EXPERTS' EVALUATION OF THE INTEGRATED SCREENING SYSTEM FOR FAST AND ACCURATE COVID-19 MITIGATION

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ABSTRACT. *This study aimed to evaluate the Integrated Screening System (ISS) for a fast and accurate COVID-19 mitigation developed and implemented at the University of Science and Technology of Southern Philippines Cagayan de Oro City, Philippines, and Caraga State University Cabadbaran City, Philippines. This study utilized the technical developmental design. The main instrument used in evaluating the newly developed ISS was adapted from the study of Arante (2018). The evaluators of this study were the experts in electronics technology, electrical technology, mechanical technology, information technology, and health and safety. Based on the study findings, the integrated screening system is highly acceptable in terms of design, construction, and availability of materials, functionality, and usability. The ISS is regarded as excellently constructed and responds to the need during this pandemic.*

Keywords: Acceptability, Expert's evaluation, integrated screening system, Covid-19 mitigation, Electronics, Prevention

INTRODUCTION

The COVID-19 pandemic is the defining global health crisis of our time. The virus has expanded to every continent except Antarctica since its inception in Asia late last year, making it the most challenging issue we have faced since World War II. As of March 2020, the coronavirus disease 2019 (COVID-19) outbreak was caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Despite global efforts for containment, it is progressing to a pandemic level, involving 101 countries with more than 100,000 confirmed cases [1]. Early detection was the most effective strategy to stop the spread of the disease. The majority of countries use a combination of early detection and prevention techniques [2].

According to WHO (2020), the best way to prevent and slow down transmission is being well informed about the COVID-19 virus, the disease it causes, and how it spreads. This idea encourages the development of a prospective technology for identifying the infection, such as a drone that can do thermal screening without the need for human participation [2]. The only way to combat COVID-19 is to prevent people from coming into touch with people who are infected with the virus by identifying cases early and reducing interaction [3].

A system is required that can effectively restrict an infected or suspected person from entering premises, viz. an office, a public place, or any establishment where people may gather around to control the spread of the virus at least to some substantial extent [4]. With an increasing number of suspected and symptomatic individuals to be tested for COVID-19, there has been a need for a safe and efficient screening system [1].

Current practices done to avoid the spread of the virus are the conduct of temperature checking, spraying disinfectant to hands, and maintaining social distancing. Other practices include advertisements, wearing of face mask, face shield, and manual filling-out of contact tracing forms upon entering any establishments, which are time-consuming. The first two mentioned are done mainly with the help of human intervention, which is risky to both parties. The proponent of the study observed the practices done by the business establishments at the Cagayan de Oro City. They are presenting of QR Code for contact tracing, vaccination card, temperature checking, and disinfection of hands using hand spray. These things are done separately with human intervention putting both parties at risk for COVID-19 infection.

In other embodiments, the existing artificial intelligence-based system for COVID prevention is only limited to temperature checking, face mask recognition, and speech analyzer. Moreover, the system is expensive.

Statement of the Problem

Establishments following the minimum health standards set by the Inter-Agency Task Force of the Philippines provide thermal scanners and disinfectant sprays or sanitizers to its clients, usually done by a person assigned. This measure might still put the concerned person at risk and cause the spread of the coronavirus from the infectious people to the person who does the screening process [5]. There is a need for an artificial system that will help do the screening and monitoring process without the need for human intervention that is fast and without compromising its accuracy.

The research study was conducted to help promote the minimum health standards set by the Inter-Agency Task Force (IATF) in the Philippines. Likewise, it sought to answer the following:

1. What is the level of acceptability of the newly developed system in terms of:
    1.1 designs, construction, and availability of materials;
    1.2 functionality; and
    1.3 usability?

Novelty

The invention relates to the existing patented Artificial Intelligence Based System for COVID Prevention. This invention presents a novel integrated screening system that combines distance sensing, temperature sensing, disinfectant spray, face mask detecting, and QR code reading for contact tracing.

Conceptual Framework

This section of the research paper discusses the direction of the study.

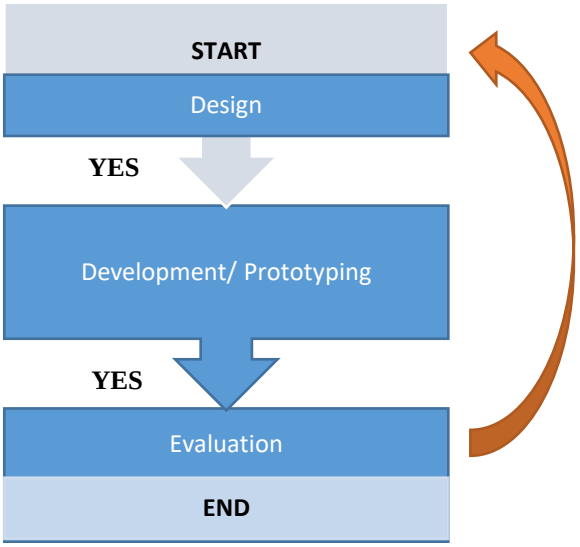

Figure 1. Process flow of the research project.

Design. It is the first stage wherein the system was designed based on the existing limitations of the present screening systems used in many business establishments.

Development. At this stage, the prototyping of the system took place. The innovation was developed using the following primary method: coding and construction.

Evaluation. The developed technology underwent a simulation and was evaluated by the selected experts for its technicalities, and if the system fails, the researcher shall go back to the first stage.

Figure 2. The Evaluated Newly Developed Integrated Screening System (ISS).

MATERIALS AND METHODS

Research Design

The study used the Technical Developmental Research Method. Technical Developmental Research Method refers to developing projects or prototypes, instructional materials, fabrications, programs, systems, and the like [6]. This method was utilized for the fabrication of the integrated screening system.

Research Environment

The study was conducted at the Southern Philippines University of Science and Technology (USTP), Cagayan de Oro, and Caraga State University Cabadbaran City (CSUCC). The vision of the USTP is to be a nationally recognized S&T University providing the vital link between education and the economy. Its mission brings the world of work (industry) into the actual higher education and training of students. It offers entrepreneurs the opportunity to maximize their business potentials through a gamut of services from product conceptualization to commercialization; contribute significantly to the National Development Goals of food security and energy sufficiency through technology solutions.

Evaluators

The evaluators of the study were eleven (11) experts from the field of electrical, electronics, information technology, mechanical, and health and safety.

Research Instrument

The study adopted the standardized instrument taken from the study Design and Assembly of an Improvised Logic Gate Simulator [7][8] evaluation instrument, which was also implemented at Caraga State University Cabadbaran City. The instrument contained several parameters that would help determine whether the newly constructed ISS's design, construction, and availability of materials, functionality, and usability exhibited desired quality.

Scoring Procedure

Experts' evaluation of the integrated screening system's acceptability is quantified using the following assigned weights as follows:

Interpretation	Range	Weight	Acceptability
Strongly Agree	3.70- 4.00	4	Highly Acceptable
Agree	2.80- 3.6	3	Moderately Acceptable
Disagree	1.90- 2.79	2	Acceptable
Strongly Disagree	1.00 -1.89	1	Not Acceptable

Data Gathering Procedure

The data gathering instrument was given to the experts prior to the actual evaluation. Then each evaluator was asked to sign up in the newly developed ***ustpeiss.site*** website for QR code generation. Once a QR code was generated, the expert then proceeded to the ISS to experience its operation by first passing the distance sensor, facing the camera for temperature checking, and presenting the QR code for contact tracing. The temperature and the person's name shall be seen on the monitor screen. After that, the expert then placed their hands on the automated alcohol dispenser for disinfection. Lastly, a voice saying "Thank you" shall be heard. It is then that the experts put their ratings to the evaluation instrument.

Statistical Tool

Mean was used to analyze the data in determining the acceptability of the ISS in terms of design, construction, and availability of materials, functionality, and usability.

RESULTS AND DISCUSSION

Acceptability of Integrated Screening System

The data used to determine the acceptability of the

integrated screening system were collected and analyzed from the experts' responses. These data were analyzed and presented in Tables 1-3.

Table 1. Acceptability of integrated screening system in terms of design, construction, and availability of materials.

Design, Construction, and Availability of Materials	HA (4)	MA (3)	A (2)	NA (1)	TWP	$\bar{x}$	VD
Integration of safety features.	11	0	0	0	44	4.00	HA
Portability and compactness of the project.	10	1	0	0	43	3.91	HA
Material's availability in the local market.	11	0	0	0	44	4.00	HA
Accessibility of vital components for easy replacement.	11	0	0	0	44	4.00	HA
Availability of necessary tools and equipment used in assembly.	11	0	0	0	44	4.00	HA
The durability of the project.	11	0	0	0	44	4.00	HA
Technical quality of the project.	11	0	0	0	44	4.00	HA
Space maximization.	11	0	0	0	44	4.00	HA

Table 1 revealed that the experts regarded the design, construction, and availability of materials of the ISS as Highly Acceptable with mean ratings of 4.00, 3.91, 4.00, 4.00, 4.00, 4.00, 4.00, 4.00, respectively. It was evident that none of the participants had rated the ISS as Not Acceptable. These findings implied that in terms of design, the ISS has an integrated safety feature, portable and compact, durable, has technical quality, maximizes space that those sold in the market with the same quality. Furthermore, the materials, components, and tools used in the ISS were locally available, making it easier for convenient mass production.

Table 2. Acceptability of integrated screening system in terms of functionality.

Functionality	HA (4)	MA (3)	A (2)	NA (1)	TWP	$\bar{x}$	VD
Multi-function capability.	11	0	0	0	44	4.00	HA
Operational accuracy of vital components.	11	0	0	0	44	4.00	HA
Functional flexibility of the project.	11	0	0	0	44	4.00	HA
Quality of each desired function during operation.	11	0	0	0	44	4.00	HA
The efficiency of the techniques used in operation.	10	1	0	0	43	3.91	HA

Table 2 shows the acceptability of the integrated screening system in terms of functionality. The results showed that the experts evaluated the ISS as High Acceptable in terms of functionality with weighted means of 4.00, 4.00, 4.00, 4.00, 4.00, respectively. It can be noted that none of the experts evaluated the ISS as Not Acceptable. These findings indicated that the ISS operated according to its designed function and showed the efficiency of the techniques used in operation. Moreover, the ISS received a very satisfactory comment from one of its evaluators and added that it responds to the need during this pandemic. Using a mobile application that scans and generates QR codes can save many papers while maintaining social distancing [9].

Table 3. Acceptability of integrated screening system in terms of usability.

Usability	HA (4)	MA (3)	A (2)	NA (1)	TWP	$\bar{x}$	VD
Project's simplicity of operation.	11	0	0	0	44	4.00	HA
Effectiveness in translating theories and principles into practical operation.	11	0	0	0	44	4.00	HA
Usability of the project as instructional material in the field of Electronics.	11	0	0	0	44	4.00	HA
Usability of the project to motivate learning.	11	0	0	0	44	4.00	HA
Stimulation of creativity.	11	0	0	0	44	4.00	HA
Project's usability as a prototype for mass production.	11	0	0	0	44	4.00	HA
Usability in motivating prevention against the covid-19 virus	11	0	0	0	44	4.00	HA

Table 10 exhibits the acceptability of the integrated screening system in terms of usability. The data shows that the experts regarded the ISS as Highly Acceptable with a unanimous mean of 4.00. It indicated that none of the evaluators rated the ISS as Not Acceptable. These findings clearly show that the system has a simple operation. It can effectively translate input signals into practical operation. It can also be used as an effective means for maintaining health and standard protocols to prevent the spread of the coronavirus. Furthermore, experts commented that the ISS has full potential and may be a starting point in the potential integration of equipment from the field of medicine, such as x-ray. It was recommended for mass production. They also commented that a QR code could be a dependable way to deal with a public health emergency. It is a routine instrument to improve public health, a way to speed up the recovery of social activities; a way to help policymakers make sound decisions; and a long-term solution that allows for scalability. [9][10]. Having facilities for hand washing, especially in public places such as markets, malls, schools, and other establishments, is necessary to prevent too spread of the virus. [11] It is essential in reducing hospital-acquired infection with adequate hand hygiene (HH) among health care workers (HCWs).

CONCLUSION AND RECOMMENDATION

CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

1. The Integrated Screening System is highly acceptable with respect to design, construction, and availability of materials, functionality, and usability.
2. The Integrated Screening System is potential for mass production and answers the need during this COVID-19 pandemic.

RECOMMENDATION

Although the Integrated Screening System showed high acceptability, adding a warning message for high temperature and a catch basin for excess alcohol coming out from the automatic dispenser can be considered for future study improvement.

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