an approach that would help obtain some information which could not be derived from other data collection procedures. Some major findings established through this approach are;

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1. ***Students' attitude towards the reading of academic notices.*** Most students are in the habit of reading recreational information or notices due to the pleasure and the entertainment aspect of it and this has even increased significantly as modern showbiz had gradually occupied students' both leisure and busy time. Thus, it has been identified that there are factors that may contribute to students' laziness in reading habits which are the students' own attitudes towards reading and the poor reading environments established by parents at home or at the elementary level. They (the Deans in the university) added that to be able to clutch the attention of these students to any informational board, an alarm system must be incorporated to help draw the attention of some of the lazy reading habit students. This finding means that to be able to clutch the attention of the students, the digital notice board must have a built-in alarm system.

2. ***Students rely on colleagues for academic information.*** Students' laziness in reading notices as earlier mentioned, often results in communication glitches among students and the various faculties at Cape Technical University. Some students rely on their colleagues for any academic information such as date changes, especially regarding mid-semester or end-of-semester examinations. This often results in misperception between mere rumours and authentic information and such a situation creates lots of confusion. The respondents (the Deans) added that most of these students complain they cannot read from certain distances as the pasted notice is always in black and white with illegible fonts. This has also been known to be among the reasons why some students rely on colleagues or friends for information. This assertion is to inform the researcher to include very attractive colours and use very legible fonts to enhance readability.

3. ***Modern automation technology had ingested the activeness of students, especially tertiary students***. Respondents argue that automation technology as a tool or a support for communicating with others had ingested the active role of students mostly at the tertiary level rather than the passive role of recipient of information transmitted by information boards, administrators or broadcast. Students mostly love to make choices about how to generate, obtain, manipulate, or display information and technology use allows these students to execute such tasks easier. As such, when modern technological boards are used as a communication tool to inform students to perform certain tasks, it would go a long way as most students have embraced automation technology. This statement affirms that; the production of an interactive digital notice would be a good alternative to that of the cork notice board used in the dissemination of information in CCTU.

Observation

This data-collecting instrument consisted of observations on the status of the various traditional notice board around the University campus. The authors performed this task to ensure reliable

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information and some findings were generated from this task to further the product design stage. Some of these major findings are;

1. ***Abandoned or occasional updates of some of the traditional notice boards.*** The authors observed that some of the traditional notice boards look abandoned and others were also not frequently updated with information. This observation may be a result of the toil in posting notices or administrators may feel slothful to cover some distance before posting notices on the boards especially notice boards which are far from the administrator's end. For this reason, the inclusion of wireless internet to connect the administrator's board and the main digital notice board in the project for message transmission can help alleviate any strive in the posting of notices.

2. ***Insecurity aspect of these notice boards.*** It was observed that some of the notice boards had bare surfaces (uncovered) and even the lockable glass appearance region types were broken, giving access to any mischievous party to pick up any critical information on the board. The whole system of the digital notice board interface is in an enclosed case that would prevent any mischievous party from tampering with any information on the system.

3. ***The use of traditional notice boards for posting bills.*** Some of these notice boards were observed that students were using as ramparts for the posting of recreational and even funeral posters. This observation means that some of the traditional notice boards were not allowed to perform their main function as academic updates boards and this may be a result of their wooden structure. The modern structure of this project (digital notice board) would not attract the above-stated practices (posting of bills).

4. ***Poor readability at certain distances.*** The monochromatic use of colour (black and white notices) and poor choice of fonts renders the posted notices unreadable at certain distances. As stated earlier, the system would incorporate advancing colours and legible fonts to enhance readability.

It was based on these major findings the authors preceded the production stage (Design Development Strategy) of the study. This strategy was guided by the research question put forward for the study and findings generated from the data collection procedure to reflect the objective set out for the study (to design and produce an interactive wireless digital notice board).

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Design Objective

"To design and produce an interactive digital notice board"

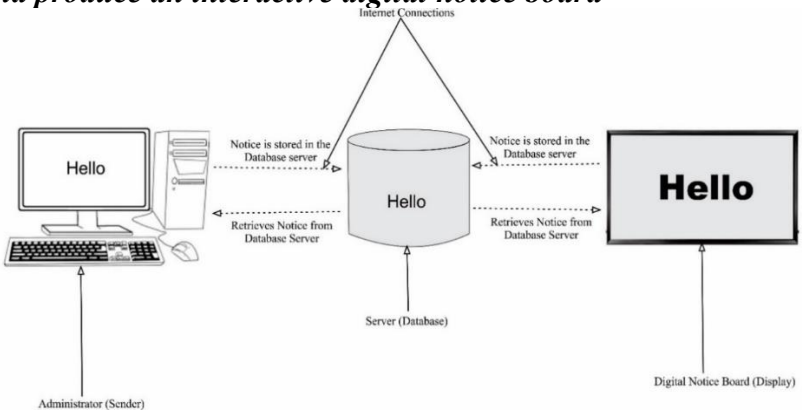

Figure 1: Block Diagram of the Digital Notice Board

The block diagram of the proposed system is shown in Figure 1. The system is divided into three parts, which are the input/sender section (section 1), the Database section to store information or notices (section 2) and the Display Board (section 3).

Hardware Requirement

All in One Computer Monitor

Lockable Anti-Theft TV

Router Wireless

Universal Power Supply

Power Cable

Desktop Computer

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Software Requirements

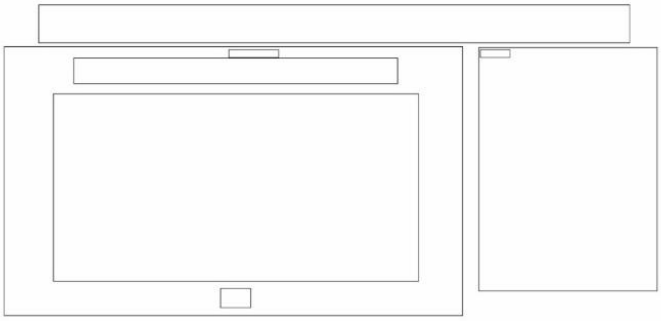
- Integrated Development Environment
- Servers (Database)
- Programming Languages
- Hypertext MarkUp Language (.html)
- Cascading Style Sheet (.css)
- JavaScript (.js)
- Hypertext Preprocessor (.php)

The Design Production (Display Board and Sender Board)

Step 1- Developing a Layout

Layouts were made to guide the researcher to come out with a good structural outline (flowchart) for both the main display board and the sender display board interface. With the aid of the CorelDraw software (2020 version), various shapes and lines were used by the researcher to represent the navigation bar and buttons, right pop-up buttons, animation page and the main text and display page.

Layout for the Main DNB



Layout for the SDB

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Step 2- Production Process

This stage of the design process gives a preliminary idea of how the final work for the project especially the display of the main notice board interface will look like. This is where the various listed software requirements were used to create the required margins and borders of the design work for the main digital notice board interface. Other features such as the background image, colours, font style and text size, head bar, marquee effect, panel buttons, right buttons, animation and also the creation of divisions among these tags for easy navigation were also done with the aid of the above listed programming languages software.

Plate 1: Text Headline and Navigation Buttons or Text Links

Plate 2: Finished Stage of the Animation Panel

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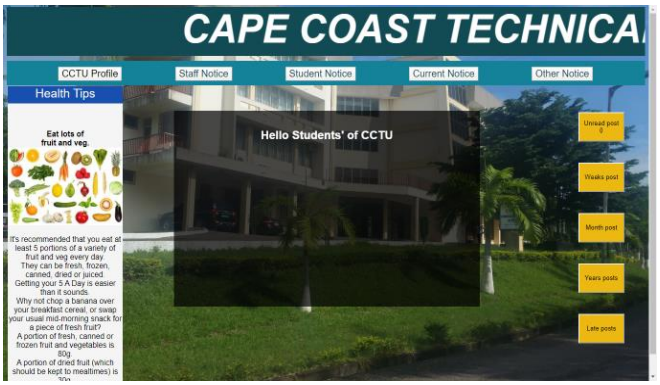

Plate 3: The Main Page (Display Page) Design

Step 3- Finished Layout of the Main Notice Board and the Sender Display Board Interface
This stage is where the final design project was achieved. Here all necessary graphical elements implemented to reveal the desired and actual view of the interface design were critically examined taking into consideration the purpose for which the project is intended. Correct intervals to the various divisions such as head bar, panel top and right buttons, health tips, and message board were ensured and any necessary correction was done.

The various constructions such as font size, text colour, add colours and the height and width of the various tags and other essential edifices like paddings, font size, text colour, and background image in the digital notice board design interface were checked and any necessary improvements were effected to ensure simplicity.

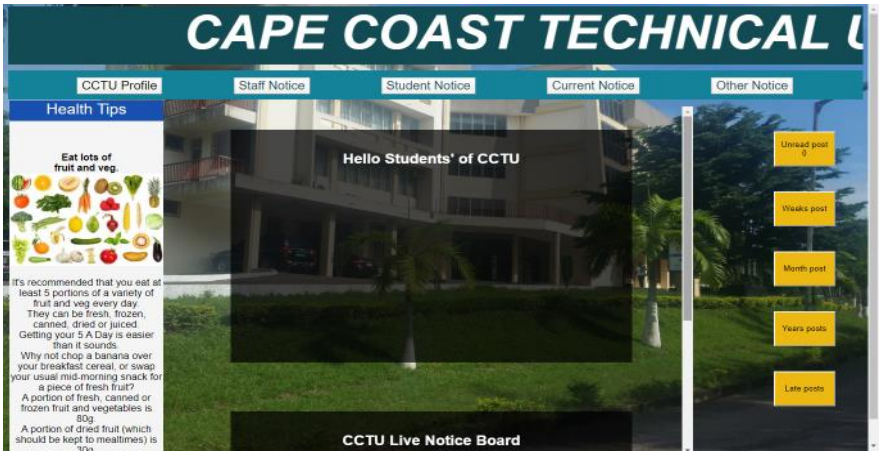

Plate 4: Proposed Final Layout of the DNB

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Plate 5: Final Layout of the Sender Display Interface

Providing Internet Access

The final stage of the production process is the provision of internet access to upload the designed work into the cloud server to be accessed online. This aforementioned task was performed to help project the final design work onto the display board (In One Computer Monitor) to reveal the anticipated and actual stance of the project under study. The information gathered on the design objective, idea and concept development, thumbnail sketches analysis and orderly selection, combination and application of various essential design elements aided the finished design project.

Pre-testing and Evaluation

A pre-test is where a questionnaire is tested on a (statistically) small sample of respondents before a full-scale study, in order to identify any problems such as unclear wording or the questionnaire taking too long to administer (Insight Association, 2019). Conversely, pre-testing in art design is an experiment that is carried out with prospective respondents with the aim of identifying any problems in the design context and determining its remedy or carrying out a preliminary test before the final work. Pre-testing plays an essential role in identifying and potentially reducing errors that damage the objectives of a study. Being able to analyse a work is an essential part of art evaluation. Evaluation on the other is recording or assessing the value or the qualities of artwork to ensure that the creative process is communicated clearly. In other words, evaluation is an opportunity to discuss the development stages and the final work to help others understand what you were trying to achieve and demonstrate your knowledge and understanding of art and design. With this in mind, the designed digital notice board was pre-tested and evaluated.

A total of two (2) practising professional IT personnel, three (3) IT lecturers three, (3) practising professional graphic designers, and (3) graphic design students were selected to assist in the evaluation exercise. At this stage, the display design of the digital notice board signage was displayed for the professionals to view and experience the display interface to bring out their reactions. The submissions and recommendations made by these professionals helped to advance the appearance, quality and functionality of the digital display of the final designed digital notice board.

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The criteria for evaluation were centred around the overall experience of compositional structure, retention and engagement of the digital notice board (attractiveness), some technical effects, layout design, colour choice and choice of typeface.

CONCLUSION

The present study explored the factors, challenges, and effectiveness of the Interactive Digital Notice Board (IDNB) at Cape Coast Technical University. The findings of this study indicate that the IDNB has the potential to improve communication, engagement, and information dissemination in higher education. However, there are also challenges associated with the implementation and use of the IDNB, such as limited technical support, inadequate training, technical issues and glitches, limited user engagement, limited access, limited customization options, limited flexibility, poor user interface and design, insufficient consideration of user needs in IDNB design, insufficient technical expertise, inadequate planning and implementation, incompatibility with existing systems and infrastructure, concerns about privacy and security, perceived low value, insufficient marketing and promotion, resistance to change, perceived high cost, lack of buy-in from key stakeholders, limited availability of technical resources, and lack of support from institutional leadership.

The authors successfully executed a complete prototype digital notice board (display board) with the sender or the administrator display interface. The authors achieved this objective by considering the various factors in designing of digital notice board such as choice of colour, font type, manoeuvring, focus techniques and findings resulting per the study. The interactive digital notice board was designed, constructed, and tested satisfactorily and was found worthy to display and disseminate emergency information.

Practical Implications

The findings of this study have practical implications for the implementation and use of IDNB in higher education. To maximize the potential benefits of the IDNB, institutions should provide sufficient technical support and training to users, address technical issues in a timely manner, involve key stakeholders in the implementation process, allocate sufficient resources to the implementation process, and ensure that the IDNB is accessible, customizable, and flexible.

Social Implications

The findings of this study also have social implications for the use of technology in higher education. The use of IDNB and other technologies in higher education has the potential to enhance communication, engagement, and information dissemination, which can ultimately improve the quality of education. However, it is important to recognize that the implementation and use of technology can also have unintended consequences, such as exacerbating social and economic inequalities. Therefore, it is important for institutions to be aware of these potential consequences and to develop strategies to address them.

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Recommendations

To ensure that traditional notice boards used for the purpose of communication in academic institutions; especially tertiary education and other organizations are enhanced through digitalization, the following recommendations are made;

1. Every Higher Institution should employ this system (digital notice board) for the purpose of delivering emergency or critical messages to their audience (students) for quick responses to any key academic updates.
2. Since there is continuous advancement of technology escalation in communication, it would be appropriate for every Higher Institution to adopt this digital notice board for communication among internal and external stakeholders

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