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About the Cover: *Cross Section* (2023) by Robert Besana. AI-generated art using Midjourney. The chair placed at the center invites us to sit down and witness how technology has encompassed every facet of daily life.

A NOTE FROM THE EDITOR:

Welcome to the inaugural issue of Chronicle.

I am pleased to introduce this pioneering publication that locates itself at the intersection of technology, design, and culture. In an era defined by rapid advancements and evolving societal dynamics, Chronicle aims to provide a comprehensive platform for critical analysis and collaborative exploration. It seeks to bridge the gap between the fast-paced developments in technology and the intricate nuances of design, all while being deeply rooted in the rich tapestry of human culture. Our multidisciplinary approach encourages scholarly contributions that interrogate the impacts of technological innovations on the world we live in, examining the symbiotic relationship between design, society, and emerging technologies.

With an unwavering commitment to scholarly rigor, Chronicle strives to uphold a benchmark of excellence and academic integrity. Each published article is carefully vetted through a rigorous peer-review process, ensuring that it reflects a diverse array of perspectives and offers original insights. Our ultimate objective is to cultivate a vibrant community that brings together academics, industry professionals, and artists, all driven by a shared passion for exploring the connections between technology, design, and culture.

We wish to extend our heartfelt gratitude to our esteemed authors, dedicated reviewers, the Editorial Advisory Board, and our tireless production team for their invaluable contributions, which have made this inaugural issue a reality. As we embark on this intellectual journey together, we invite you to immerse yourself in the groundbreaking research and transformative ideas that lie within the pages of Chronicle.

Welcome, and let the dialogue begin.

Elvin Amerigo Valerio
Editor-In-Chief

ARTICLES

Effectiveness of Evidence-based Instructional Practices on Students' Mathematics Achievement: A Meta-Analysis

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Abstract

Examining trends in the literature regarding evidence-based instructional practices (EBIPs) enables mathematics educators to make well-informed decisions when selecting effective teaching strategies for their classrooms. The evidence-based pyramid suggests that systematic reviews, such as meta-analyses, are the highest level of evidence in a particular field. This study aimed to systematically analyze existing empirical studies on the impact of different evidence-based instructional approaches on students' mathematical achievement. Using a meta-analysis research design, 28 studies were examined. The findings indicated that, overall, EBIPs are successful in improving students' mathematical content knowledge and skills. Furthermore, the study revealed that among the EBIPs explored, teaching with cases was the most effective for elementary learners, while upside-down pedagogy yielded the best results for high school students. Additionally, the results showed that teaching with cases facilitates short-term comprehension of mathematical concepts, whereas upside-down pedagogy promotes long-term understanding.

Keywords: *meta-analysis, upside-down pedagogy, teaching with cases, POGIL, mathematics education, evidence-based practice*

Introduction

In recent years, pedagogical research has been focused on finding ways on how students' achievement may be enhanced. One of the trends in education research is the implementation of evidence-based teaching (EBT) (Borrego & Henderson, 2014). The evidence-based practice was originally implemented in the fields of clinical medicine and nursing wherein the available empirical evidence in the literature is integrated into clinical practice (Groccia & Buskist, 2011). In the field of education, one way to implement this evidence-based approach is by employing various evidence-based instructional practices (EBIPs). EBIPs are approaches to teaching that have been empirically shown to be effective in promoting and developing students' conceptual understanding (Burns & Ysseldyke, 2009; Sturtevant & Wheeler, 2019).

While there are a lot of teaching strategies available in the current literature that have been found to be effective in improving students' achievement, to our knowledge, there is no existing list of EBIPs in mathematics. In the existing literature, the only available list of EBIPs is for Science, Technology, Engineering and Mathematics (STEM) in general (Sturtevant & Wheeler, 2019). Such a list of EBIPs in mathematics is deemed to be of importance for teachers since it can serve as a guide on how and why students' mathematics proficiency is attained in a particular setting (Petty, 2009). The list is likewise important so teachers can easily choose and employ different teaching strategies that work.

Furthermore, within the realm of mathematics education, there exists a wide array of instructional approaches that can be classified as EBIPs. Given this extensive array, the present study narrows its focus to just three specific subsets of EBIPs. These subsets were identified as being the least commonly employed methods among mathematics educators, as indicated by our prior investigation (Villanueva & Prudente, 2022). The three underutilized EBIPs are Teaching with Cases (TWC), Process-Oriented Guided Inquiry Learning (POGIL), and Upside-down Pedagogy (UP). The rationale behind concentrating on these less-utilized EBIPs is to offer mathematics instructors insight into alternative and effective instructional strategies for incorporation into their classrooms. In this paper, when we refer to EBIP, we are specifically alluding to these three least-used practices. Presented in Table 1 are the definitions of TWC, POGIL, and UP.

TABLE 1

EBIP	Definition
Teaching with Cases	A teaching approach that uses a case from a book, article, story, simple question, or a real-life problem with sufficient details that allow the students to analyze and come up with a?
Process-Oriented Guided Inquiry Learning	A student-centered pedagogical approach that emphasizes small group collaboration, guided inquiry, and active learning to promote deeper understanding and critical thinking in STEM education.
Upside-down Pedagogy	Also known as inverted or flipped learning, is an instructional approach where traditional classroom activities such as lectures are moved outside of class, and homework-like activities such as problem-solving and discussion occur inside the classroom, allowing for more active and interactive learning.

As part of a much larger study, this systematic review aimed to collect substantial evidence which showcases the effectiveness of different pedagogical approaches in students' mathematics performance. Regarding this, the conduct of meta-analysis, which is considered to be the highest and the most common form of establishing evidence in the evidence-based pyramid (Murad et al., 2016), was employed in this study.

This current study will be the first to investigate the factors that influence the overall effect of the abovementioned EBIPs. This would be helpful to analyze the trend in the literature about each least-used evidence-based instructional practice. Accordingly, this study aimed to provide a systematic analysis of the existing empirical studies on the effect on students' mathematical achievement of different evidence-based instructional approaches. Specifically, this sought to answer the following questions:

1. What is the level of effectiveness of evidence-based instructional practices on students' mathematical content knowledge and math skills?
2. What is the relative effectiveness of each evidence-based instructional practice compared to other EBIPs in mathematics?
3. How do moderator variables influence the effects of EBIPs?

DESIGN & METHODS

Research Design

This study employed the meta-analysis research design. Meta-analysis is a technique of combining the empirical findings of previous research to create a synthesis of evidence (Basu, 2017). In the current study, the numerical findings from the empirical studies in the literature are pooled to arrive at an estimated effect of the EBIPs on students' mathematics performance.

Inclusion and Exclusion Criteria

The following inclusion criteria needed to be met by each study to be considered for inclusion in this current meta-analysis.

1. The publication date is from 2011 to 2020.
2. Samples are students in basic education or K-12 curriculum.

3. Research design is a quasi-experimental or experimental design where a group of participants that underwent an EBIP (treatment group) were compared against a control group (no treatment group).

4. Either mathematics achievement or mathematics skills (critical thinking, problem-solving, logical thinking) are assessed in the study.

5. Sufficient statistical data needed to compute for the effect size are present (mean, standard deviation, results of the tests of difference, effect size, and sample size).

6. Any journal article, thesis, or dissertation that is peer-reviewed or published in reputable journals (Web of Science, Scopus, Taylor and Francis, EBSCO, Publish and Perish).

Study Search Procedure

After setting the criteria for inclusion, the research started the article identification using Harzing's Publish or Perish 7. This initial article identification includes the databases of Google Scholar and SCOPUS. Each database was searched using 11 keywords (Table 2) which were paired with the terms "Math" or "Mathematics." Additionally, separate searches were conducted on EBSCO, ProQuest, and Taylor and Francis databases. These three databases were purposively chosen since the authors have legal access to these databases through De La Salle University. Furthermore, EBSCO and Taylor and Francis publish major journals in the Social Sciences, especially in the field of Education. Meanwhile, ProQuest publishes thesis and dissertations from various reputable institutions all over the world. The researchers used the Advanced Search options in identifying the records published on EBSCO, Taylor and Francis, and ProQuest. The terms per category in Table 1 were used interchangeably.

TABLE 2

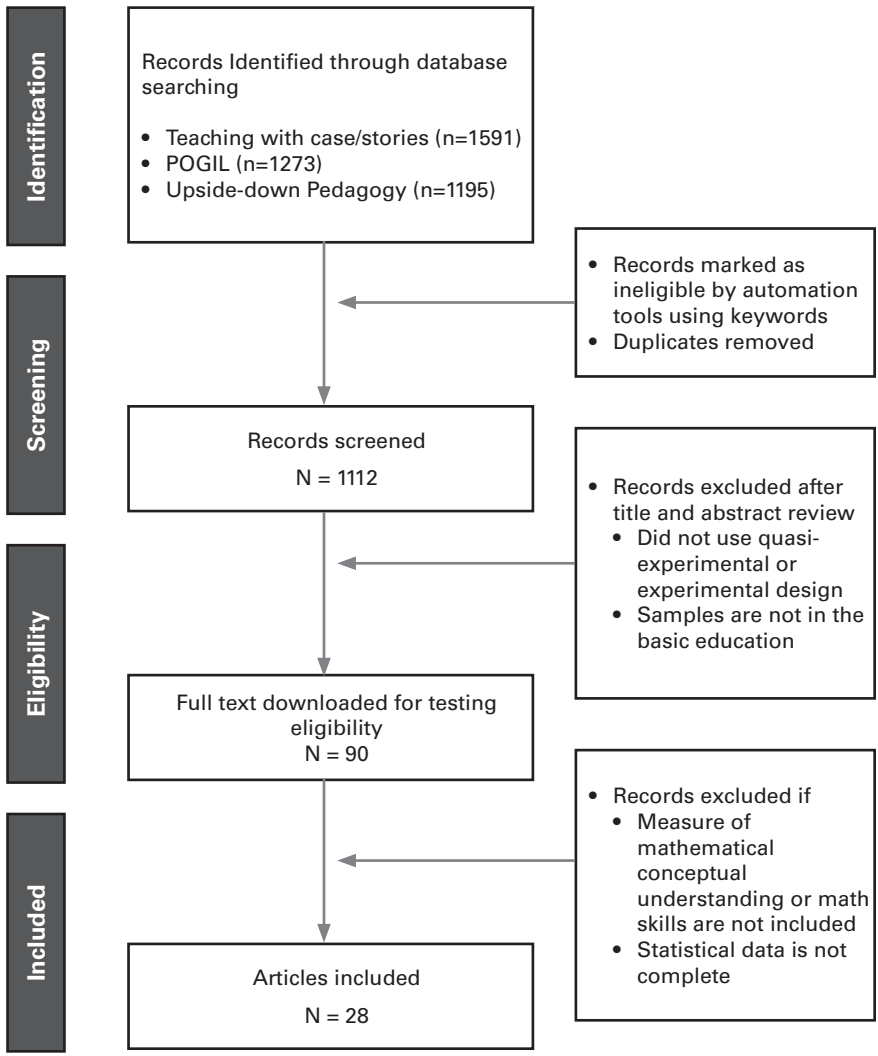
Keywords Used in the Study Search

Teaching with Cases/Stories	POGIL	Upside-down Pedagogy
Case-based	Process-oriented Guided Inquiry Learning	Upside-down
Teaching with cases	Guided Inquiry Learning	SCALE-UP
Story-based approach	POGIL	Flipped

Considering the inclusion criteria and study search procedure, 28 studies were exhausted from 4059 records which came from the initial article identification. Using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram, Figure 1 summarizes the entire search procedure for this meta-analysis.

FIGURE 1

Flow Diagram of Different Articles at Different Phases



Coding Procedure

The 90 studies which passed the screening were narrowed down to 28 studies. This is because only the 28 studies contained sufficient information to calculate the effect sizes. The included studies were coded using the following identification and the corresponding scheme: study identification (first author's last name and year of publication), source of study (article, thesis, or dissertation), students' grade level (elementary, high school, or both), EBIP model used (conventional, or with innovation), assessment coverage (single topic or cumulative), type of test used (researcher-made or adopted).

Data Analysis

The researchers utilized Meta-essentials v.1.5 Workbook 3 (van Rhee et al., 2015). Hegde's g was used to represent the effect sizes of each study. There are studies in the present meta-analysis that compared means of pretest and post-test scores of the respondents. However, in terms of means, Workbook 3 of the meta-essentials only asks for means of two independent groups. Considering this, the Cohen's d for some studies were manually calculated using the following formula:

$$Cohen's\ d = \frac{M_t - M_c}{SD_{pooled}}$$

$$SD_{pooled} = \sqrt{\frac{(n_t - 1)SD_t + (n_c - 1)SD_c}{n_t + n_c - 2}}$$

Where:

M = mean
n = sample size
SD = standard deviation
t = treatment group
c = control group (non-treatment group)

After the necessary and sufficient data for each study was entered in the Meta-essentials, data analysis including the Forest plot, estimates of heterogeneity, and publication bias were conducted. The Forest plot was utilized to understand the effect size of each study relative to the overall effect size of the meta-analysis. Additionally, the estimates of heterogeneity used in this study were Q statistic, I2, and prediction interval. Q statistic is the widely used measure of heterogeneity in a meta-analysis. However, van Aert et al. (2019), posited the Q statistic is greatly influenced by the sample size. Thus, I2 was used to compensate for the limitation concerning the sample size. Yet, Borenstein et al. (2009), argued that while I2 is not greatly affected by the sample size, it is influenced by the accuracy of statistics.

Therefore, they also suggested the use of prediction interval which is neither influenced by sample size nor accuracy of the statistics in a study. Lastly, to determine whether publication bias exists in the current meta-analysis, Funnel plot coupled with Eger's test and Begg and Mazumdar's test were utilized.

Results

The 28 articles that met the criteria are presented in Table 3. A total of 6026 students were included in the study. It can be noticed that most of the included studies implemented Upside-down pedagogy. Meanwhile, POGIL and teaching with cases both have five empirical studies involved in the meta-analysis.

TABLE 3

Coding and the Effect Size of the Included Studies

First Author	Sample Size	Hedge's g	SE	Grade level	EBIP model	Assessment Coverage
POGIL						
Ucang (2013)	188	0.98	0.15	High School	Conventional	Single topic
Muhammad (2020)	60	1.25	0.28	High School	Conventional	Single topic
Kartono (2020)	64	0.50	0.25	High School	Innovative	Cumulative
Adiningsih (2013)	50	0.14	0.28	Elementary	Conventional	Single topic
Andriani (2019)	49	0.64	0.29	Elementary	Conventional	Single topic
UPSIDE-DOWN PEDAGOGY						
Flick (2019)	206	-0.29	0.14	Elementary	Innovative	Cumulative
Martin (2015)	1329	0.92	0.06	Mixed	Conventional	Cumulative
Ripley (2015)	2370	-0.17	0.14	Elementary	Conventional	Cumulative

First Author	Sample Size	Hedge's g	SE	Grade level	EBIP model	Assessment Coverage
Zeineddine (2018)	46	0.82	0.30	High School	Conventional	Single topic
Charles-Ogan (2015)	100	1.13	0.21	High School	Conventional	Single topic
Ramaglia (2015)	520	1.95	0.11	Both	Conventional	Cumulative
Montgomery (2015)	117	3.40	0.29	High School	Conventional	Cumulative
Saunders (2014)	58	0.05	0.26	High School	Conventional	Cumulative
Kumar (2016)	82	2.06	0.27	High School	Conventional	Single topic
(Segumpan (2018)	90	-0.74	0.22	High School	Conventional	Single topic
Jackson (2019)	46	0.20	0.29	Elementary	Conventional	Single topic
Tekin (2020)	67	-0.09	0.24	High School	Conventional	Single topic
Casem (2016)	24	-0.78	0.41	High School	Conventional	Single topic
Vang (2017)	60	0.02	0.26	High School	Conventional	Cumulative
Lai (2016)	44	1.13	0.32	Elementary	Innovative	Single topic
(Jarrah, 2019)	79	0.98	0.24	High School	Conventional	Cumulative
Esperanza (2016)	91	0.42	0.21	High School	Conventional	Cumulative
(Ku 2019)	49	0.82	0.29	Elementary	Innovative	Single topic
TEACHING WITH CASES						
Gunbas (2014)	85	0.65	0.22	Elementary	Innovative	Cumulative
Özpinar (2017)	58	0.50	0.26	High School	Innovative	Cumulative
Ahmed (2014)	27	0.98	0.41	High School	Conventional	Cumulative
Zankour (2017)	30	0.92	0.37	Elementary	Innovative	Single topic
Huang (2020)	37	0.84	0.34	Elementary	Conventional	Single topic

TABLE 4

Overall Effect Size

Model	k	ES	SE	95% CI		z	p	Heterogeneity				
				Lower	Upper			Q	df	p_q	I^2	PI
Fixed	28	0.69	0.03	0.62	0.76	20.06	0.0	459.39	27	0.0	94.04%	-0.93 2.30
Random	28	0.69	0.16	0.26	1.02	4.24	0.0					

As shown in Table 4, the test of heterogeneity indicates that the effect sizes in the current meta-analysis are heterogeneous ($Q(27) = 453.39$, $p < 0.05$). Since there is heterogeneity, random effects model was considered. Furthermore, the overall effect size of 28 studies is 0.61 which implies EBIPs have a positive medium effect on students' mathematical content knowledge and math skills. Additionally, the

overall prediction interval is from negative to positive values (-0.93 to 2.30). This indicates that future studies involving TWC, POGIL, and UP may have a negative or positive effect on students' mathematical content knowledge and math skills.

The forest plot in Figure 2 exhibits the effect sizes of each included studies relative to each other and the overall effect size. Six studies included in the meta-analysis were found to have negative effect sizes. Such negative values indicate that the

FIGURE 2

Forest Plot of the Meta-analysis of 28 Studies

#	Study name	Hedges' g	CI Lower limit	CI Upper limit	Weight
1	Ucang (2013)	0.98	0.68	1.28	3.83%
2	Muhammad (2020)	1.25	0.71	1.83	3.52%
3	Shora (2020)	0.50	0.00	1.00	3.60%
4	Adiningsih (2013)	0.14	-0.41	0.71	3.52%
5	Andriani (2019)	0.64	0.07	1.23	3.49%
6	Flick (2019)	-0.29	-0.57	-0.02	3.86%
7	Martin (2015)	0.92	0.81	1.04	3.96%
8	Ripley (2015)	-0.17	-0.44	0.10	3.86%
9	Zeineddine (2018)	0.82	0.22	1.44	3.45%
10	Charles-Ogan (2015)	1.13	0.71	1.57	3.70%
11	Ramaglia (2015)	1.95	1.74	2.16	3.91%
12	Montgomery (2015)	3.40	2.85	3.99	3.50%
13	Saunders (2014)	0.05	-0.47	0.57	3.58%
14	Kumar (2015)	2.06	1.54	2.62	3.54%
15	Segumpan (2018)	-0.74	-1.18	-0.32	3.69%
16	Jackson (2019)	0.20	-0.38	0.79	3.49%
17	Tekin (2020)	-0.09	-0.57	0.40	3.63%
18	Casem (2016)	-0.78	-1.65	0.05	3.10%
19	Vang (2017)	0.02	-0.49	0.54	3.59%
20	Lai (2016)	1.13	0.51	1.80	3.40%
21	Jarrah (2019)	0.98	0.52	1.46	3.64%
22	Esperanza (2016)	0.42	0.01	0.84	3.71%
23	Ku (2019)	0.82	0.25	1.43	3.48%
24	Gunbas (2015)	0.65	0.22	1.10	3.68%
25	Ozpinar (2017)	0.50	-0.02	1.04	3.57%
26	Ahmed (2014)	0.98	0.17	1.85	3.11%
27	Zankour (2017)	0.92	0.18	1.71	3.22%
28	Huang (2020)	0.84	0.17	1.54	3.34%

result of the comparison of means favored the non-treatment group. Moreover, this result suggests that students who did not experience the EBIP treatment have performed better compared to those who underwent the treatment.

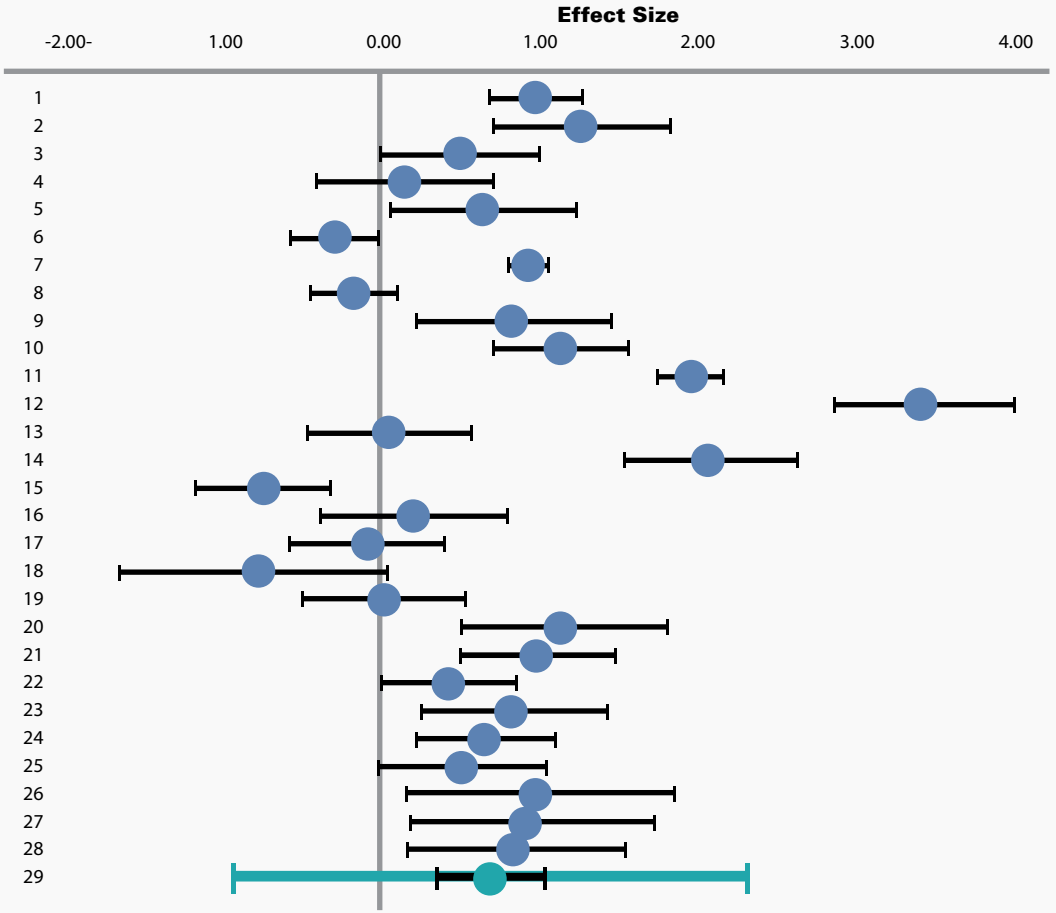


FIGURE 3

Funnel Plot of Standard Error by Effect Size

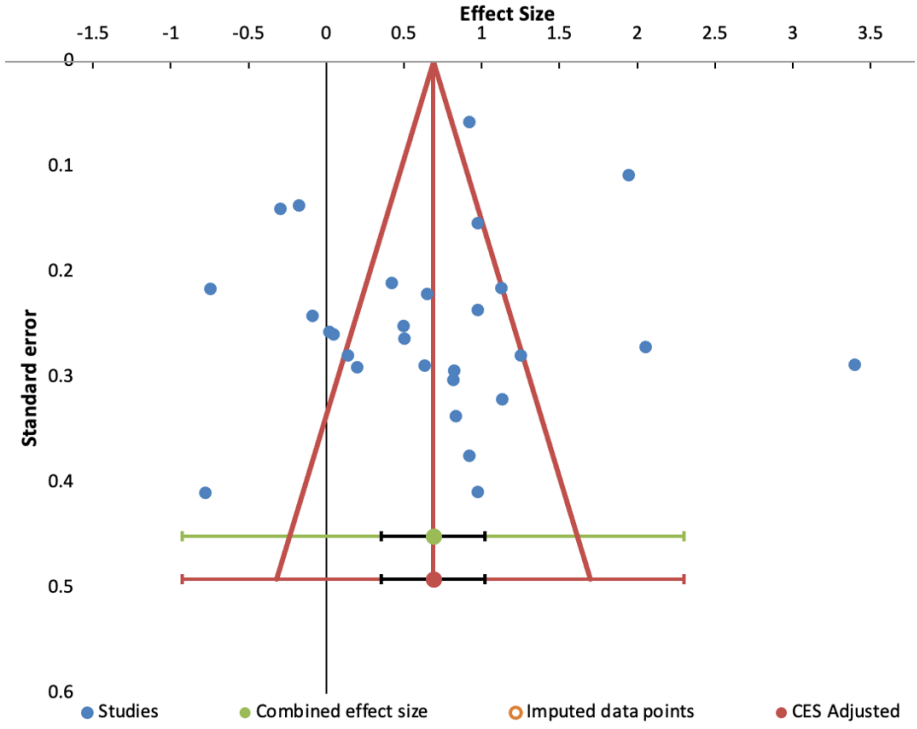


TABLE 5

Tests for Publication Bias

Egger's Test	
t test	0.03
p-value	0.978
Begg & Mazumdar's Test	
Δx-y	36.00
Kendall's Tau a	0.10
z	0.71
p	0.477
Rosenthal' failsafe-N test	
Overall Z-score	17.69
Failsafe-N	3211
Ad-hoc rule	FALSE

Figure 3 displays that there is a symmetry in the distribution of effect sizes. This symmetry indicates that there is no publication bias present in the meta-analysis. The estimate of the non-existence of the publication bias in the meta-analysis is supported by the Egger's test and Begg and Mazumdar's test in Table 5. The p-values ($p = 0.978$ and $p = 0.477$, respectively) from the two tests denote that there is no significant difference between the distribution of effect sizes in the meta-analysis and a symmetrical distribution. Moreover, Rosenthal's failsafe-N test indicates that 3211 studies averaging a z-value of zero are missing so that the combined effect size will become insignificant.

TABLE 6

Relative Effectiveness of Each Evidence-based Instructional Practice

Model	k	ES	SE	95% CI		Heterogeneity				
				Lower	Upper	Qw	p	I^2	PI Lower	PI Upper
Type of EBIP										
TWC	5	0.77	0.09	0.6	0.94	1.56	0.816	0.00%	-1.48	3.02
POGIL	5	0.70	0.37	0.33	1.03	11.20	0.024	64.29%	-1.60	3.01
UP	18	0.66	0.25	0.18	1.15	440.28	0.00	96.14%	-1.12	2.44
Students' Grade Level										
Elementary	10	0.47	0.16	0.17	0.78	46.44	0.00	80.62%	-1.48	2.43
High School	16	0.59	0.28	0.05	1.13	300.84	0.00	95.01	-1.31	2.49
Both	2	1.43	0.51	0.43	2.44	70.44	0.00	98.57%	-11.18	14.04
Assessment Coverage										
Single Topic	15	0.49	0.22	0.05	0.92	334.74	0.00	92.63%	-1.43	2.41
Cumulative	13	0.75	0.27	0.22	1.29	189.88	0.00	96.42%	-1.23	2.74
EBIP model used										
Conventional	21	0.59	0.22	0.25	0.94	518.99	0.00	96.15%	-1.61	2.8
Innovative	7	0.62	0.18	0.18	1.06	34.28	0.00	95.30%	-1.28	2.52

Table 6 displays the categorization of the 28 studies in the meta-analysis utilizing random effects model with respect to different codes. In terms of the type of EBIP used, it can be noticed that the number of studies ranged from 5 (TWC and POGIL) to 18 (UP) and the standard error of these is from 0.09 to 0.37. The overall effect size of studies involving TWC (Hedge's $g = 0.77$) is the largest while UP has the lowest overall effect size (Hedge's $g = 0.66$). Additionally, the result shows that POGIL ($Q = 11.20$, $p < 0.05$) and UP ($Q = 440.28$, $p < 0.05$) have statistically significant variances within groups which imply that the studies across POGIL and UP do not share a common effect size. On the other hand, the result reveals that there is not enough evidence to say that studies across TWC do not share common effect size ($Q = 1.56$, $p > 0.05$).

In terms of the students' grade level, it can be noted that the number of studies involving elementary, high school, and a mixture of both elementary and high school students ranged from 2 (both) to 16 (high school) and the standard error of these is from 0.05 to 0.43. The overall effect size of studies involving a combination of elementary and high school (Hedge's $g = 1.43$) is the largest while studies

involving elementary students has the lowest overall effect size (Hedge's g = 0.47). Also, the result shows studies that involve elementary ($Q = 46.44$, $p < 0.05$), high school ($Q = 300.84$, $p < 0.05$), and a combination of both ($Q = 70.44$, $p < 0.05$) have statistically significant variances within groups which imply that the studies across these three categories do not share a common effect size.

Table 6 also exhibits the characteristics of the 28 included studies according to assessment coverage. The analysis of the effect sizes within the studies that utilized single topic coverage (k = 15) and cumulative coverage (k = 13) reveals that EBIPs have greater effect on studies that utilized comprehensive assessments (Hedge's g = 0.75). Furthermore, the difference between the effect sizes of studies within the single-topic assessment is statistically significant which means they do not share common effect sizes. Additionally, there is a significant difference across the studies that made use of cumulative assessment indicating that each study does not share a common effect size.

Lastly, the overall effect sizes of studies that utilized conventional and innovative models are 0.59 and 0.62, respectively. The analysis of variance within each subgroup reveals that studies which employed conventional models do not share a common effect size. Likewise, studies that made use of an innovative model during the implementation have no common effect size.

TABLE 7

Interaction of EBIP and Students' Grade Level

EBIP	PARTICIPANTS											
	Overall			Elementary			High School			Both		
	k	ES	SE	k	ES	SE	k	ES	SE	k	ES	SE
TWC	5	0.7	1	3	0.75	0.08	2	0.64	0.08	-	-	-
POGIL	5	0.37	1	2	0.39	0.25	3	0.24	0.66	-	-	-
UP	18	0.69	0.71	5	0.32	0.28	11	0.67	0.67	2	1.43	0.51

Considering that studies within elementary and high school subgroups do not share common effect size, the researchers analyzed the interaction between each EBIP and students' grade level (see Table 7). In elementary level, the result reveals that studies utilizing TWC have the largest effect size compared to POGIL and UP. On the other hand, UP has the largest effect size among the studies which involved high school students. Moreover, it can be noted that POGIL has the lowest effect on high school students. Furthermore, the most notable difference was the effect sizes for UP participated by elementary and high school students (difference of 0.35).

TABLE 8

Interaction of EBIP and Studies' Assessment Coverage

EBIP	ASSESSMENT COVERAGE								
	Overall			Single Topic			Cumulative		
	k	ES	SE	k	ES	SE	k	ES	SE
TWC	5	0.78	1	2	0.87	0.04	3	0.65	0.11
POGIL	5	-	-	4	-	-	1	-	-
UP	18	0.62	1	9	0.51	0.31	9	0.8	0.4

Cognizant of the abovementioned results that studies within single topic and cumulative subgroups do not share common effect size, the researchers analyzed the interaction between each EBIP and studies' assessment coverage (see Table 8). POGIL studies with cumulative assessments are not well represented. The use of single-topic assessment in TWC has a larger effect size compared to the use of cumulative assessment. On the contrary, the use of single-topic assessment in UP has a smaller effect size compared to the use of cumulative assessment.

TABLE 9

Interaction of EBIP and Model

EBIP	EBIP MODEL USED								
	Overall			Conventional			Innovative		
	k	ES	SE	k	ES	SE	k	ES	SE
TWC	5	0.78	1	2	0.89	0.07	3	0.65	0.1
POGIL	5	-	-	4	-	-	1	-	-
UP	18	0.64	1	14	0.69	0.29	3	0.53	0.44

Considering that studies within conventional and innovative subgroups do not share common effect size, the researchers analyzed the interaction between each EBIP and EBIP model used by each study (see Table 9). POGIL studies using traditional models are not well represented. Moreover, conventional models were found to have a generally larger effect compared to innovative models.

Discussion

The first research question aimed at determining the level of effectiveness of EBIPs on students' mathematical content knowledge and math skills. The result shows that, in general, EBIPs have a positively moderate effect on students' mathematics achievement. The reason for such a moderate result is because five studies (Casem, 2016; A. Flick, 2019; Ripley, 2015; Segumpan et al., 2018; Tekin & Emmioğlu-Sarıkaya, 2020) were found to have negative effect sizes. This means that these studies' control groups, or the groups which received no treatment, have performed better than the treatment group. This goes to show that while EBIPs improve mathematics content knowledge, there are cases wherein the non-treatment group would perform better. These negative effect sizes from the five studies might also be the reason why publication bias does not exist. This is because even though the results from the five studies failed to show that EBIPs are more effective than traditional teaching, they were still published in reputable journals or publications.

Furthermore, the second research question aimed to assess the comparative effectiveness of each Evidence-Based Instructional Practice (EBIP). The findings indicated that Teaching with Cases (TWC) demonstrated the highest impact, with each study yielding moderate to substantial improvements in students' mathematics achievement. Moreover, the analysis of TWC studies in this investigation revealed a consistent pattern of effect sizes, suggesting the strategy's effectiveness across diverse educational settings.

Interestingly, among the three EBIPs examined, Upside-down Pedagogy (UP) garnered the most substantial body of evidence over the past decade, as evidenced by numerous studies (Casem, 2016; Charles-Ogan & Williams, 2015; Esperanza & Toto, 2016; Flick, 2019; Jackson, 2019; Jarrah & Khaled Mohammed Abdel Baki Mohammed Diab, 2019; Ku et al., 2019; Kumar Bhagat, Chang, et al., 2016; Lai & Hwang, 2016; Martin, 2015; Ramaglia, 2015; Ripley, 2015; Saunders, 2014; Segrin et al., 2015; Segumpan & Tan, 2018; Tekin & Emmioğlu-Sarıkaya, 2020; Vang, 2017; Zeineddine, 2018). This predominance can be attributed to the fact that all the studies encompassing Upside-down Pedagogy employed a flipped classroom approach, which is one of the most extensively investigated pedagogical methods in contemporary mathematics education. The popularity of the flipped classroom model stems from its incorporation of technology into instruction, aligning it with the ongoing technological revolution.

Lastly, our third research inquiry aimed to uncover the influence of moderator variables on the effectiveness of Evidence-Based Instructional Practices (EBIPs). With respect to students' grade levels, it was observed that Teaching with Cases or Stories and Process-Oriented Guided Inquiry Learning (POGIL) demonstrated comparatively lower effect sizes when implemented with high school students as

opposed to elementary students. Conversely, Upside-down Pedagogy (UP) exhibited a higher impact on high school students.

Furthermore, concerning the choice of EBIP models, we observed that POGIL studies employing traditional models were underrepresented. Notably, within the Teaching with Cases (TWC) framework, the utilization of traditional models yielded larger effect sizes compared to innovative models. Similarly, within the UP approach, the use of traditional models generated larger effect sizes in contrast to innovative models.

Regarding the coverage of moderator assessments, there was a shortage of POGIL studies incorporating cumulative assessments. Additionally, we found that the implementation of single-topic assessments in TWC was associated with larger effect sizes, whereas in UP, the use of cumulative assessments resulted in smaller effect sizes compared to single-topic assessments.

Conclusion

This meta-analysis was conducted with the primary goal of assessing the overall effectiveness of three of the least utilized EBIPs within the domain of mathematics education, while also endeavoring to make comparisons among these EBIPs. Our findings have led to several significant conclusions.

Firstly, in terms of the general effectiveness of EBIPs, the range of effect sizes observed, spanning from 0.26 to 0.97, can serve as valuable benchmarks for evaluating the effectiveness of other EBIPs that were not specifically examined in this study. These effect size ranges provide a reference point for educators and researchers seeking to gauge the potential impact of various instructional approaches within the field of mathematics education.

Secondly, our analysis has identified Teaching with Cases as the most promising EBIP for elementary-level learners. On the other hand, Upside-down Pedagogy has emerged as particularly effective for high school-level students. This distinction underscores the importance of tailoring instructional approaches to the specific developmental and educational needs of different student populations.

Thirdly, the choice of EBIP models has been shown to influence outcomes. Traditional models of EBIPs demonstrated a greater likelihood of success when compared to EBIP models characterized by innovation. This finding suggests that, in many cases, sticking to established and well-understood approaches may yield more consistent positive results.

Lastly, our analysis revealed that Teaching with Cases is especially valuable for facilitating short-term comprehension of mathematical concepts. In contrast, Upside-down Pedagogy appears to excel in promoting long-term understanding.

This distinction emphasizes the importance of considering the intended learning outcomes and the temporal dimension when selecting an appropriate EBIP for a given educational context.

In summary, this meta-analysis contributes valuable insights into the field of mathematics education by assessing the effectiveness of less commonly used EBIPs and providing guidance on their application. Educators, policymakers, and researchers can draw upon these findings to make informed decisions about instructional practices, considering the grade level of students, the chosen EBIP model, and the desired learning outcomes. This research ultimately supports the ongoing enhancement of mathematics education strategies and practices.

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Development of an Online Report Management System for Local Government Officials and Residents (e-Reklamo)

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David Andrew Guerrero
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Abstract

This paper details the development and implementation of an online report management system, referred to as "e-Reklamo" system, to help the local government constituents' express views, disputes, and complaints in the form of online reports reach the authorities. The primary target end-user of this system is the "barangay" – a smallest geographic, administrative, and political unit in the Philippines. Barangay, a small territory of a city or municipality, is governed by a council, locally called as "Sangguniang Barangay." Its primary function is to plan and implement government policies and programs in the community. With the e-Reklamo, officials can quickly respond to the concerns of its residents, hence providing a more convenient way to send reports and receive immediate feedback or actions. Through the created Android-based mobile application, reports can be created and sent to the admin website for the barangay official to respond. It includes features such as a chat system, locator using Global Positioning System (GPS), and image sending, to assist barangay officials in acquiring more accurate information on reported cases. Application trials and testing, and end-user surveys were conducted to evaluate its functionalities and features. This resulted to an overall satisfactory rating from the respondents on their experience with the mobile application and its admin website.

Keywords: *admin website, barangay, mobile application, online reporting, web application*

Introduction

A barangay is the smallest and primary administrative and political unit of the local government. Ranges of activities and events happen in the barangay that affects the lives of each citizen. There may be quarrels, squabbles, crimes, or even problems that concern the community in general. According to Mr. Reynaldo Roxas, Chairman of Barangay 757 in the City of Manila, under the administrative district of Sta. Ana, they do not have an online for their residents to report their concerns and problems. Most of which are gathered reports received in their offices or relayed through barangay officials roaming around the barangay. In case that all barangay officials are engaged in addressing the needs of their constituents, or if they are limited with the number, they will not be able to take reports from the residents. Instead, they will have to wait for the officials to be present simply to report. The employees of the barangay are at times faced with large numbers of reports and a day can simply not be enough for the employees to sort and file all the reports which can stack up. This in turn will make it harder for the barangay to take action with regard to the reports. Some reports may be simple but unsolved because the officials do not know about it yet. Some could be getting worse by the day as it does not take any action making the situation worse than it already is.

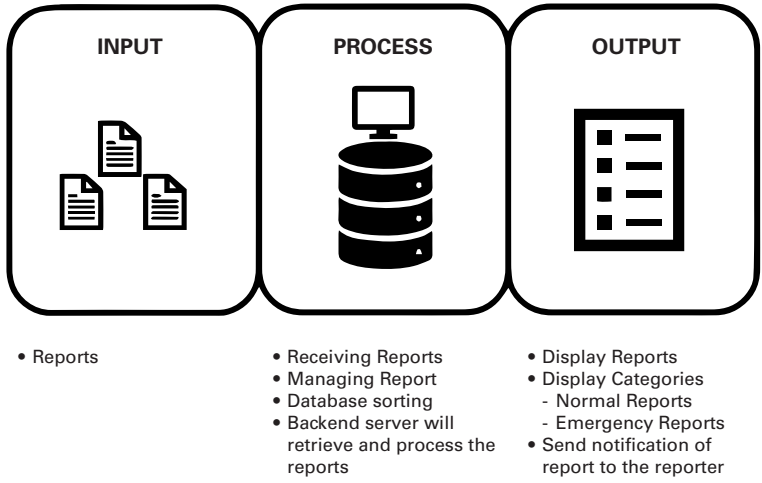
Reporting incidents, such as crimes, consumes time and effort and sometimes is ignored (Imus, Magloeo, Soriano, & Olalia, 2018). The inconvenience created by this long and tedious procedure tends to result in the resident turning a blind eye to the concerns in their barangay and often can lead to issues not being resolved. Reports that are ignored can become a big issue down the line and might even affect the entirety of the barangay if not resolved. Reporting systems can be a cornerstone to improving the overall condition of an organization. There are systems created to help track individual incidents and responses over time and helpful for common people, government organizations and different societies (Priya, Srivastava, Islam, & AMIT, 2019). Local Government Units (LGUs) have started to deploy technological solutions to further improve the efficiency and effectiveness of management and delivery of services to its residents (Garcia, 2021). The Butuan City Police Office or BCPO had the iPolice Information System - developed to help the BCPO personnel with solutions to solve the problems they are experiencing and make the response time better. The developed system used Rapid Application Development (RAD) as a development methodology along with Agile Prototyping as an approach. The International Organization for Standardization (ISO) together with the International Electrotechnical Commission (IEC) integrated models so that software quality of such a system can be measured (Bustillo, Patrimonio, & Mateo, 2020). Another application was evaluated and got good results for evaluation as it is very usable for its portability and ability to report crime covertly from a mobile phone (Sakpere, Kayem, & Ndlovu, 2015). A good management reporting

system is the foundation of a successful strategy for execution of plans in running an effective local government (Knutson, 2018). People tend to ignore or avoid reporting to the authorities incidents, and the response time of police officers to a report, including verification of report, are the other challenges that (Ocay, Trecenio, & Mairina, 2016) have been enumerated in their research.

For the barangay citizens conveniently create and send incident reports to barangay authorities, e-Reklamo has a mobile application to create and send detailed information proposed to offer a faster and time-efficient reporting and filing of incident reports or complaints. The mobile application will categorize the reports received and will help record the reports more easily for the barangay personnel. The mobile application will also help encourage residents to become more responsible residents, hence enabling the barangay to be more alert and ready to respond to a report at the soonest time. Figure 1 illustrates the input, process, and output of the proposed system.

FIGURE 1

Barangay Reporting System Conceptual Framework



The general objective of this research is to develop a system for the people of the barangay to send reports and barangay officials to manage and respond to the reports. In addition to this, it aims to (1) enable the people of the barangay community to conveniently report issues of the barangay, (2) create a user-friendly system that is accessible to job orders and records, and (3) to provide a time efficient reporting system. While being constrained by these factors, the scope of the application would be one barangay only, when one or more barangay uses the application, the application between two or more barangays cannot communicate, and the handling of the user's data is not guaranteed to be protected even though the user agreed to the terms and agreement.

TABLE 1

Objective Metrics Description and Scale Measurement

Objectives	Definitions	Metrics	Description	Scale
Convenience	Less effort or difficulty in reporting/ receiving reports	Measured through survey like Likert Scale	Excellent	5
			Good	4.00-4.99
			Average	3.00-3.99
			Below Average	2.00-2.99
			Poor	1-1.99
User-friendliness	Easy access and navigation of the system and information are displayed clearly	Measured through survey like Likert Scale	Excellent	5
			Good	4.00-4.99
			Average	3.00-3.99
			Below Average	2.00-2.99
			Poor	1-1.99
Time Efficiency	Time invested to report or execute task in the system	Technical performance specifications testing for improved average time from reporting to receiving	Excellent	< 1 sec
			Good	1-5 sec
			Average	5-20 sec
			Below Average	20 sec - 1 min
			Poor	> 1 min

Table 1 summarizes the objectives and its metrics to be used in evaluating the proposed system. These will be evaluated through a survey via Google Forms which will be sent to the barangay officials and its residents based on a 1 to 5 scale, at 1 being the lowest and 5 being the highest rating, and then getting the average scale for the final rating.

The e-Reklamo would improve response to crimes that happen in the barangay level and constituents will be more willing to take responsibility in reporting issues and pressing matters. With the convenience of this reporting system, people will be more vigilant and barangay officials will be alert so that they can respond quickly to the needs of their barangay. Because reporting incidents in the barangay may involve barangay officials who are not doing their jobs diligently or involved in corruption activities, the personal information of residents who sent reports is ensured to be kept in confidentiality

Software Application Design

FIGURE 2

System Block Diagram

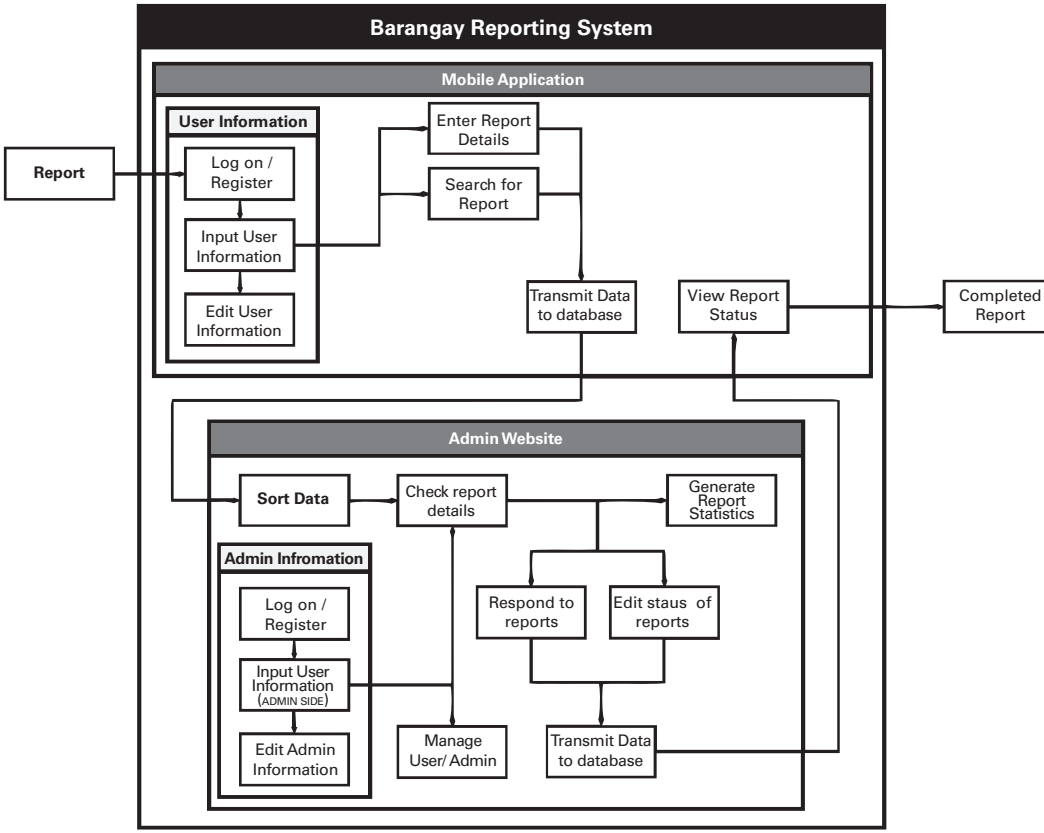


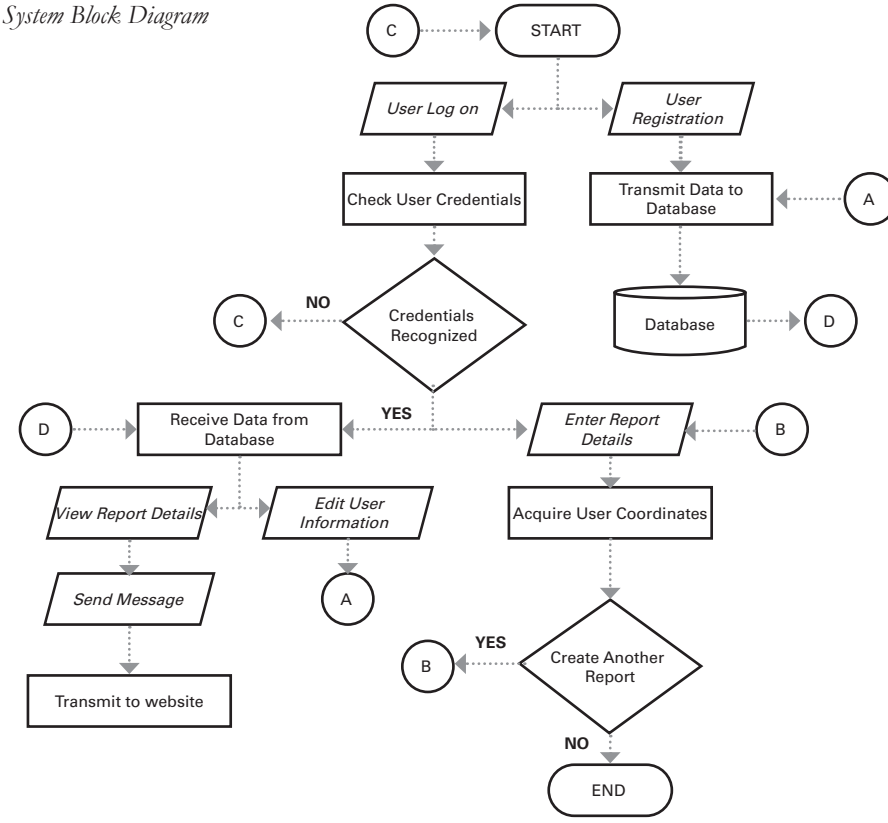
Figure 2 shows the different functions that the barangay reporting system is expected to perform. The system will start by acquiring the report from the user through the application installed in their Android mobile device. This will include the login or registration of the user, input of user details, and editing of user's information on the page. As the report details are entered, data will be transmitted into the database where it will be processed. Report can then be viewed by the user which includes the status of the report and see the updates until the report is completed.

As the data is transmitted, the admin will be able to view the data. The admin is always logged in so that they are available to respond 24/7. The application will sort the data so that the admin can determine the level of priority and assign officials who can respond to the report. With this, the report details are checked, and response is made to the reports and status is updated. Once status is updated, the data is then allowed to be viewed by the user to see whether the report is responded to and completed.

For the mobile side, the user login/registration, input user information, edit user information, enter report details, and search for report functions are to be accomplished by using Android Studio as it has the edge over Visual studio for mobile android application. Conversion of coordinates to exact locations will use Geocoder with HERE as back-up. For the get location function, Location Manager will be used, as it is already built in Android Studio. It is more user- friendly as compared to Fused Location. For the upload photo function, Picasso will be used, since it has a lot of positive feedback, and it is also easier to implement compared to other external image uploading libraries. For the website side, the log on/register, input user information, edit user information, view reports, check report details, respond to reports, edit status of report, manage users/admins, delete user accounts, and change admin password function are to be accomplished using Visual Studio Code for its support. HTML Graphs were used for generating reports and statistics, while Bootstrap tables for sorting data, for their user-friendliness and easy implementation. To store data in database, cloud-based Firebase was used as it provides a lot of functionality without having to spend a lot of time, effort, and money for its resources. Wi-Fi connection is preferred over mobile networks for faster and more stable internet in transmitting data to the database function.

FIGURE 2

System Block Diagram



The mobile application process flowchart, as illustrated in Figure 3, starts with user log in or registration. If user registration is selected, it transmits the registered data to the database, while when logs on, the system will check user credentials. If the user's credentials are not recognized it loops back (i.e., connector C) to the start of the system. If it is recognized, the user is given the option to edit user information, enter report details, or view report details. Edit user information allows the user to edit his/her information and it is updated on the database (cf. connectors A, D). Enter report details lets the user input the details of the report they want. After which, the user coordinates are acquired and transmitted to the database which is accessed by the website. The user is then asked if they want to Create Another Report. If yes, it loops back to the previous choices (i.e., connector B). Otherwise, the system process ends. View report details presents the user their report details and allows the user to send a message to the website for the admin to view.

FIGURE 4

Website Flowchart (for barangay officials)

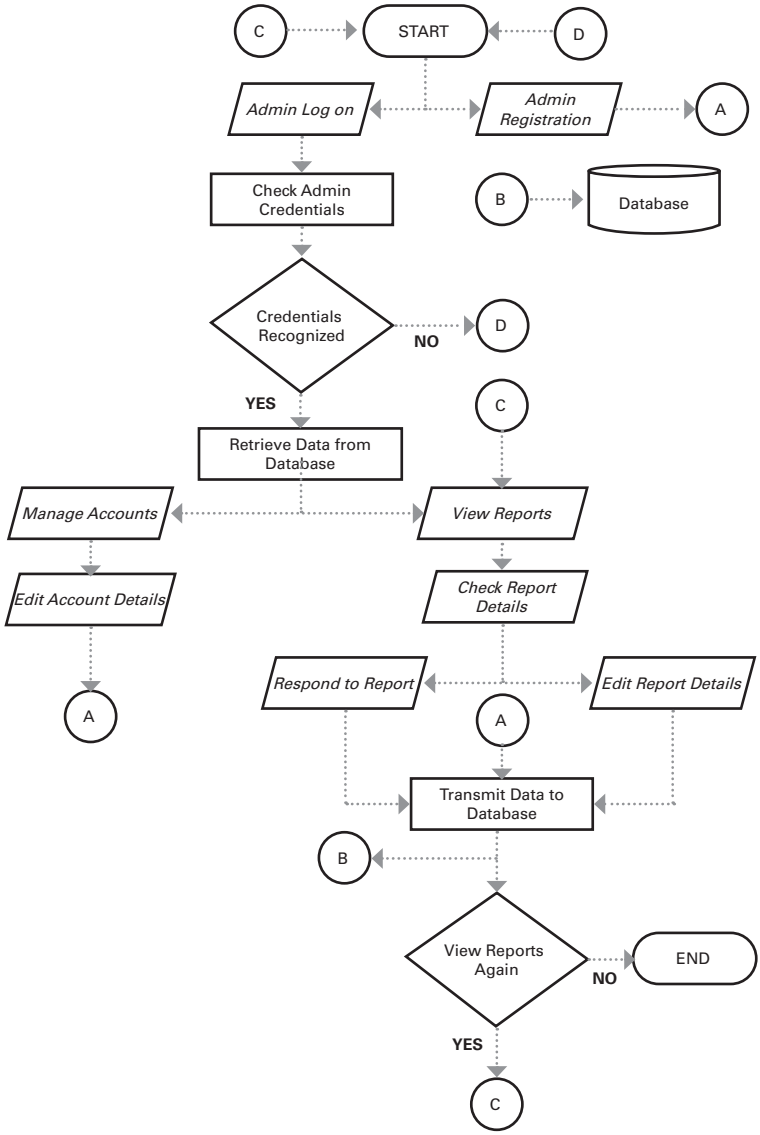
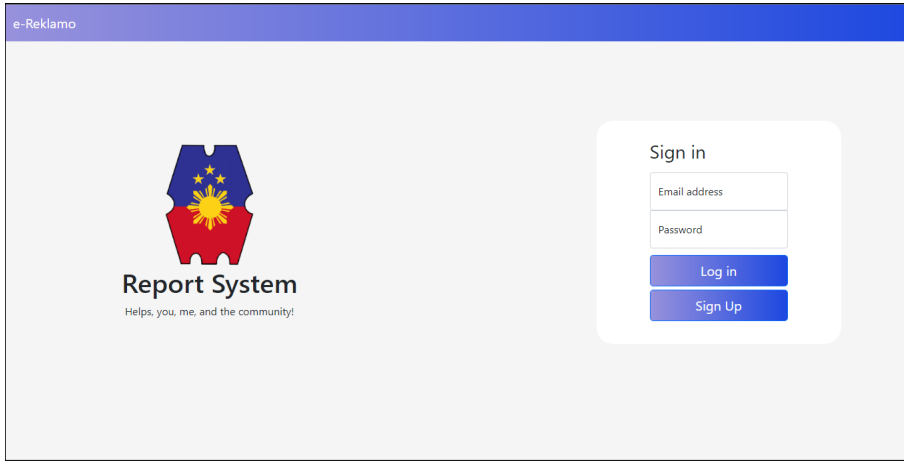
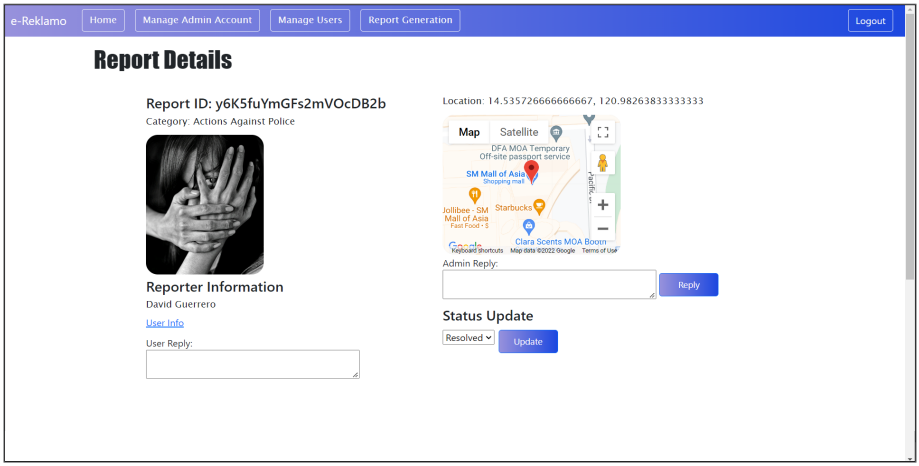


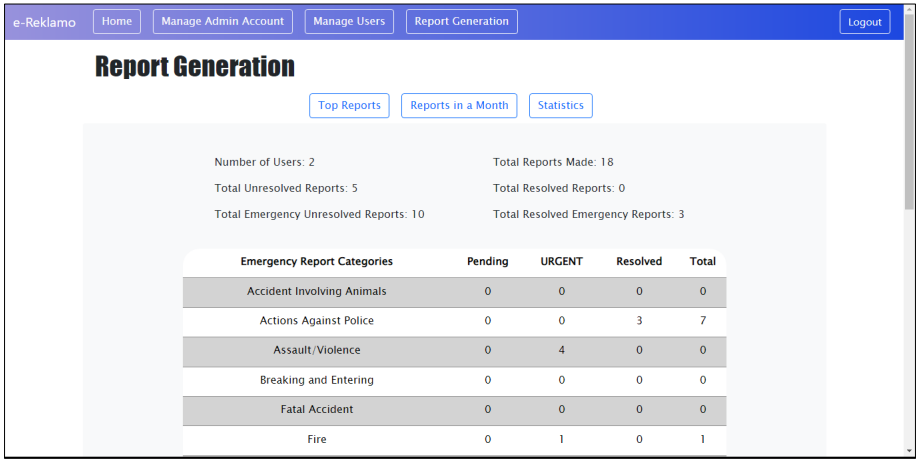
Figure 4 shows the system flowchart of the admin website. The process starts with the admin's choice to either log on or register. If the admin chooses to register a new user account, credentials are transmitted to the database (i.e., connectors A, B) for it to be stored and loops it back to the start of the system. If the admin chooses to log on, the system will check the credentials inputted. If it is not recognized, it will loop back to the start of the system (i.e., connector D) but if it is accepted, the system retrieves the required data from the database and is then presented with two options: manage accounts or view reports. When the manage accounts, option is selected, the admin can edit his/her account details and the changes made are transmitted to the database (i.e., connector A). On the other hand, when the view reports option is selected, functions enable the admin to view the reports in the database and generate a visual and check report details (i.e., connector C). This gives the admin a choice to either respond to the report or edit report details. From there, the system gets the coordinates of the report to be displayed on the map. Both choices transmit data to the database after which the admin is asked whether to view reports again or exit the program.

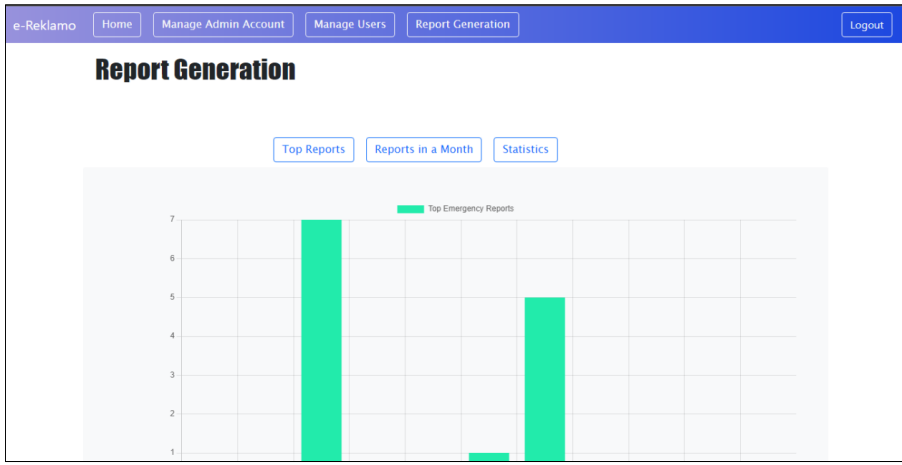
FIGURE 5

Admin Website User-Interface: a. Login Page, b. Report Details, c. Statistics Page, d. Top Report Page




e-Reklamo
Home
Manage Admin Account
Manage Users
Report Generation
Logout
Report Details
Report ID: y6K5fuYmGFs2mVOcDB2b
Category: Actions Against Police
Reporter Information
David Guerrero
User Info
User Reply:
Location: 14.535726666666667, 120.98263833333333
Map
Satellite
DFA MOA Temporary Off-site passport service
SM Mall of Asia
Shopping mall
Jollibee - SM Mall of Asia
Fast Food · $
Starbucks
Clara Scents MOA Boonn
Admin Reply:
Reply
Status Update
Resolved
Update


e-Reklamo
Home
Manage Admin Account
Manage Users
Report Generation
Logout
Report Generation
Top Reports
Reports in a Month
Statistics
Number of Users: 2
Total Reports Made: 18
Total Unresolved Reports: 5
Total Resolved Reports: 0
Total Emergency Unresolved Reports: 10
Total Resolved Emergency Reports: 3
Emergency Report Categories
Pending
URGENT
Resolved
Total
Accident Involving Animals 0 0 0 0
Actions Against Police 0 0 3 7
Assault/Violence 0 4 0 0
Breaking and Entering 0 0 0 0
Fatal Accident 0 0 0 0
Fire 0 1 0 1

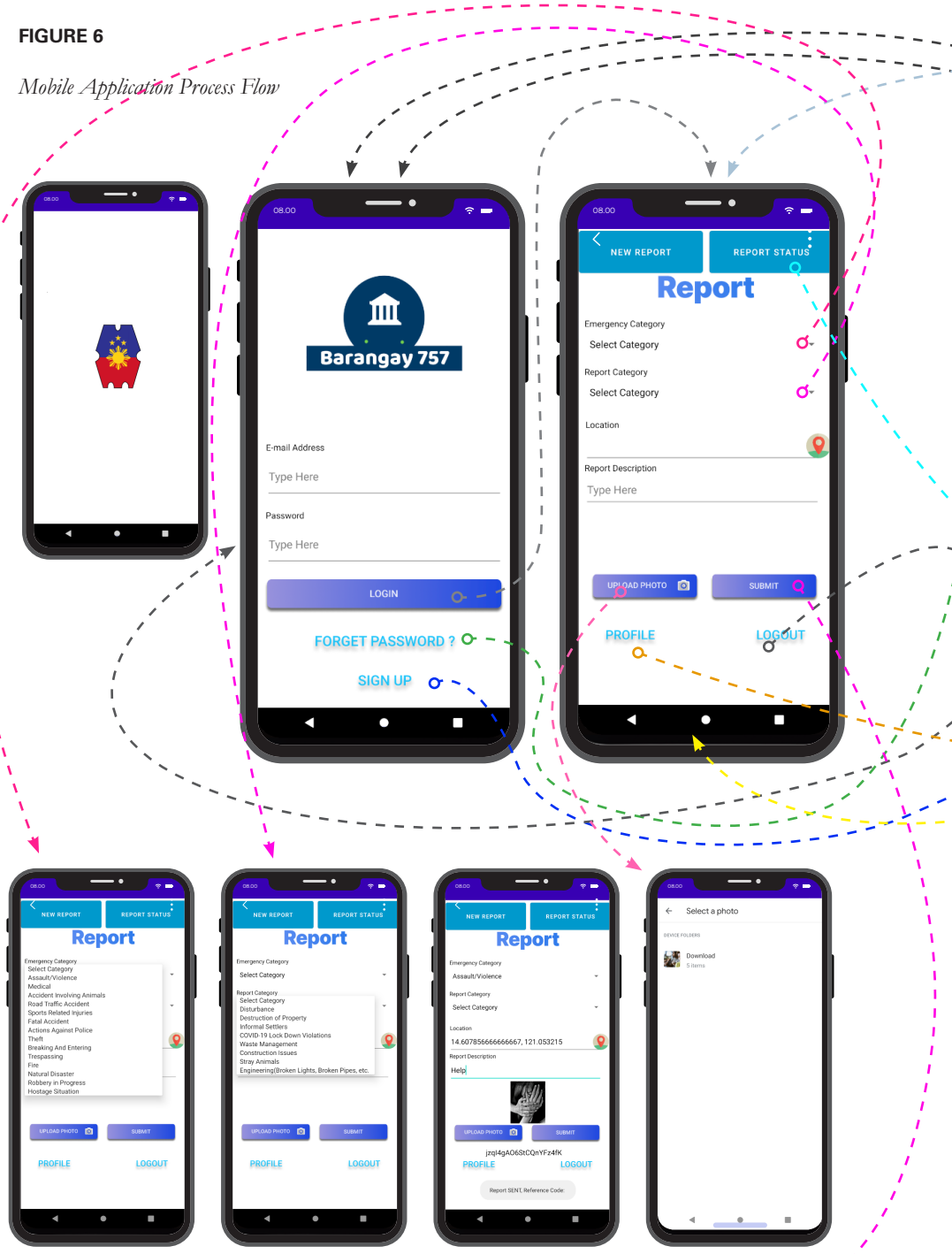


The user interface included in the admin website are pages for both login and sign-up, a homepage that displays all the reports information that were received from the mobile application presented in tabular and graphical form, and another page to display and manage users. Figure 5 shows screenshots of the login, and report pages.

Shown in Figure 6 are screenshots of the mobile app pages that a user will be able to access depending on which (user-type) module are they in (i.e., admin/official, or resident). The first module that they will see is the home screen of e-Reklamo, and once it is loaded, the user will be directed to the login module where there are several options for them to choose from. The terms and agreements page shows specific details, requirements, and other information about the use of application, including information and laws on the gathering of personal information and recording of the LGU for data recording purposes. The report submission page is classified into either general or emergency. In its location textbox, the resident can opt to either manually input the location or address of concern or click the map pin to use the GPS functionality of the phone which uses their coordinates for their current location. Additionally, the user may add a description of the situation under the report description and likewise attach a picture to support the report. Once the report is submitted, they will get a report code that can be searched in the report status page.

FIGURE 6

Mobile Application Process Flow




Forget Password
Reset your password
Please Enter Your Email Address To Reset Your Password
Email Address
RESET PASSWORD
Create Account
757RepSys
E-mail Address
First Name
Last Name
Contact No.
Address
Password
Confirm Password
I Agree with Terms And Conditions
REGISTER
Terms and Agreements
Information Collection and Use
Location Information
Security
Service Providers
Communications
Compliance With Laws
Profile
User Information
Name
Skipper Guerrero
E-mail
skipperguerrero70@gmail.com
Contact No.
09228984397
Address
3090 Makati Sample
EDIT INFORMATION
CHANGE PASSWORD
Change Password
User Information
Old Password
New Password
Confirm Password
UPDATE PASSWORD
Update Profile
User Information
First Name
Last Name
E-mail
Contact No.
Address
UPDATE INFORMATION
NEW REPORT
REPORT STATUS
Report Status
Enter Report ID
SEARCH
Reply
SUBMIT
Report Category
Report Description
Status
Reply
4GwaBdXtPcf5qZ8zn08M
We need help
Assault/Violence
Violence
Resolved
Case ongoing
Reply Sent

Software Testing and Evaluation

In order to verify and validate both the mobile and web application's functionality according to their design specifications and feature objectives : (1) convenience, (2) user-friendliness, and (3) time efficiency, functional tests were conducted from the residents of four (4) barangays: Barangay 757 of Manila City, Barangays Kasilawan and Bangkal of Makati City, and Barangay 183 of Villamor Air Base in Pasay City, to participate for the mobile application survey, while ten (10) barangay officials of Barangay 757 of Manila City were asked to get their opinions about the convenience and user-friendliness of the admin website, and solicit additional information about ways to improve the usefulness of both the admin website and the mobile application for their residents.

Mobile Application

The end users are given an initial demo of how the app works and are given a brief discussion about its hand-in-hand function with the Firestore database as well as an explanation of what happens to the report sent. After this, they are given the chance to navigate the app on their own before giving out the Google form link for the survey. Initially, most of the residents were happy with the idea of the application, but most of the remarks said while navigating the app is connected to its UI. A lot of the respondents said that the UI is too filled, or the icons and labels are too small. There were a few instances wherein the app was slow - from logging in, acquiring the GPS location, and submitting a report, due to the use of the mobile data service latency. The time execution testing of the mobile application used Google Stopwatch package initializing on key press and on the end of the code execution. This process was also applied for the login, GPS location, submit report and view report status.

TABLE 2

Convenience Evaluation Results

Objective	Number of respondents	Questions	Average Response Rating	System Rating
To enable the people of the barangay community to instantly report issues to the Barangay that is convenient to both the reporter and the recipient of the report	28	Amount of time it took to submit a report	4.14	4.25
		Ease in sending report to the barangay	4.39	
		Usefulness of our application	4.61	
		Performance/stability of e-Reklamo	3.86	
		Sending and Receiving chats regarding your report through the application	4.25	

Table 2 shows the five (5) survey questions on convenience with the use of mobile applications. Among the 28 survey respondents, the application got a 4.25 rating with usefulness of the application in sending report with the highest rating of 4.61, and performance stability of the app at a rating of 3.86 as the lowest.

TABLE 3

User-friendliness Evaluation Results

Objective	Number of respondents	Questions	Average Response Rating	System Rating
To make the system user-friendly and accessible to job orders and records	28	Clarity of the icons in the application	3.64	3.91
		Clarity of the reporting features of the application	3.96	
		Responsiveness of the application	4.00	
		Feedback of the reporting and report status functions of the application	4.25	
		Navigation and design of the application	3.71	

Table 3 shows the five (5) survey questions on user-friendliness with the use of mobile applications. Among the 28 survey respondents, the application had a relatively lower rating of 3.91 rating with the reporting feedback and status functions with the highest rating of 4.25, and clarity of the icons in the app at a rating of 3.64 as lowest.

TABLE 4

User-friendliness Evaluation Results

Function	Number of Trials	Time Delay Range (ms)	Time Delay Average (ms)	Rating
Login	10	574.9 - 717.7	629.02	Excellent
Sending Reports		1.32 - 3.03	2.11	Excellent
Viewing Report Status		4.56 - 192.4	23.717	Excellent
Acquiring GPS		8.81 - 14.98	11.28	Excellent

Table 4 shows the time efficiency in testing the mobile application on its key features. The average time delay to log-in, sending and viewing reports, and acquiring GPS location is ranging between 4.5 to 5.5 ms, but in one of the test cases, it extended up to 192.4 ms due to problem in connecting to the cloud database resulting in several request timeouts. Eventually, it was able to connect. The timing component is embedded in the code, specifically in the success or failure listeners of each function.

Based on mobile compatibility testing of the e-Reklamo mobile application, most of the newer and widely used Android operating system supports the functions of the e-Reklamo mobile application as well as communicating with the Firestore database. Phone models used in the testing are: Samsung Galaxy A22, Honor Play, Samsung a55 5G, Samsung a55, Redmi Note 9, Oneplus 7, Vivo V21, Asus Zen phone 6, Huawei Nova 5t, and Pocophone F3.

Admin Website

The evaluation of the admin website involves interview with the barangay officials of Barangay 757, including their chairman. The demonstration includes applications running along on the mobile application and explaining the objectives and purpose of its website to them. It showcased all the modules that the admin website has in tandem with the mobile application for sending sample reports. In the demonstration, the proponents also allowed the barangay officials to navigate the admin website for themselves. Afterwards, the survey linked to the Google forms

were shared for them to rate the prototype and share their thoughts regarding the application. There were comments on the benefits of this system being implemented, and it seemed that they had no negative comments other than the absence of a notification system for both the mobile application and the admin website.

The testing for time efficiency for the admin website was done through setting a time at the start of the function to the end of the function within the program. Tested items are for the login, viewing tables, viewing reports, send reply, and update status. For the viewing tables, list of reports and its details, the timer starts when the user lands on the home page and all the data in the Firebase has successfully printed and displayed on the website. For send reply and update status, the timer starts after the user clicks the button, and the timer ends once the data is sent to the Firestore cloud database.

TABLE 5

Convenience Evaluation Results

Objective	Number of respondents	Questions	Average Response Rating	System Rating
To enable the people of the barangay community to instantly report issues to the Barangay that is convenient to both the reporter and the recipient of the report	10	Presented Information by the website	5.0	4.96
		Ease in receiving report	5.0	
		Usefulness of our website	4.9	
		Performance/stability of the website	4.9	
		Experience of receiving and sending chats regarding reports through the website	5.0	

In Table 5, the overall system rating for the convenience of the admin website is at 4.96/5.00 resulting in an excellent rating. The system rating was calculated by getting the average of the average response rating of the questions that came from the survey from a total of ten (10) respondents.

TABLE 6

User-friendliness Evaluation Results

Objective	Number of respondents	Questions	Average Response Rating	System Rating
To make the system user-friendly and accessible to job orders and records	10	Clarity of the icons on the website	5.0	4.92
		Clarity of report viewing features of the website	5.0	
		Responsiveness of the website	4.8	
		Feedback of the reporting and report status functions of the website	4.9	
		Navigation and design of the website	4.9	

Table 6 displays the number of respondents for the survey and the average response rating of each question for user-friendliness from the survey. The overall system rating was at 4.92/5.00, which is equivalent to an excellent rating. The system rating was calculated by taking the average response rating of the user-friendliness questions from the survey.

TABLE 7

User-friendliness Evaluation Results

Function	Number of Trials	Time Delay Range (ms)	Time Delay Average (ms)	Rating
Logging in	10	1.31 - 1.96	1.53	Excellent
Viewing Tables		168.72 - 271.12	218.04	Excellent
Viewing Report		164.79 - 221.77	205.87	Excellent
Send Reply		0.02 - 0.06	0.03	Excellent
Update Status		0.03 - 0.12	0.06	Excellent

Table 7 shows the time efficiency testing of the admin website in terms of its key features. The testing was done using PLDT internet at speeds around 10 MBPS to 20 MBPS. The Firestore cloud database is 71 MB in total size of all accumulated files. There were fifty (50) reports and their corresponding images. Logging on to the page did not have any issues at an average time delay of 1.53ms.

Summary and Recommendations

The authors were able to create e-Reklamo - a reporting system to service residents in a barangay on sending their concerns, complaints, and situations of emergencies, online. This system enabled quick, convenient, and accessible reporting and receiving of reports to both the residents and its officials. The efficiency of the e-Reklamo has proven its potential to shorten the response time of barangay officials in addressing its residents' concerns, and more importantly in saving lives. This makes it convenient for the residents to report with just a tap on their mobile devices, to have less documentation as the app has a record keeping feature, and to receive instant feedback from the officials in the barangay. The ability of the system to sort the reports received enables easy viewing, assessing, and updating of the status of the reports.

Throughout the project's creation and testing, the authors encountered noticeable issues. Hence, they would like to recommend the following to help improve the system's implementation and deployment. There are areas for improvement in making the mobile application offline ready, making it multi-platform, improving UI placements, using backward compatible plugins to support older versions of Android, and improving the consistency and stability of the application. Should this system be implemented in the future, barangays can become more efficient, officials more effective, and help residents be more proactive citizens of the community.

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Development of a GPS Location Detection and Monitoring System for NU-APC Shuttle Service Using Android Application and Web Server

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Engr. Einstein D. Yong
Engr. Juan Miguel H. Villarroel
Engr. Sergio R. Peruda Jr.
Engr. Paulo Cosio

Abstract

Shuttle service serves as a highly convenient mode of transportation for private institutions and companies seeking to travel between two locations. NU-Asia Pacific College offers a school shuttle service that accommodates students, parents, visitors, faculty, and staff who rely on public transportation from Lapu-Lapu St. to the main building of NU-Asia Pacific College. Currently, there is no existing monitoring system in place for the college's shuttle service. Consequently, several potential scenarios could arise, including unexpected incidents like hijacking or kidnapping, route changes due to refueling, unauthorized usage of the service, and insufficient capacity. To address these issues, a system has been developed that utilizes Google Maps to accurately track the shuttle's current location, capacity, and status. Additionally, the system automatically records each trip and generates historical analytics. The study's results demonstrate an impressive accuracy rate of 99.99989% in terms of GPS coordinates, thus confirming the system's reliability for real-time monitoring of shuttle activity at NU-Asia Pacific College and highlighting the significance of this technological advancement.

Keywords: *track monitoring system, transportation, web services, database, Google maps*

Introduction

Transportation is an essential aspect of contemporary society (Cascetta, 2015). In the Philippines, commonly utilized forms of public land transportation include tricycle, jeepneys, buses, and taxis (Thanatorn Chuenyindee, 2022). When people travel, it is crucial for them to stay informed about their current location, ensuring they are on the right track and aware of the distance remaining to reach their destination safely. Modern technologies, such as the Global Positioning System (GPS), play a significant role in providing secure transportation services like Grab, Uber, and Angkas.

Shuttle service proves to be an extremely convenient means of transportation between two locations (Collins Dictionary, n.d.), especially when one of the destinations is not easily accessible via public transportation. These shuttle services are reliable in terms of reaching their designated destinations within specific time frames.

Statement of the Problem

Undoubtedly, a glaring concern looms over the shuttle service operations at NU-Asia Pacific College – a concern that demands immediate attention and rectification. Astonishingly, the current scenario paints a disconcerting picture: a complete absence of any form of monitoring system for the shuttle service. This unsettling void in oversight gives rise to a series of potentially dire situations, each more alarming than the last. First and foremost, the specter of unexpected incidents, such as hijacking or kidnapping, hangs ominously over the entire operation. The absence of a monitoring mechanism magnifies the vulnerability, leaving both passengers and authorities in a state of helpless uncertainty. Adding to this unnerving landscape, the potential for abrupt route changes due to the mundane necessity of gas refilling emerges yet another lurking danger. Without a robust system in place, even the most routine operational alterations can lead to confusion, inconvenience, or worse. Compounding these concerns is the disquieting specter of unauthorized individuals exploiting the system for their own purposes. The lack of a vigilant eye allows for clandestine and unauthorized usage of the shuttle service, a perilous breach of security and propriety. Lastly, the dismaying realization of insufficient shuttle service capacity looms large, exacerbated by the absence of a mechanism to gauge and manage demand. Passengers left stranded due to capacity issues may find themselves questioning the very reliability of the service they depend upon. In the absence of a monitoring system, this multifaceted predicament deepens, highlighting a stark and urgent need for comprehensive oversight and rectification. The call for action resounds louder than ever, underscoring the pressing need to establish a robust and vigilant monitoring system without delay.

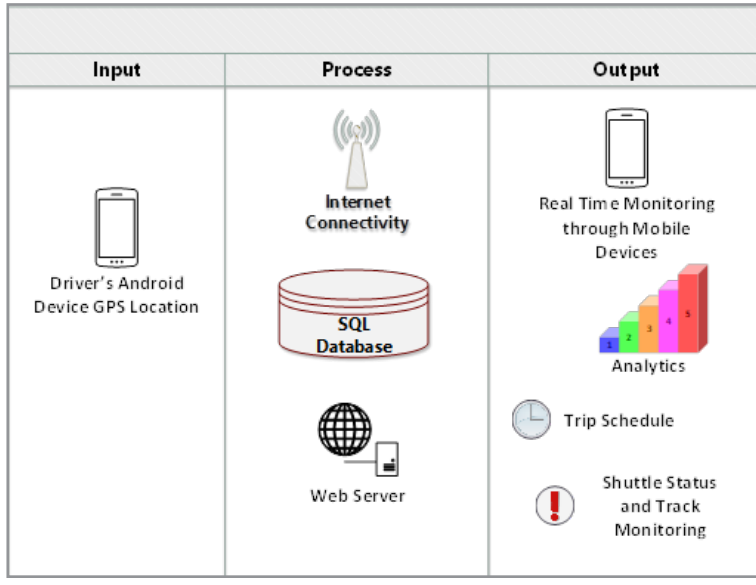
To address these concerns, the researchers propose the implementation of a

GPS tracking system utilizing an Android application through a web server. Separate Android applications will be developed for drivers and users, while administrators and users will have web access. Administrators will be able to monitor the current location of shuttle drivers and the number of trips made throughout the day via a web browser and the web server. Additionally, administrators will have access to historical data regarding the shuttle's capacity status. This data will aid in decision-making regarding the deployment of additional shuttles, based on the average daily trips for the corresponding day of the week over a four-week period (e.g., if today is Monday, the historical data will be from the last four Mondays).

Drivers will have access to the application to monitor their current number of trips and the shuttle's location. Students, faculty, and staff users can view the shuttle's current location by connecting to the Wi-Fi or using mobile data, either through the Android application or by accessing a public link within the APC main campus. The application will notify administrators if a shuttle deviates from the official route or enters an emergency status. The Administrator will be prompted to contact the shuttle driver, allowing them to verify the driver and passengers' status and determine the reason for the route change.

FIGURE 1

Conceptual Framework



The primary objective of this research is to develop a GPS Location Detection and Monitoring System for the APC Shuttle Service using an Android Application via a web server. The system aims to notify, detect, and monitor the shuttle's activity effectively. An end-user application will be meticulously designed and developed for Android devices using Android Studio, while non-Android devices will utilize PHP-HTML. Additionally, the system will generate comprehensive historical analytics based on daily time and shuttle trip capacity status to optimize overall shuttle service capacity. Rigorous testing will validate the system's accuracy in detecting and monitoring the precise GPS location of the shuttle, ensuring dependable notifications about its position on the designated track.

Objectives of the Study

The research project aims to enhance accessibility and efficiency by monitoring the shuttle's route, status, and location. Users can eliminate uncertainty about the shuttle's whereabouts and check its status through the Android application and website. Drivers will have access to monitor their shuttle trip schedules and communicate with administrators using the Android application.

The logistics staff and administrators will benefit from the web server application, enabling them to remotely monitor shuttle trip schedules, routes, and status. The generated analytics will assist in determining the required number of shuttles for specific scheduled times, minimizing inadequate shuttle service capacity daily.

Scope and Delimitations of the Study

The project's scope includes monitoring the shuttle's current location through the user's Android application or the web application. Drivers will have a separate Android application allowing them to log in, set the shuttle's status, view the schedule and trip history, and select the capacity status before each trip. The GPS location received from the driver's Android phone will be transmitted to the server and displayed to all users (students, faculty, staff, logistics, and administrators) through the Android application and web server. Logistics and administrators will have the ability to register, enable, and disable driver accounts, view historical analytics based on time and shuttle trip capacity status, and receive notifications from the web server application if the shuttle deviates from its track and contact the driver.

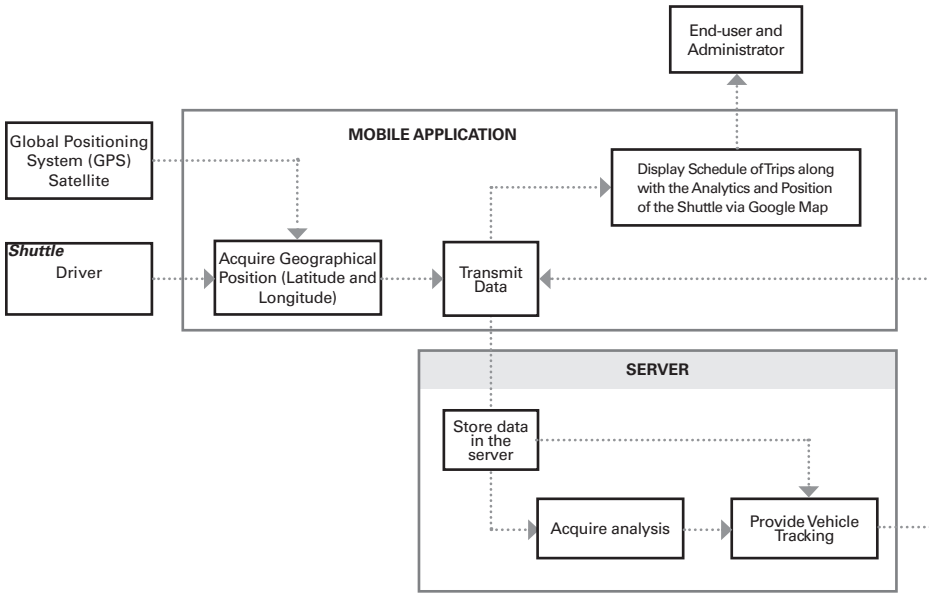
Certain delimitations exist within the project. GPS location readings will be based on the driver's Android devices and transmitted via Wi-Fi or mobile data. Only APC students, faculty, and staff will have access to the application, while guests can only view the map on the APC main lobby. The shuttle's capacity status will be selected by the driver at the beginning of each scheduled trip. The shuttle's route will be limited between the terminals on Lapu-Lapu St. and the APC Main

building. The shuttle's capacity status will be categorized as full, more than half, less than half, or empty. The driver will manually select the shuttle's status, which is limited to On Duty, Refilling Gas, or On Emergency Maintenance.

Software Application Design

FIGURE 2

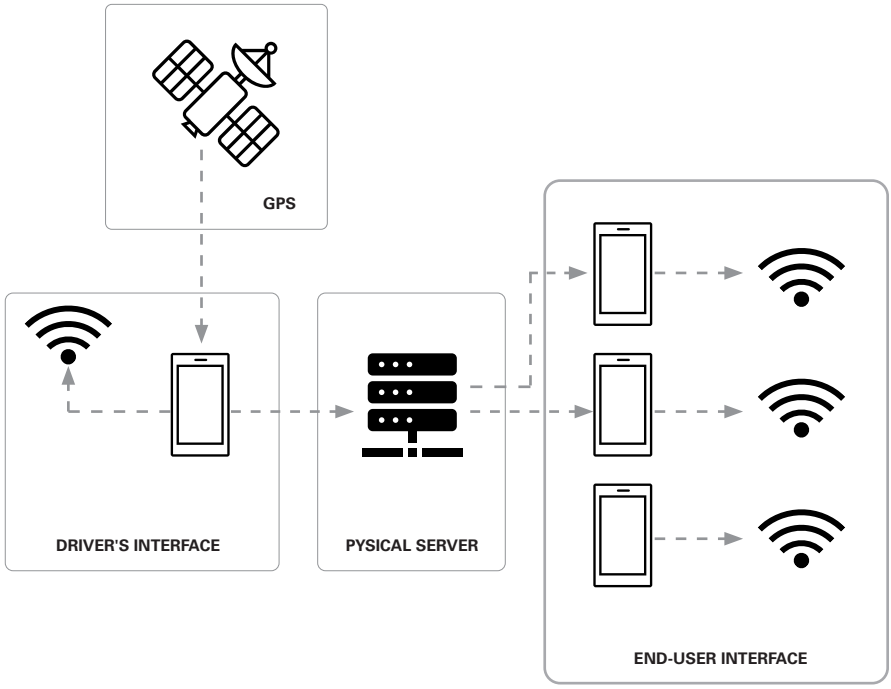
System Block Diagram



The block diagram illustrates the flow and components involved in the driver's mobile application and its connection to the GPS, as well as the subsequent transmission and storage of acquired position data on the server. It also demonstrates the comparison between the acquired position and the expected route position of the shuttle, incorporating the shuttle's analytics. Furthermore, the diagram showcases the functionality of the system in enabling vehicle tracking based on the gathered data, as well as the transmission of schedule and generated data to the end-user's application. Lastly, it highlights the system's ability to promptly notify the administrator in the event of a deviation in the shuttle's position.

FIGURE 3

High Level System Block Diagram



The high-level system block diagram shown in Figure 3 illustrates the interconnections within the proposed system. It showcases the various connections involved in the system through a graphical representation. The driver's device and the end-user's devices are both connected to the internet, depicted by a dash-line. The driver's interface retrieves the GPS location data from the device, which is then directly transmitted to the server. This data can be accessed and viewed by any end-user who is connected to the server through an Android application.

FIGURE 4

Driver's Application Flowchart

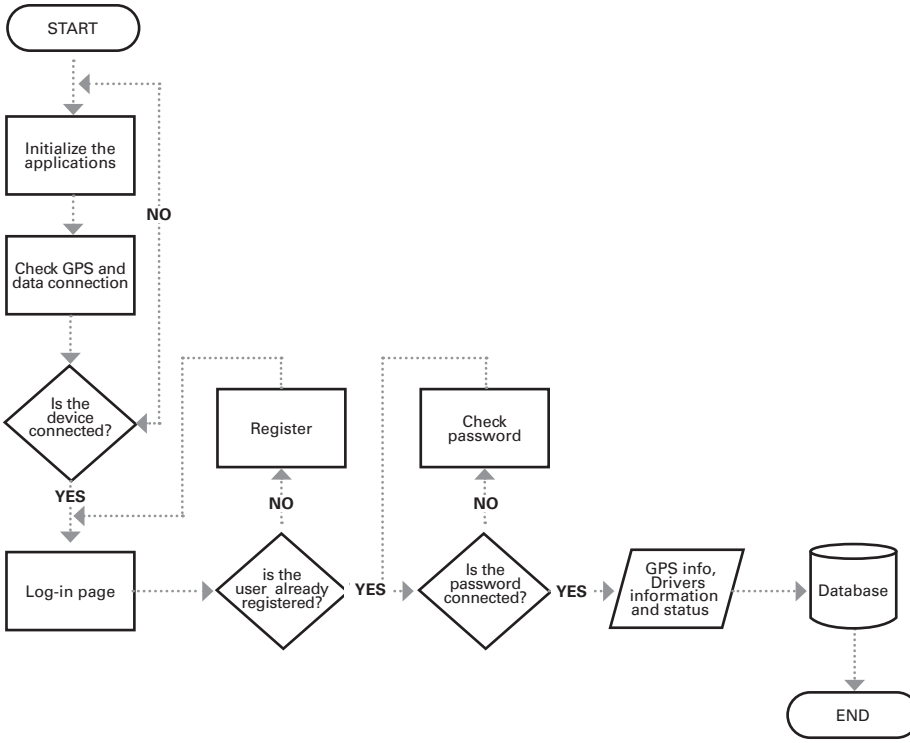


Figure 4 shows the flowchart of the application design for the driver. The application will first initiate the checking process for GPS and data connection. It is required that the device is connected to both a network and GPS. The user will then be directed to the login page, where they will have the option to register if they have not done so already. In the case of a registered user, a password must be entered, which should match the one stored in the database. Once successfully logged in, the application will transmit GPS information, driver's details, and status to the database.

FIGURE 5

User's Application Flowchart

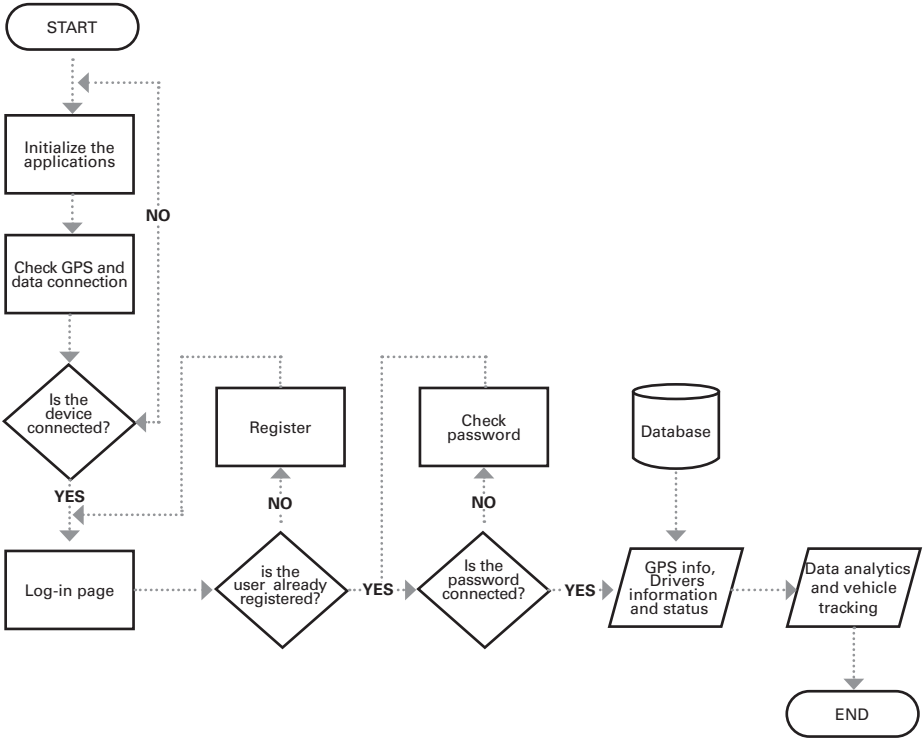


Figure 5 shows the flowchart for the application design for the user. The application will be initiated, and the first step involves checking the data connection. It is essential for the device to be connected to a network. Subsequently, the user will be directed to the login page, where they will have the opportunity to register if they have not already done so. For registered users, they will need to input their password, which must match the one stored in the database. Upon successful login, the application will retrieve the GPS information, driver's details, and status from the database. Additionally, the application will offer features for data analytics and provide vehicle tracking functionality.

FIGURE 6

Notification Flowchart

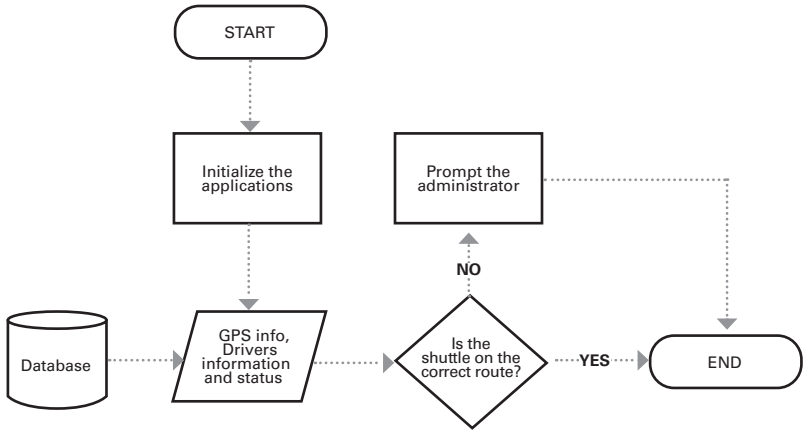


Figure 6 displays the notification flowchart, illustrating the sequence of events. The GPS information, driver's details (including the route and schedule), and the shuttle's status will be retrieved from the database. The application will then verify whether the shuttle is following the designated route. If the shuttle deviates from the expected path, the application will promptly notify the administrators.

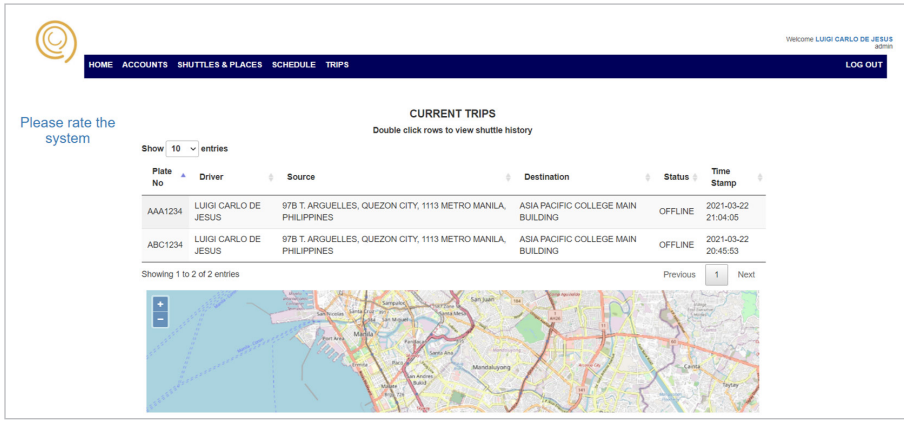
FIGURE 7

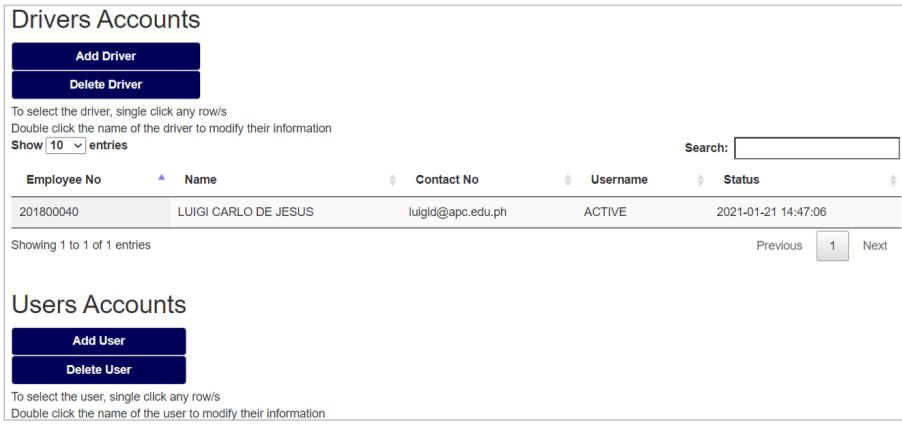
Android Application Prototype Design

The android application is developed using Android Studio as the Integrated Development Environment (IDE). Figure 7 depicts a sample user interface (UI) for the application. In designing the UI, the researcher considers three key factors: development, visibility, and acceptance. Under development factors, considerations include the device, platform constraints, and available libraries. Android Studio offers an intelligent code editor that facilitates easy deployment on Android devices, while readily available libraries and tools effectively address development requirements.

FIGURE 8

Admin WebApp Modules Prototype Design





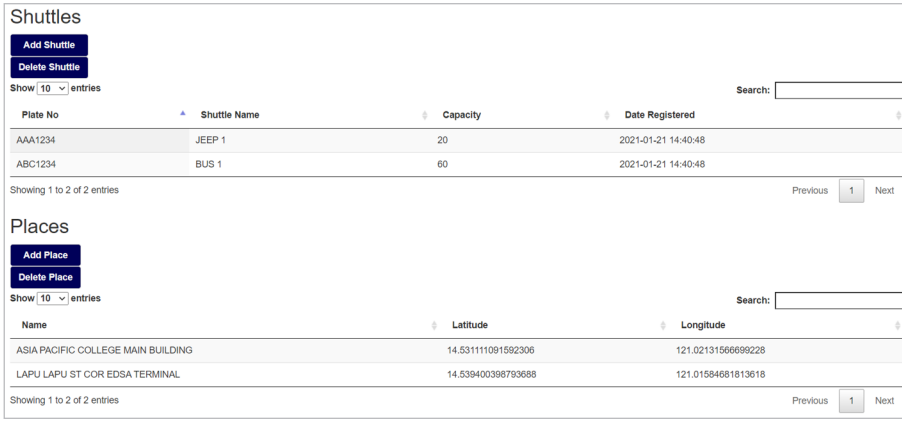


Figure 8 displays the preview of the website, which utilizes XAMPP for its Java Server Pages (JSP). The proponent chose XAMPP for its convenient deployment of Java and PHP-based applications, enabling efficient server deployment.

Visibility factors focus on the design of the interface, encompassing layout, typography, color, texture, and imagery. The design presented in Figures 7 and 8 takes all these elements into consideration. The arrangement of blocks and buttons is intentionally kept simple. User-acceptability will be assessed to determine the acceptance of the user interface. Factors such as organization, consistency, layout, navigability, simplicity, clarity, readability, and color will be tested for their impact on user- acceptance.

Testing and Evaluation

Tests were performed to validate the functionality of the application in accordance with the design specifications and desired objectives for design features: (1) accuracy, (2) reliability, and (3) user acceptability.

Accuracy

TABLE 1

Detection of GPS Location

Stopover	Google Map Latitude	Google Map Longitude	Application Latitude	Application Longitude	Lat Diff	Long Diff
1	14.5395580	121.0154001	14.5395356	121.0154112	0.0000224	-0.0000111
2	14.5393570	121.0147782	14.5393466	121.0147708	0.0000104	0.0000074
3	14.5327663	121.0193621	14.5326728	121.0192092	0.0000935	0.0001529
4	14.5317399	121.0199037	14.5317425	121.0199238	-0.0000026	-0.0000201
5	14.5315400	121.0207412	14.5315322	121.0207285	0.0000078	0.0000127

Table 1 presents a comprehensive overview of the outcomes stemming from an examination of GPS coordinates encompassing latitude and longitude. The assessment encompassed five distinct and randomly selected locations. The data, drawn both from the designated application and Google Maps, were meticulously analyzed, with a key focus on the absolute disparity between the coordinates furnished by the two sources. This rigorous evaluation of coordinate accuracy was conducted as part of a broader inquiry into the precision and reliability of the application's geographical measurements.

The accuracy of GPS location data is primarily determined by the geometry of satellite positions relative to the receiver's location on Earth. This relationship, known as Dilution of Precision (DOP), considers factors such as the number of visible satellites, their distribution across the sky, and their signal strength, collectively influencing the precision of the calculated position (Kaplan & Hegarty, 2006; Misra & Enge, 2006; Leick, 2004; Teunissen & Montenbruck, 2017).

Interestingly, the time of data acquisition, despite its seemingly significant role, has been found to have a minimal impact on the location's accuracy. This is due to the remarkable speed of light, which travels at approximately 299,792 kilometers per second (Kaplan, 2006). Consequently, the time required for GPS signals to traverse the distance from satellites to the receiver is negligible in comparison to other sources of error within the GPS system. Instead, the accuracy of GPS positioning is predominantly influenced by factors like atmospheric interference, multipath effects (signals reflecting off obstacles), receiver noise, and the geometric arrangement of the satellite constellation (Teunissen, 2017). Given these considerations, there is no requirement for the proponent to record the time of data acquisition.

Worth noting is the context within which this evaluation took place: the testing occurred against the backdrop of the global pandemic. The prevailing circumstances of the pandemic necessitated certain limitations, including a restricted number of shuttle trips to the designated locations for data collection. This scarcity of shuttle trips is a direct result of the challenges posed by the pandemic, which hindered the ability to carry out extensive fieldwork and gather a more extensive dataset.

Against these constraints, the application's accuracy in measuring coordinates emerged as a highlight of the investigation. By quantifying the absolute differences between the coordinates derived from the application and those sourced from Google Maps, a noteworthy level of precision was observed. Specifically, the results revealed a remarkable accuracy rate of 99.99989% across the five randomly selected locations.

This exceptional accuracy rate underscores the application's capacity to provide dependable and consistent geographical information, even in the face of the testing limitations imposed by the pandemic. Despite the reduced number of shuttle trips available for data collection, the application's performance remained impressive and indicative of its robustness in accurately determining latitude and longitude coordinates.

Table 1's depiction of the GPS coordinate assessment, coupled with the observed accuracy rate, underscores the application's reliability in geographical measurements. This achievement is particularly noteworthy considering the challenging circumstances of the pandemic, which led to a constrained number of shuttle trips and thereby highlights the resilience and effectiveness of the application's capabilities.

Reliability

TABLE 2

Shuttle's Location Monitoring

Stopover	Google Map Coordinates	Application Coordinates	Is the stop over within the route? (Y or N)	Did the application alert the administrator if the shuttle is not following the route? (Y or N)
1	14.5395580, 121.0154001	14.5395356, 121.0154112	Y	N
2	14.5393570, 121.0147782	14.5393466, 121.0147708	Y	N
3	14.5327663, 121.0193621	14.5326728, 121.0192092	Y	N
4	14.5317399, 121.0199037	14.5317425, 121.0199238	Y	N
5	14.5315400, 121.0207412	14.5315322, 121.0207285	Y	N
6	14.5381075, 121.0041301	14.5380556, 121.0041288	N	Y
7	14.5388898, 121.0109015	14.5388781, 121.0109129	N	Y
8	14.5391873, 121.0126406	14.5391769, 121.0126567	N	Y
9	14.5384847, 121.0070895	14.5384367, 121.0070996	N	Y
10	14.5384167, 121.0065977	14.5383797, 121.0066061	N	Y

Table 2 offers a comprehensive presentation of the outcomes stemming from a thorough testing regimen focused on GPS coordinates. These coordinates encompass both latitude and longitude data, which were derived from two distinct sources: the designated application and Google Maps. The testing effort encompassed a total of 10 diverse and randomly chosen locations, each serving as a unique point of analysis.

To facilitate a structured assessment, the 10 locations were further categorized into two distinct groups: "on track" and "out of track." The division was based on specific criteria related to geographic positioning. Five of the chosen locations were classified as "on track," meaning that they fell within the predefined range established for accurate tracking. The remaining five locations were labeled as "out of track," as they were deliberately situated approximately 100 meters beyond the designated map boundary.

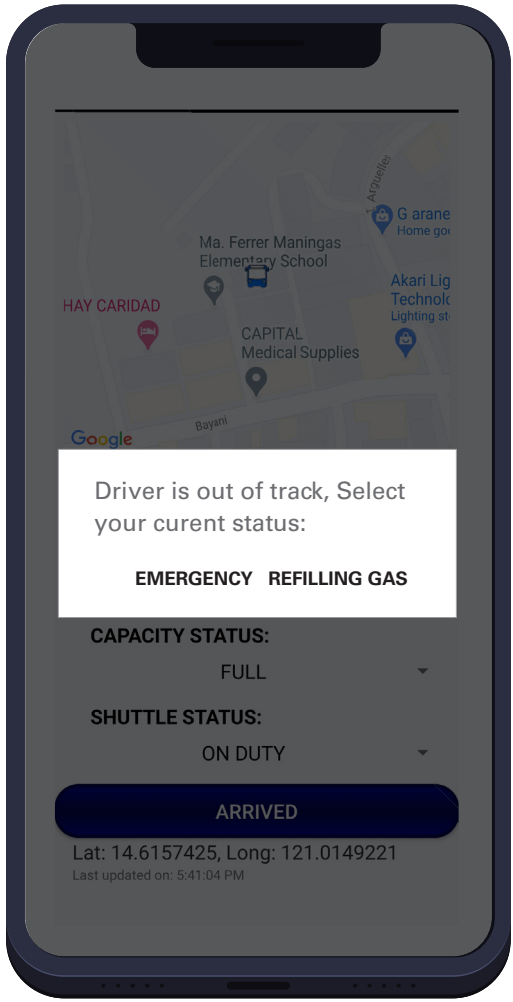
The testing methodology incorporates a proactive system to address scenarios in which the tracked location deviates from the intended track. When the system identifies that a vehicle's location has strayed beyond the established track boundary, it triggers a continuous series of notifications. These notifications are directed toward the driver and are facilitated through the application. The notifications persist until the driver takes deliberate action by manually updating their status. This action involves the driver pressing a designated button, a process that is visually represented in Figure 9 of the documentation.

This dynamic system of notifications and manual intervention is crucial for maintaining the integrity of the tracking process, especially in instances where a vehicle ventures outside the anticipated route. The system's responsiveness and real-time alerts enable drivers to promptly rectify any discrepancies between their actual location and the intended path.

Table 2 encapsulates the findings derived from a meticulous assessment of GPS coordinates across various locations. The inclusion of both on-track and out-of-track scenarios underscores the system's robustness in detecting deviations from the intended path. The implementation of continuous notifications and a manual update mechanism exemplifies the application's proactive approach to ensuring accurate tracking and enhancing driver engagement. This comprehensive approach contributes to the overall effectiveness and reliability of the tracking system, ultimately benefiting users and optimizing the navigation experience.

FIGURE 9

Driver Application Message Box Notification for Out-of-Track Status



User Acceptability

TABLE 3

User Acceptability Survey Result Summary

Elements	Average Rating
Organization	4.67
Consistency	4.67
Layout	4.57
Navigability	4.70
Simplicity	4.80
Clarity	4.67
Readability	4.77
Color	4.57
Average Rating	4.6775

Table 3 furnishes a comprehensive overview of the outcomes derived from an extensive Likert Scale survey, which was conducted to assess various elements pertaining to the application's user experience. The survey participants were prompted to rate each element on a scale that ranged from 1 (lowest) to 5 (highest), with the higher score indicating a more favorable evaluation. The provided ratings encompass a range of specific attributes that collectively contribute to the overall user perception of the application.

The obtained average ratings for each element reveal a notably positive assessment of the application's user experience. The highest average ratings were awarded to Simplicity (4.80), Readability (4.77), Navigability (4.70), and Organization (4.67). These scores are indicative of a high degree of user satisfaction in these areas, underlining the application's effectiveness in providing an intuitive and user-friendly interface.

Furthermore, the element of Consistency garnered an average rating of 4.67, demonstrating the application's ability to maintain a coherent and uniform user experience across various sections and interactions. Similarly, Clarity achieved the same average rating, affirming the clarity and effectiveness of the information presented within the application.

While most elements received notably high average ratings, two areas stood out with slightly lower scores. The Color category attained an average rating of 4.57, and the Layout category also received the same score. These scores, while still representing a positive evaluation, indicate that there may be room for improve-

ment in terms of visual aesthetics and the arrangement of elements within the application's interface.

Notably, the survey results include outlier scores for the Color and Layout categories. Specifically, one user's feedback led to a notably lower score of 2 in these categories.

This user expressed a desire for a more visually engaging application, citing the perceived monochromatic nature of the interface as an area for enhancement.

Table 3 provides a comprehensive snapshot of user sentiment regarding various elements of the application's user experience. The consistently high average ratings across multiple attributes highlight the application's success in delivering a user-friendly, clear, and cohesive experience. While the Color and Layout categories received comparatively lower scores, the overall assessment of the application remains very positive, with ample scope for further refinement to address specific user expectations and preferences.

Summary and Recommendations

In line with the study's objectives, the implemented design functions yielded satisfactory and necessary results based on the evaluation data. Among these functions, location monitoring and stable data transmission are of utmost importance, requiring a smartphone with high-accuracy GPS and a reliable network provider. The accuracy of the system is crucial as it affects the quality of route monitoring, considering the potential interference from GPS satellites and wireless signals. Certain blind spots were identified in the Globe Telecomm network, particularly in areas with dense vegetation along Lapu-Lapu Street. Additionally, compatibility with non-Google Play devices, such as Huawei devices from 2019 onwards, should be considered.

Furthermore, the system demonstrated flawless execution, as confirmed by positive feedback from drivers, administrators, and users in the Likert Survey. Specific objectives were successfully achieved, with the DRIVER APP exhibiting a GPS location accuracy of 99.99989% and a reliability rating of 100%, both evaluated as Excellent. The utilization of a private server hosted by Hostinger.com contributed to the system's responsiveness and compatibility with PHP-based websites, ensuring zero network failures during data transmission. User acceptability, as assessed through surveys conducted with shuttle drivers and users, averaged at 4.6775, indicating a "Very Good" rating.

During the project development and testing phase, the proponent identified areas for improvement in the designed project. Due to the COVID-19 pandemic, certain issues could not be addressed during development. These identified areas can serve as valuable references for future researchers aiming to enhance similar engineering designs.

Firstly, it is recommended to enhance the user interface (UI) and code to ensure a more user-friendly and comprehensible navigation experience for all user types: drivers, users, and administrators. This improvement would facilitate easier learning and usage of the application.

Secondly, incorporating an estimated time of arrival feature in the passenger/user application for each trip would be beneficial. This addition would provide users with an expected arrival time, enhancing their experience and convenience.

Thirdly, developing a method to count the total number of passengers on a trip would be valuable. This data could contribute to improved analytics and enable the creation of a prediction model. The prediction model could assist administrators in assigning the appropriate number of shuttles based on forecasted passenger numbers.

Additionally, enhancing the analytics charts by making them downloadable and adding an additional view would be advantageous for administrators. This improvement would facilitate the submission of reports and enhance data analysis capabilities.

Lastly, it is recommended to develop an application that supports Huawei devices released from 2019 onwards for obtaining GPS coordinates independent of Google Map Services. This would ensure compatibility and functionality across a wider range of devices.

By considering these recommendations, future researchers can build upon the existing project and contribute to its further enhancement

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Enhancing Building Design: Integrating IP Telephony, Internet of Things (IoT), and Fire Detection and Alarm System (FDAS) Network for Smart Buildings

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Abstract

With the advancement of sensor technologies, numerous applications have emerged in various fields and regions. Utilizing these innovations and recent advancements can greatly benefit building applications, enhancing smart functions, and improving user comfort. In particular, the detection of fire plays a crucial role in preventing property destruction and potential loss of life. Fire Detection and Alarm Systems (FDAS) are intelligent frameworks aimed at providing automated management of control services and optimizing resource utilization. In this proposed model, all devices are registered in the IOE server and administered by an Administrator, while an IP Telephony network facilitates long-distance calls and Voice over Internet Protocol (VoIP) applications. The proponents have employed Cisco Packet Tracer, along with VLAN networks, to simulate the proposed model, and for real-life scenarios, they have implemented a cost-effective design for the Internet of Things (IoT) and FDAS-based Evacuation Service.

Keywords: *VLAN Networks, Cisco Packet Tracer, IoT, FDAS, IP Telephony*

Introduction

One of the most destructive aspects of fire is its rapid and uncontrollable spread (A. Bröring, 2011). Therefore, timely fire detection is crucial for preventing fire hazards. The Internet of Things (IoT) consists of interconnected sensors, actuators, and programmable devices embedded in home appliances, physical devices, and vehicles, enabling them to exchange data and improve the efficiency of everyday devices using computer-based systems (Anwar, 2018). In addition to enhancing device efficiency, IoT also offers economic benefits and aims to simplify human life by creating smart devices.

IoT extends the connectivity of objects beyond conventional devices used for everyday purposes. In this paper, the proponents have developed an IoT-based alarm system, where registered devices in the IOE server act as a home gateway controlled through the IoT monitor. This paper provides a detailed presentation of the design and implementation of monitoring products for the fire protection system based on IoT. The IoT terminal devices are responsible for monitoring the operational status of the fire suppression and safety system, including building fire department alarms, hydrant pipe flow, environmental temperature, and more. Through IoT, effective sensing, reliable transmission, and centralized and efficient management of the fire system become achievable (L. Huang, 2011).

Thus, the Fire Detection and Alarm System (FDAS) is widely adopted as the primary safety system for high-rise residential, commercial, and industrial establishments, as it acts as a protective measure to prevent accidental fires from escalating into unmanageable outbreaks. Traditional FDAS systems were traditionally constructed using wired transmission and the CAN (controller area network) bus protocol (Shu-guang, 2011). However, wired fire detection and alarm systems come with drawbacks, such as installation and maintenance costs, construction and expansion complexities, susceptibility to corrosion, aesthetic concerns, high fault rates, and a high count of false alarms due to limited cable transmission distance.

The network also includes an IP Telephony component, which showcases the basic setup of IP telephones within a specific building or establishment. These facilities facilitate long-distance voice communication or calls, allowing IP phones to be configured for internal and external calls within a specific location.

Methodology

The overall system is built using Cisco Packet Tracer, a proprietary multi-platform tool that allows for the creation of networking and IoT simulations without the need for hardware or an existing network. Each zone of the system includes a fire monitor and sensor nodes equipped with ceiling sprinklers, siren, temperature sensor, and smoke detector. These smart components are connected to a microcontroller and can be linked to the network by connecting the microcontroller to

the Home Gateway wirelessly. The entire system is responsible for processing data and sending control signals to activate the notification devices, and data processing and monitoring can be accessed through the software.

Cisco Packet Tracer offers several advantages. First, it is easy to use, making it accessible to a wide range of users. Additionally, it can be accessed anywhere and anytime, providing flexibility and convenience to its users. Another advantage is its ability to simulate configurations related to Cisco devices, allowing users to test and troubleshoot network designs before implementing them in real-life scenarios. Moreover, it provides information-driven operation efficiencies that reduce inventory, downtime, and time to market. Finally, it offers a greater ability to support business evolution from a reliable, transparent technology foundation that is viable with future innovation discharges.

TABLE 1

Devices Used in the Network and their Function

DEVICE	FUNCTION / DESCRIPTION
Router 2811	Supports multiple WAN interfaces.
Switch 2960	Easy to deploy, manage, and troubleshoot. It offers automated software installation and port configuration.
IP Phone 7960	Full-feature telephones that provide voice communication over an IP (Internet Protocol) network.
Personal Computer (PC)	Connection to access layer
Laptop	
Tablet	Manipulating, storing, calling up information for the user in changed format if required.
Smartphones	
Server	Monitors intelligent things that are recorded on it and have specific database features.
Central Server	Used to link the router with the cellular network.
Cell Tower	Cellular-enabled mobile device site where antennas and electronic communications equipment are placed to create a cell in a cellular network.
Home Gateway	Allows data to flow from one discrete network to another.
Microcontroller (MCU-PT)	Used to connect various intelligent things.
Ceiling Sprinkler	Provides an appropriate amount of water to extinguish fires before they get the opportunity to grow and spread throughout the room.
Siren	Designed to sound the alert in the event of a fire-related emergency.
Lights	Visible lights
RFID Reader	Type of communication device that involves connection and communication between a transmitter (transponder or tag) and a receiver (reader).
Smoke Sensor	Used to detect smoke in a specific room, surroundings or area.
Temperature Sensor	Measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes.

Table 1 presents a comprehensive overview of the devices utilized in a network configuration, along with their respective functions. The Router 2811 is specifically designed to support multiple WAN interfaces, enabling seamless and efficient network connectivity. In contrast, the Switch 2960 offers a user-friendly experience, allowing for easy deployment, management, and troubleshooting. It also boasts automated software installation and port configuration capabilities, streamlining operational processes.

The IP Phone 7960 is a sophisticated telecommunications device that facilitates voice communication over an IP network, offering a wide range of telephony features. Additionally, personal computers (PCs), laptops, tablets, and smartphones serve as versatile tools for accessing and manipulating information in various formats, tailored to individual user requirements.

Servers play a vital role as monitoring systems for intelligent devices, efficiently recording and storing data with specialized database features. The central server acts as a vital intermediary between the router and the cellular network, ensuring effective communication between the two.

Cell towers are indispensable components of cellular networks, housing antennas and communication equipment to establish reliable cellular coverage within specific areas. Home gateways are responsible for facilitating seamless data flow between discrete networks, ensuring uninterrupted connectivity. Microcontrollers (MCU-PT) play a pivotal role in establishing connections between diverse intelligent devices within the network infrastructure.

To enhance safety measures, ceiling sprinklers are employed to deliver an appropriate amount of water, effectively extinguishing fires and preventing their propagation throughout a room. Sirens are specifically designed to emit audible alerts during fire-related emergencies. Lights serve as visible indicators within the network, providing visual cues to users. RFID Readers facilitate communication between transmitters (tags) and receivers, enabling seamless data exchange. Smoke sensors are dedicated to detecting smoke within specific areas, while temperature sensors accurately measure the ambient temperature, converting this data into electronic format for monitoring, recording, or signaling temperature fluctuations.

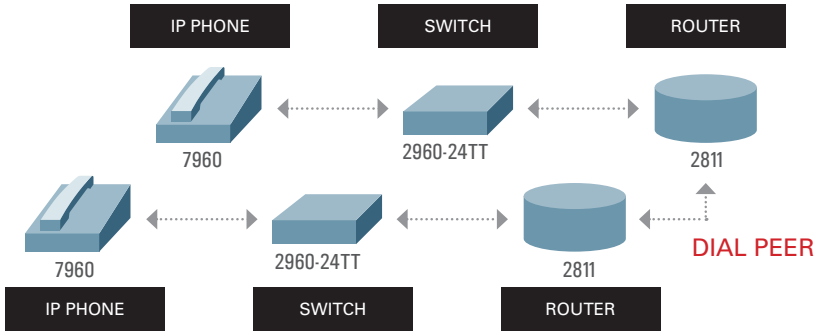
Design and Implementation

The proponents utilized the following devices as discussed in the methodology in implementing the design for the network system of IP Telephony, IoT, and FDAS. The implemented design and network diagram for this project will be shown in this section.

C.1. Block Diagram

FIGURE 1

IP Telephony Block Diagram



In Figure 1, the transmission of voice or audio signals between two specific IP Phones is depicted. The setup process involves several steps to ensure proper connectivity and secure data transmission.

To begin, VLANs are established by configuring the switch. This entails assigning VLANs, configuring interface ports, and enabling access to the designated VLANs. Concurrently, network assignments are configured on the router, with the inclusion of an encapsulation method to enhance security and data reliability. Additionally, configurations for telephony services and the assignment of IP Phone directories or numbers are implemented on the respective devices.

Once the network setup is complete, the router needs to be connected to the other router's network. This requires assigning an IP Address and Gateway to both routers. Static routing is then configured to enable mutual recognition of transmitted data. Finally, to enable voice communication and transmission within the network, dial-peer configurations are performed. This type of configuration directs calls to a specific network based on assigned destination patterns and session targets, ensuring efficient communication between the IP Phones.

By following these steps, a secure and reliable voice communication system can be established within the network, facilitating smooth and effective transmission of audio signals between the designated IP Phones.

FIGURE 2

FDAS Block Diagram

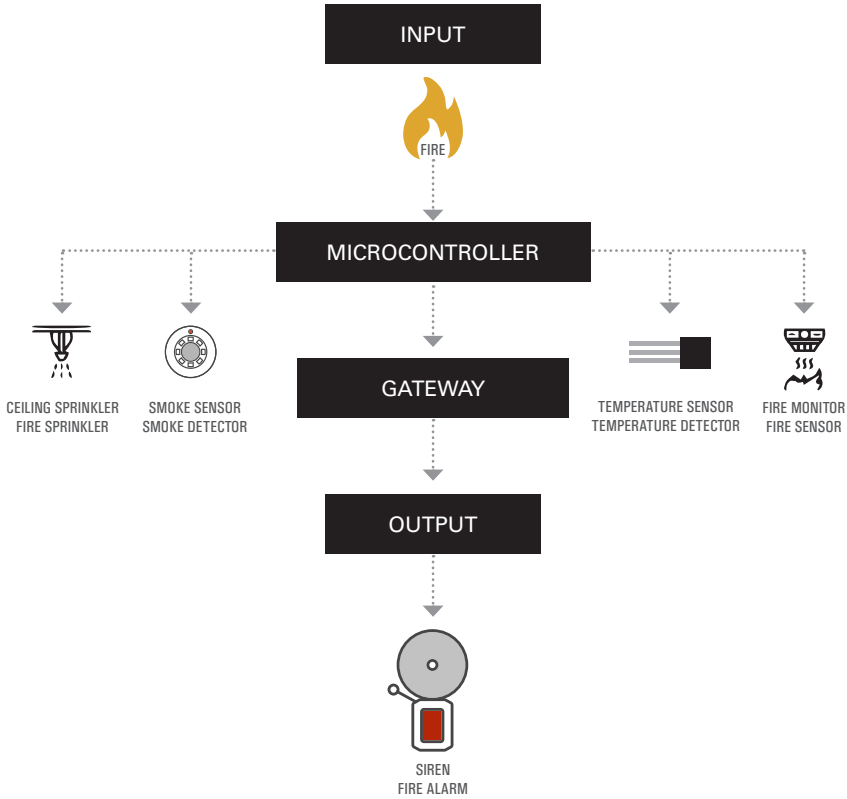


Figure 2 illustrates the block diagram of the Fire Detection and Alarm System (FDAS). In this configuration, devices such as the smoke sensor, temperature sensor, fire monitor, and ceiling sprinkler are interconnected with the MCU-PT Microcontroller. The control of these devices is facilitated through programming codes developed and compiled specifically for the MCU-PT Microcontroller. To establish connectivity with the Home Gateway, the proponents have incorporated a wireless module. This integration enables the IoT monitor to identify and communicate with the MCU-PT Microcontroller, as well as other connected home and industrial devices and appliances. Subsequently, specific conditions have been established and implemented to trigger the alarm siren and activate the ceiling sprinkler when a fire is detected by the sensors.

C.2. IP Addresses and Configurations

The network setup incorporates specific IP address configurations for the router, VLAN, microcontroller, and server. The router, serving as a central hub, is allocated a unique IP address within its respective Virtual Local Area Network (VLAN). This IP address enables the router to establish communication with other devices within the network, facilitating the seamless transfer of data between different VLANs.

Likewise, the microcontroller, playing a vital role in connecting various intelligent devices, is also assigned an IP address. This address allows the microcontroller to communicate with other devices within the network, ensuring efficient data transmission. By having an IP address, the microcontroller becomes an identifiable entity within the network architecture, enhancing its integration and functionality.

Similarly, the server, functioning as a monitoring system and housing critical data, is configured with its own IP address. This IP address facilitates connections between the server and other devices within the network, enabling the retrieval and transmission of data as required. It establishes a reliable communication channel between the server and other devices, ensuring effective data management and analysis.

In summary, the assignment of IP addresses to the router, VLAN, microcontroller, and server is fundamental for the proper configuration and optimal functioning of the network. It enables efficient communication and data exchange between these devices, thereby enhancing the overall functionality and reliability of the network infrastructure. The IP addresses of the mentioned devices are displayed in Tables 2, 3, 4, and 5.

TABLE 2

Router Interface

Router	Interface	IP Address	Subnet Mask
Main Bldg. 1	Eth 1/0	20.20.20.1	255.255.255.0
	Eth 1/1	10.10.10.1	255.255.255.0
Main Bldg. 2	Eth 1/0	10.10.10.2	255.255.255.0
	Eth 1/1	30.30.30.1	255.255.255.0
Annex	Eth 1/0	20.20.20.2	255.255.255.0
	Eth 1/1	30.30.30.2	255.255.255.0

TABLE 3

DATA and VOICE VLANs

VLAN	Main Bldg. 1	Main Bldg. 2	Annex
DATA	192.168.10.0	192.168.30.0	172.16.69.0
VOICE	192.168.20.0	192.168.40.0	172.16.96.0

TABLE 4

Servers

VLAN	Main Bldg. 1	Main Bldg. 2	Annex
Floor 3 Server 1	Fa 0	192.168.10.1	255.255.255.0
Floor 3 Server 2	Fa 0	192.168.10.1	255.255.255.0
Central Office Server	Fa 0/0 or backbone	162.69.0.2	255.255.255.0
	Cell Tower	172.16.1.1	255.255.255.0

TABLE 5

MCU-PT Microcontroller

Microcontroller	Gateway	DNS Server
1st Floor MCU-PT Microcontroller	192.168.25.1	0.0.0.0
2nd Floor MCU-PT Microcontroller	192.168.25.1	0.0.0.0
3rd Floor MCU-PT Microcontroller	192.168.25.1	0.0.0.0
4th Floor MCU-PT Microcontroller	192.168.25.1	0.0.0.0
5th Floor MCU-PT Microcontroller	192.168.25.1	0.0.0.0
Annex MCU-PT Microcontroller	192.168.25.1	0.0.0.0

C.3. Network Diagrams

FIGURE 3

Network Diagram of Floors 1, 2 and 3

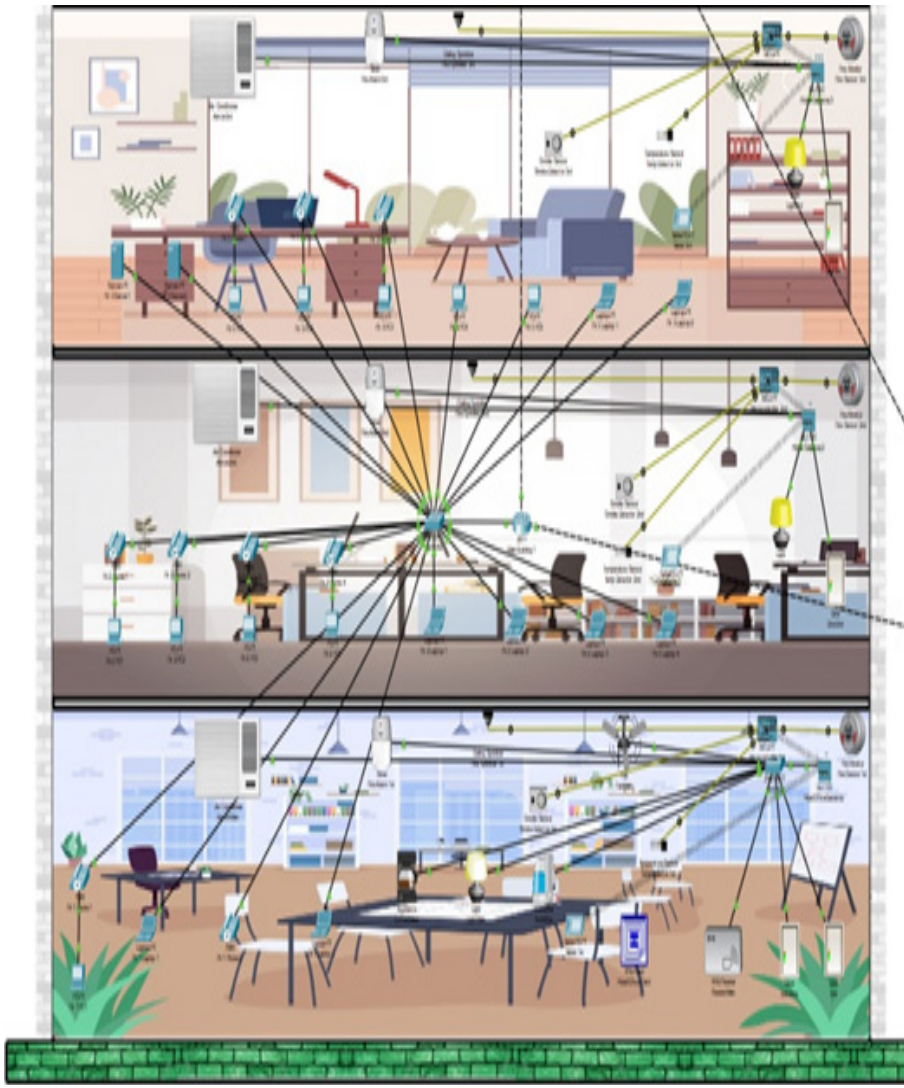
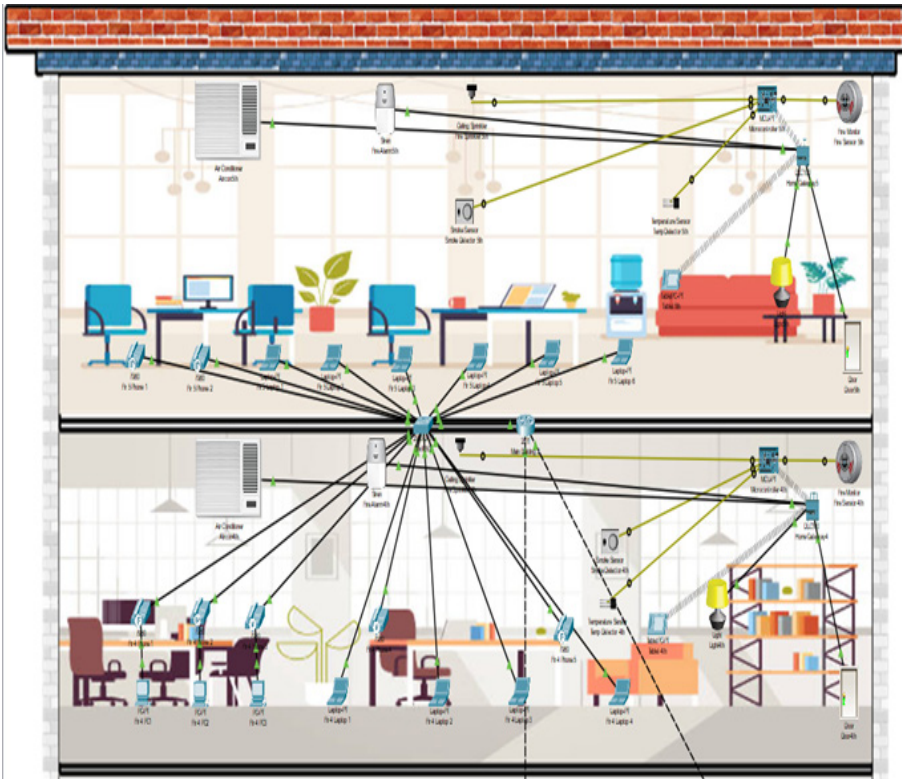


FIGURE 4

Network Diagram of Floors 4 and 5



The network system and diagram for the main building, shown in Figures 3 and 4, incorporate the use of two routers across different floors. Specifically, Main Building-1 (Router) is assigned to floors 1, 2, and 3, while Main Building-2 (Router) is designated for floors 4 and 5. The router configuration remains mostly consistent per floor, differing only in terms of VLAN settings and IP Phone assignments.

Within each floor, there is a Home Gateway and an MCU-PT Microcontroller responsible for facilitating communication among various devices in the IoT and FDAS network. These devices include sirens, lights, sprinklers, smoke sensors, coffee maker, fans, humidifier, doors, air conditioners, temperature sensors, fire monitors, RFID readers, RFID Cards, Smartphones, and tablets.

Additionally, the IP Telephony network involves devices such as IP Phones, routers, PCs, laptops, and switches. Each floor is equipped with a specific set of devices connected to a switch, aligning with the corresponding range of the router.

FIGURE 5

Network Diagram of the Annex Building

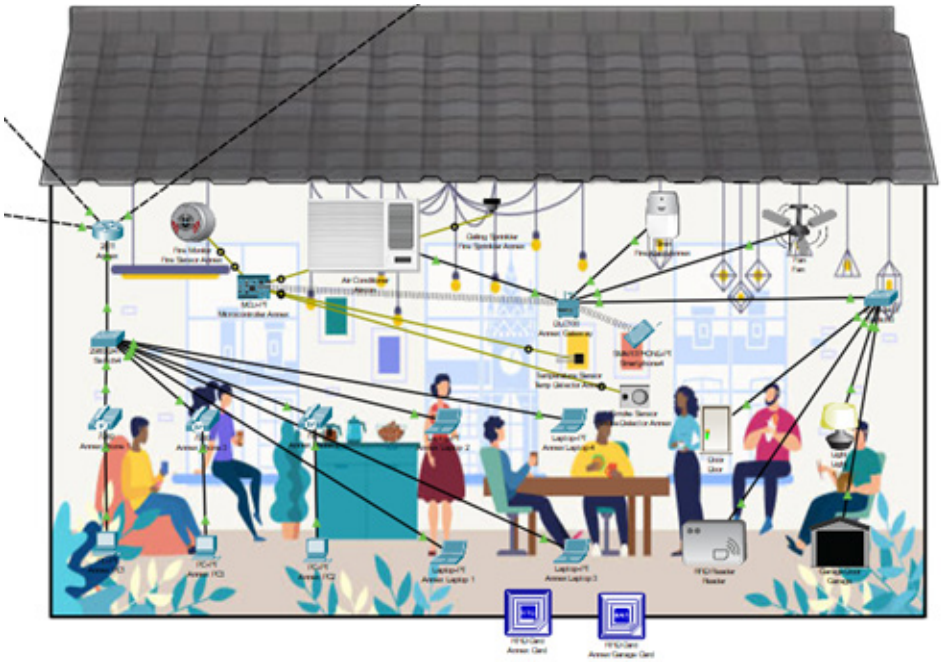
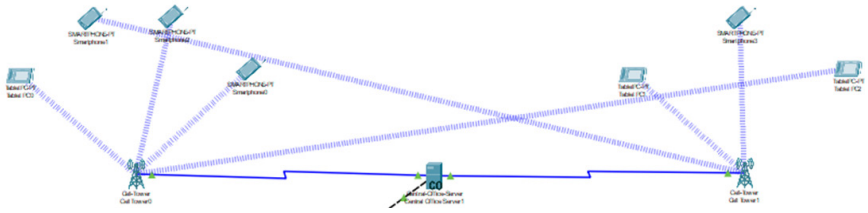


FIGURE 6

Network Diagram of the Cell Towers



For the creation of the network system and diagram in Annex as shown in Figure 5, a single router is utilized to serve the entire building, with the Annex's Router connected to a Central Office Server. The configuration of the router in Annex shares similarities with the routers in the Main Building, differing primarily in terms of VLANs, Network Address, and assignment of IP Telephone numbers. In addition, the building is equipped with a Home Gateway and an MCU-PT Microcontroller, facilitating communication among devices within the IoT and FDAS network.

Moreover, the IP Telephony network involves various devices such as IP Phones, Routers, PCs, Laptops, and Switches. Additionally, the Central Office Server is connected not only to the Annex's Router but also to two cell towers located outside the building shown in Figure 6.

Conclusion and Recommendations

In this study, the researchers successfully integrated IP Telephony, FDAS, and IoT networks to develop a Smart Building concept. This concept encompasses various functions and services, all defined with hardware compatibility. The system not only accurately portrays a real-life scenario of an advanced building, but it also demonstrates the IP Telephony concept, enabling voice communication both within and outside the establishment.

The simulation conducted in this study was error-free, and it is recommended to load or open the PKT file a few minutes after the simulation to allow the devices to load the necessary IP and network configurations. The materials and devices used in the study are readily available in the market, ensuring the model's sustainability and feasibility. Consequently, the model or design created using Cisco Packet Tracer exhibits similar results and functionality to real-life IP Telephony, IoT, and FDAS implementations.

It is highly recommended that future researchers and practitioners explore the potential of integrating IP Telephony, FDAS, and IoT networks to implement the Smart Building concept. The successful integration showcased in this study not only provides an accurate representation of an advanced building but also highlights the practicality and effectiveness of IP Telephony for seamless voice communication.

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Enhancing Sound Amplification and Filtering for Hearing Aids: A Simulation using MATLAB

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Abstract

Human sense of hearing is instrumental in various aspects of our lives, enabling us to recognize and locate sounds. This research aims to explore the enhancement of sound amplification and filtering capabilities in hearing aids through a simulation conducted using MATLAB. The study addresses the prevalent issue of hearing loss in the global population, with a focus on improving the limited adoption of hearing aids. By leveraging the digital signal processing capabilities of MATLAB, the project aims to differentiate between speech and background noise, leading to improved audio quality for hearing aid users. The simulation involves three main stages: audio recording, audio filtering, and audio amplification. The MATLAB-based simulation generates output files reflecting the enhanced audio, while also addressing the challenges of potential distortion and the selective cancellation of specific noises. The findings of this research hold the promise for the development of more effective and efficient hearing aid technologies, ultimately improving the quality of life for individuals with hearing impairments.

Keywords: *sound amplification, filtering, hearing aids, MATLAB simulation, improved audio quality*

Introduction

The human sense of hearing is instrumental in various aspects of our lives, enabling us to recognize and locate sounds, thereby preventing potential dangers such as car accidents or fires, as well as aiding in the discovery of objects overlooked by our eyes (Lam, 2018). However, individuals who lack this ability face difficulties in navigating such situations (Smith, 2020). Hearing loss manifests in different ways, with some people experiencing difficulty hearing low-frequency sounds, while others struggle with high-frequency sounds, highlighting the variations in hearing impairment (Jones, 2019). Hearing aids play a crucial role in assisting individuals with hearing deficiencies by amplifying and filtering sounds across different frequency channels (Gupta, 2017). However, simply amplifying the specific frequency channels is insufficient, as it also amplifies accompanying noises, resulting in distorted and unintelligible sounds (Smith, 2020). To address this issue, digital filtering is employed to eliminate noise within a given frequency range, ensuring a cleaner audio output (Gupta, 2017). Once noise cancellation is achieved, appropriate amplification can be applied without the risk of amplifying unwanted noise (Jones, 2019). Therefore, it is established that digital filtering is a necessary step before performing amplification (Lam, 2018).

The objective of this research is to enhance an individual's hearing abilities by improving the functionality of hearing aids. The primary task of a hearing aid is to amplify sound at various frequency ranges, ensuring that speech frequencies can reach the ear, based on the specific degree and configuration of the individual's hearing loss. This project aims to provide benefits not only to the hearing-impaired individuals but also to the researchers involved, as it seeks to educate them on the principles of audio amplification and ensure the efficient operation of the hearing aids.

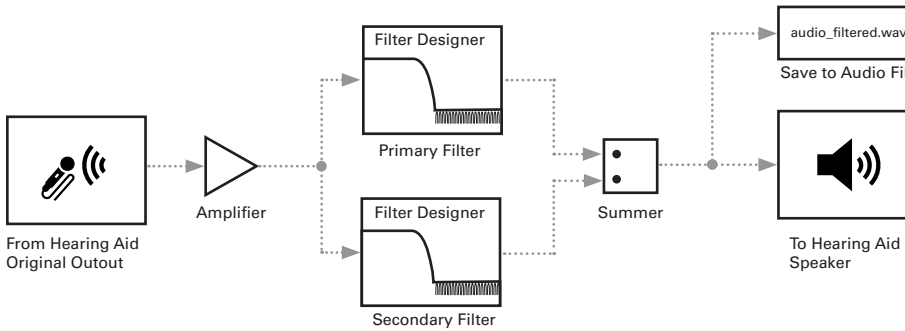
The focus of this project lies in leveraging a simulator, namely MATLAB, because of the prevailing pandemic situation. The primary aim is to direct efforts towards the exclusive processing of audio signals. However, it is imperative to acknowledge the intrinsic limitations that accompany this approach. While the results achieved through the simulator may exhibit similarities to real-life situations, it is important to note that they may not entirely replicate the authentic utilization and experiential elements associated with the use of an actual physical hearing aid.

Methodology

B.1. Block Diagram

FIGURE 1

MATLAB Simulink Block Diagram



The block diagram of a hearing aid system consists of four main blocks: the original output block, amplifier block, parallel digital bandpass filter block, and hearing aid speaker block. The original output block represents the input sound signal captured by the microphone. This block converts the acoustic signal into an electrical signal, which serves as the initial input for further processing. The electrical signal then enters the amplifier block, where it undergoes amplification. The purpose of the amplifier is to increase the strength of the signal to a level that can be effectively processed by the subsequent blocks. Next, the signal is divided into multiple parallel paths in the parallel digital bandpass filter block. Each path represents a specific frequency range that requires specialized processing. The bandpass filters within this block isolate and extract the desired frequency components from the signal, while attenuating frequencies outside the desired range. This enables targeted signal enhancement and noise reduction. After the signal has been processed by the bandpass filters, it is directed to the hearing aid speaker block. This block converts the electrical signal back into an acoustic signal, which is then delivered to the user's ear. The speaker produces sound waves based on the processed signal, allowing the user to perceive the amplified and filtered sound.

Overall, the block diagram showcases the sequential flow of the sound signal through the different processing stages of the hearing aid system. Starting from the original output, the signal passes through amplification, parallel digital bandpass filtering, and finally, to the hearing aid speaker, resulting in an enhanced and tailored audio experience for the individual with hearing impairment.

B.2. Bandpass Filter Design

The bandpass filter is a digital filter that has been specifically chosen for its ability to isolate and process signals within a designated frequency range. Its primary function is to remove unwanted noise effectively while emphasizing frequencies crucial for speech and sound perception. In this research, a configuration involving two parallel bandpass filters has been implemented, as depicted in Figure 1.

The inclusion of two parallel bandpass filters offers several advantages, including enhanced noise reduction and a targeted response to specific frequencies. Each filter is meticulously designed to cater to a particular frequency range, ensuring that the desired speech frequencies are accentuated while minimizing the impact of noise outside those ranges. By adopting this configuration, the objective of the research is to optimize the filtering process and enhance the overall performance of the hearing aid system.

The parallel arrangement of the bandpass filters enables independent and simultaneous processing of different frequency components. This design decision grants greater flexibility in adapting to individual hearing profiles and fine-tuning the filtering parameters to improve speech intelligibility and sound quality. The utilization of two bandpass filters in tandem establishes a comprehensive and effective approach to noise filtering, ultimately leading to improved performance and user satisfaction in hearing aid applications.

The utilization of the Filter Designer tool in MATLAB has proven to be highly effective in the development of this research project. This tool enables engineers and researchers to design and optimize digital filters that are specifically tailored to meet the precise requirements of the hearing aid system.

The MATLAB's Filter Designer tool offers a wide range of filter types that can be implemented to enhance the audio processing capabilities of the hearing aid. For example, low-pass filters can effectively reduce high-frequency noise, while high-pass filters can amplify critical speech frequencies. Additionally, band-pass filters can be employed to target specific frequency ranges, thereby improving the clarity and intelligibility of speech sounds.

The tool provides various filter design methods, including Butterworth, Chebyshev, and elliptic filters, which allow users to select the most suitable approach based on the desired specifications of the hearing aid system. Parameters such as roll-off, passband ripple, and stopband attenuation can be adjusted to meet the unique requirements of each user.

FIGURE 2

Primary Bandpass Filter

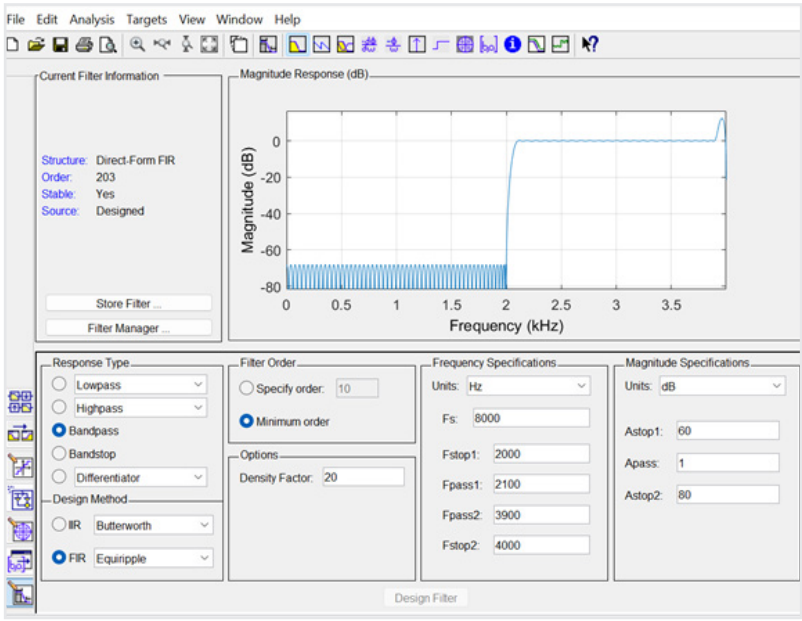
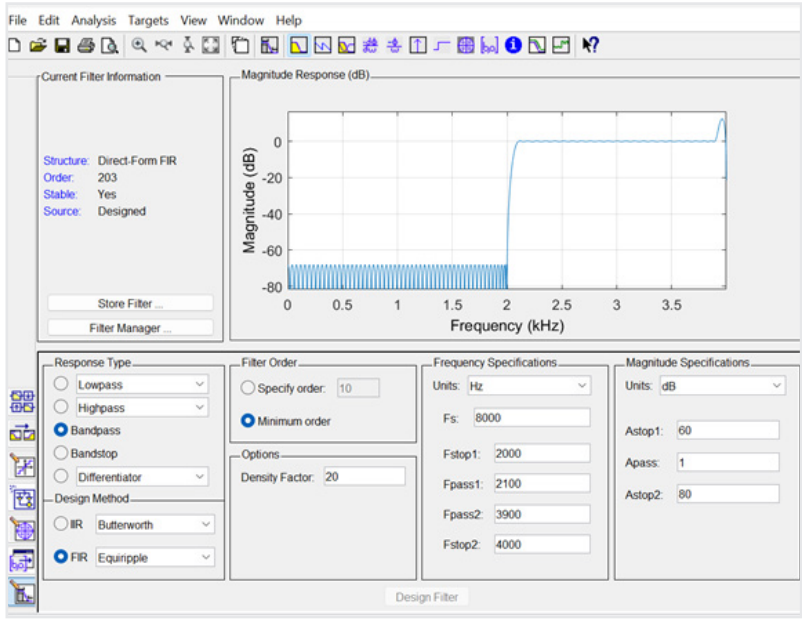


FIGURE 3

Secondary Bandpass Filter



The design configuration of the bandpass filter used for enhancing hearing aids involves carefully chosen parameters to target the relevant frequency range for speech perception and suppress unwanted noise. The center frequency is typically set between 2kHz to 4kHz, illustrated in Figure 2, capturing the fundamental frequencies of speech sounds, and ensuring intelligibility. The bandwidth is selected to encompass important speech frequencies while attenuating frequencies outside the range of 200Hz to 800Hz, illustrated in Figure 3, preserving relevant speech information. The filter order, determining the steepness of the filter response, strikes a balance between noise reduction performance and computational efficiency. The researchers used the minimum order Equiripple filter since it offers several advantages that make it a valuable tool in digital signal processing. One of its primary benefits is its ability to provide a nearly flat frequency response in the passband while maintaining a precise control over the stopband attenuation. This means that it can effectively suppress unwanted frequencies while minimizing distortion in the desired frequency range. Another advantage of the minimum order Equiripple filter is its efficiency in terms of computational resources. Due to its Equiripple characteristic, this filter requires a lower order compared to other filter designs to achieve the same level of performance. This leads to reduced computational complexity, making it more efficient and suitable for real-time applications with limited processing power. Furthermore, the minimum order Equiripple filter exhibits excellent stopband rejection. It can attenuate frequencies outside the passband with a high degree of precision, minimizing the potential for interference from unwanted signals. This feature is particularly valuable in applications where strong out-of-band signals or noise need to be effectively suppressed. Additionally, the Equiripple nature of this filter allows for precise control over the filter's frequency response by adjusting the passband ripple and stopband attenuation parameters. This flexibility enables designers to tailor the filter's characteristics to specific requirements, achieving optimal performance in various applications. Lastly, the minimum order Equiripple filter provides a reliable and stable solution. It is designed to have a well-defined and predictable response, ensuring consistent performance across different implementations and variations in operating conditions.

By configuring the bandpass filter with appropriate parameters, hearing aids can effectively amplify and emphasize speech frequencies while attenuating noise, resulting in improved speech intelligibility and overall sound quality for individuals with hearing impairments.

Results & Discussion

FIGURE 4

Original Signal Waveform in Time Domain

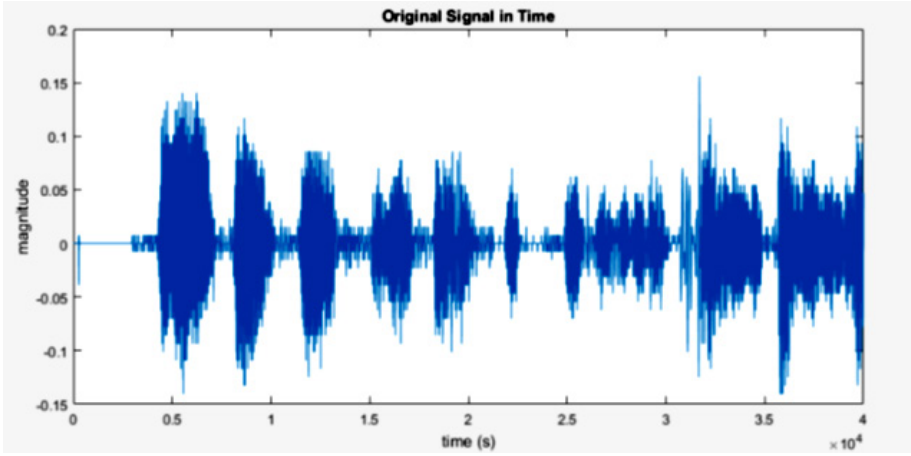


FIGURE 5

Original Signal in Frequency Domain

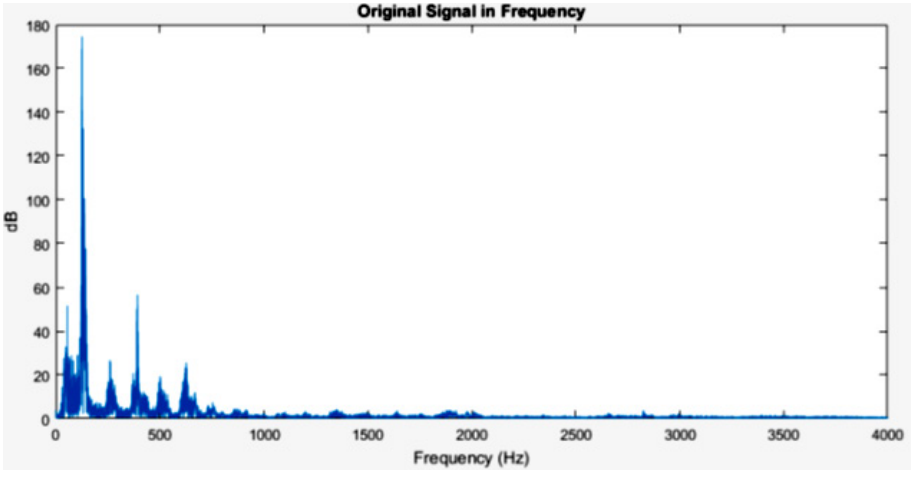


FIGURE 6

Amplified and Filtered Signal Waveform in Time Domain

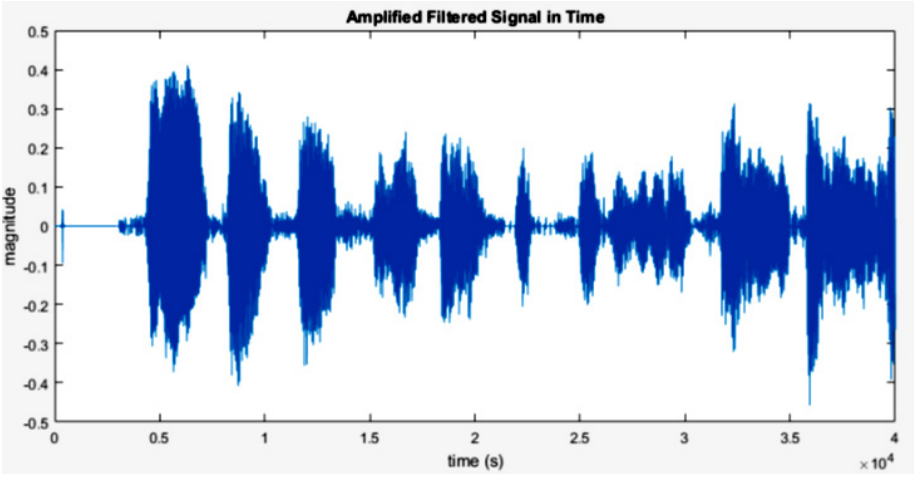
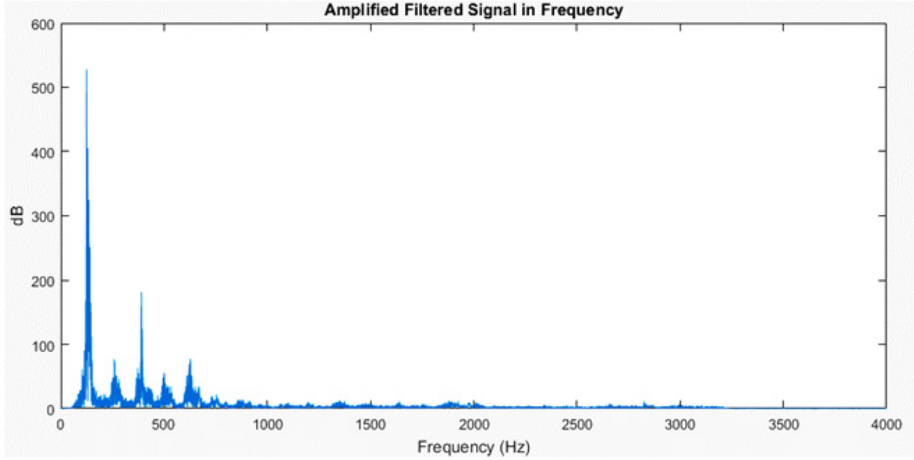


FIGURE 7

Amplified and Filtered Signal in Frequency Domain



The audio signal was initially transformed from the time domain to the frequency domain using the Fourier transform. Figure 4 displays the original audio sound wave in the time domain, while Figure 5 represents the same signal in the frequency domain.

After applying amplification and filtering through two bandpass filters, Figure 6 illustrates the time domain representation of the output signal, whereas Figure 7 showcases the filtered audio in the frequency domain.

Upon comparing Figures 4 and 6, it becomes apparent that the output signal has undergone smoothing, amplification, and clipping, resulting in a graph with a more refined appearance. Similarly, the comparison between Figures 5 and 7 reveals a significant reduction in noise and enhanced frequency components in the frequency domain representation of the filtered audio. These findings confirm the successful implementation of the amplification and filtering techniques, ultimately leading to improved signal quality and the elimination of unwanted artifacts.

Summary and Recommendations

The researchers have achieved successful development of a working simulation using a programming language called MATLAB, which has facilitated the implementation of a digital hearing aid system. This program provides enhanced control and flexibility, enabling fine-tuning of the sound to cater to the unique requirements of each listener. It is worth noting, however, that there might be a minor distortion in sound quality because of the digital processing involved. Nevertheless, the amplified sound still holds significant potential in greatly enhancing the listener's overall auditory experience.

In the implementation of the digital hearing aids system, traditional analog sound processing has been substituted with cutting-edge digital processing techniques, leveraging the capabilities of MATLAB. This transition to a digitalized approach has paved the way for precise signal analysis and filtering, leading to improved customization and accuracy in sound amplification and filtering. The digitized system allows for the application of advanced algorithms, which effectively differentiate between speech and background noise, ultimately contributing to an elevated standard of sound quality.

The utilization of MATLAB in this implementation has provided a robust platform for signal processing, empowering efficient manipulation of audio signals. Through the process of digitalization, these signals can now be processed in a more controlled and precise manner, facilitating the application of sophisticated filtering techniques. This, in turn, aids in the reduction of undesired noise and optimization of the frequency response, thereby elevating speech intelligibility and sound perception.

To summarize, the successful integration of MATLAB in the implementation of the digital hearing aids system serves as a testament to the numerous advantages of digital signal processing. It not only enables superior sound customization but also facilitates precise signal analysis and advanced filtering capabilities. Consequently, individuals with hearing impairments can enjoy enhanced hearing experiences, thanks to these advancements in technology.

The project proponents have put forward recommendations to enhance the functionality of the current program, recognizing the potential for further improvement in building the program using MATLAB. They emphasize the importance of discussing and exploring the integration of new technologies into the existing framework. The primary recommendations include exploring methods to enhance signal clarity by reducing background noise and improving the signal-to-noise ratio. Additionally, they suggest implementing a more flexible gain-processing mechanism to enable precise control and adjustment of sound amplification based on individual needs. The proponents also propose the incorporation of advanced techniques to minimize or eliminate feedback, which can have a significant impact on audio quality. Another key recommendation involves the development of sophisticated algorithms capable of accurately distinguishing between speech and background noise, enabling precise amplification of speech signals while minimizing interference from ambient sounds. To further enhance sound quality and intelligibility, the proponents suggest employing techniques to reduce unwanted noise relative to desired audio signals. More importantly, they emphasize the need to ensure that any modifications and enhancements to the program do not compromise the overall audio quality, thus maintaining a high standard of sound reproduction. These recommendations offer valuable avenues for future research and development, with the aim of optimizing the program's performance and providing an improved user experience. By addressing these aspects, the program could offer more effective hearing assistance and contribute to enhanced auditory perception for individuals with hearing impairments.

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Exploring the Intersection of Digital Art and AI Technology: Implications for Competitions and Judging

Robert Nelson Besana

Abstract

The recent Sony World Photography Award sparked a heated debate among photographers and artists worldwide. Boris Eldagsen's winning entry in the creative photography category was met with controversy after he revealed that it was created using an artificial intelligence image generator. In this article, I will explore how competitions can adapt to the evolving digital art landscape shaped by AI (Artificial Intelligence). What factors must be considered? Is establishing distinct criteria for AI necessary? Should AI be viewed solely as a creative tool or as a work of art? The importance of addressing these issues cannot be overstated. During my tenure as the chair of the panel of judges for the Vision Petron National Student Art Competition's Digital Art Category in March of this year, we faced certain nuanced issues. The fact that AI is now involved in the creation process created apprehension among the panel. In this paper, I aim to delve into crucial discussions in this field and their impact on photography and digital art competitions. It is important to recognize the unique characteristics that AI brings to the creative process and consider how these should be evaluated. As AI becomes more prevalent in the creation of visual art, it is likely that we will see new forms emerge. Competitions must be prepared to adapt to these changes and embrace innovation in the field..

Keywords: *promptography, digital art competitions, controversy, AI-generated image, Sony World Photography Award, AI image generator, photorealistic imagery*

Controversy Erupts Over AI-Generated Image Winning Prestigious Photography Award

On April 13 in London, Berlin-based German photographer Boris Eldagsen was awarded the prestigious Creative Photography category of the 2023 Open Competition of the Sony World Photography Award. His winning entry, titled Pseudomnesia: The Electrician, was created using DALL-E 2, an AI image generator developed by OpenAI.

FIGURE 1

Boris Eldagsen's Pseudomnesia: The Electrician

Eldagsen's aim was to challenge the contest and spark discussion about a technology that has the potential to alter our perception of photorealistic imagery. After the announcement, he declined to accept the award, leading to a strained relationship between him and the organizer. Despite not being invited, Eldagsen took the stage during the ceremony to address the audience.

He said AI images are not photographs and therefore should not be considered in competitions designed for camera-based practitioners. On his website, Boris stated that the judges lacked the ability to differentiate between photographic images and those generated by AI machines. He argued that his creations are not photographs but "images" artificially synthesized with photographic elements as visual language (2023).

The disclosure raised multiple inquiries regarding the characteristics of artwork produced by AI and raised doubt about the definition of photography, whether it should be distinguished from its medium. The photographer expressed disappointment stating, "photographic language has dissociated itself from its medium, which is disheartening for photography because AI now defines the future of the field" (Fotopodden, 2023).

According to World Photography Award officials, they are aware that the image is AI generated. The Creative Photography category in its tradition has always been open for experimentations. A spokesperson for the Sony World Photography Awards clarified:

During our various exchanges with Boris Eldagsen ahead of announcing him as the Creative category winner in the Open competition on 14 March, he had confirmed the 'co-creation' of this image using AI. In our correspondence he explained how following 'two decades of photography, my artistic focus has shifted more to exploring creative possibilities of AI generators' and further emphasizing the image heavily relies on his 'wealth of photographic knowledge'. As per the rules of the competition, the photographers provide the warranties of their entry (artforum, 2023).

The officials of the Award have announced the suspension of all activities with him, citing his deliberate attempts to mislead them, which has rendered the warranties he provided invalid. Eldagsen, on the other hand, contests this assertion and maintains that he participated as a cheeky monkey. He stated: I opted to submit an image that was artificially created. I saw myself as a hacker attempting to uncover weaknesses in the system. My intention was not to exploit the competition, but rather to highlight an area in need of attention (Eldagsen, 2023).

The controversy surrounding Eldagsen's entry has sparked an intense debate within the photography community. Some argue that AI-generated images should not be allowed in photography competitions, while others believe that the use of technology is essential for the evolution of the art form.

In the advent of photography, artists had similar apprehensions like today with AI, in his website Derek Murphy noted: "Baudelaire called photography the refuge of failed painters with too little talent. Van Gogh said photographs could never capture that human spark, so he started focusing more on painting portraits" (Murphy, 2022).

Eldagsen's actions have also raised questions about the responsibility of artists and creators to disclose the use of AI in their work. While some feel that it is important to be transparent about the tools and techniques used, others argue that the focus should be on the outcome and the impact it has on the viewer. While John Lennox puts it in his book titled 2084: "The real problem with AI, then, is . . . the likelihood of our blindly depending on machines, lulled to trust them by bad metaphors. The danger is that computers will fail us and do so in bad ways"(2020).

Regardless of where one stands on the issue, the use of AI in art and photography will continue to be a hotly debated topic in the years to come. As technology advances and artists push the boundaries of what is possible, it will be the responsibility of organizations such as the Sony World Photography Awards to navigate these uncharted territories and establish definitive criteria for participation in their competitions.

Navigating the Intersection of Photography and AI in Competitions

One of the most significant concerns surrounding the use of AI in photography competitions is the ethical implications. AI can be used to manipulate images and create something that was not initially there, which raises questions about the authenticity and truthfulness of the images submitted to competitions. While AI can enhance an image, it can also be used to deceive viewers, that may lead to a loss of trust in the authenticity of the photography industry.

Boris asserted that photography and AI should not be lumped together. The next step would be to talk about the correlation between promptography and photography, and whether they should be grouped together in a single museum, festival, gallery, or competition. This matter is intricate, and I cannot provide a definite response. However, I can state that the simplistic views held by those who advocate for the return to traditional techniques and those who claim that promptography is equivalent to photography are misguided. To reach a satisfactory conclusion, we need to delve deeper into the issue (Parshall, 2023).

His concern was valid, as he predicted that thousands of AI-generated images could flood photography competitions in a year's time. Boris expressed: Initially, I was aware of a single software that could create images based on textual cues, but

I am astounded by the rapid expansion of internet resources in the last year. There was a significant surge, and now the progress is continuously picking up momentum (Eldagsen, 2023).

This raises a challenge in distinguishing between photographs, which are captured using light and lenses, and AI images, which are created through prompt inputs. The disparity between mediums is what reveals the most significant differences. However, as judges in a competition, we only have access to the final output and cannot see the process behind its creation. This leaves us questioning how we can accurately differentiate. As time passes, deciphering these differences will only become more challenging than it is today, as technology progresses exponentially over time.

Eldagsen used the term 'promptography' to refer to the image, pointing out how platforms like DALL-E 2 and ChatGPT utilize "prompts" or precise user instructions to generate personalized visuals or content. According to Eldagsen in an interview with the BBC, while promptography is done with prompts, photography is done with light. He believes it is crucial to distinguish between the two and have an open discussion within the photography community. The question remains whether the realm of photography is inclusive enough to encompass this type of imagery, given that the visual language is similar (Seymour,2023).

Reflections on the Future of Competitions

Creating digital art, like photography, can be a complex and intricate process. During the judging phase of the Vision Petron Digital Art competition in March, our primary focus was to identify the entries that effectively conveyed a storyline and communicated the theme. As we reviewed the shortlisted entries, we realized that we needed access to the layered files to understand how each artwork was created. Our goal was to locate areas where AI technology was utilized and explore how it was employed in the artwork.

Looking for the AI footprints: for some, it is easy to say that they can recognize which image is created using AI, at least for now. As technology becomes more sophisticated, the difference between analog and AI may become permanently undetectable.

What properties and qualities are we looking for and how do we deconstruct the new form that this digital art has evolved into? One way of looking at it is to utilize the classic Aristotle's four causes, namely, material cause, formal cause, efficient cause, and final cause. The material cause (what something, say a table, is made of); the formal cause (the form that determines the shape of the table); the efficient cause (what brings the table into being–a carpenter); and a final cause (the purpose for which the table was made–to use for dining) (Falcon, 2023).

Let us explore how this concept could be relevant to the field of digital art and artificial intelligence.

1. Material cause: This refers to the material or substance from which an object is made. For digital art, the material cause can be the software or hardware used to create the artwork.

2. Formal cause: This refers to the form or shape that an object takes. For digital art, the formal cause can be the style or technique used to create the artwork.

3. Efficient cause: This refers to the process or action that leads to the creation of the object. For digital art, the efficient cause can be the use of AI technology to assist in the creative process.

4. Final cause: This refers to the purpose or end goal of the object. For digital art, the final cause can be to convey a message or tell a story through visual means.

I want to emphasize the significance of the final cause, as it gives an artwork its purpose and meaning. Without context and intent from the artist, such creations are merely arbitrary.

To further examine the legitimacy of considering AI as an art form, we can utilize the methodology of sufficient and necessary conditions. The necessary condition requires the use of generative art software in the creation process, while the sufficient condition mandates that an artist creates the AI image with the intention of conveying their unique vision. For an AI image to be recognized as true art, it must fulfill both the necessary and sufficient conditions.

As Harrison and Wood stated: It may be beneficial to examine discourses not just based on their expressive worth or formal changes, but by their modes of existence. The ways in which discourses circulate, gain value, are attributed, and are adopted differ among cultures and are adjusted within them. The means in which they are expressed through social relationships can be better comprehended through examining the author-function and its alterations than through the topics or ideas that discourses generate (Harrison & Wood, 2007).

However, Bernard Marr (2023) argues that the line between humans and machines is becoming increasingly unclear. Marr claims that creativity has always been a distinguishing factor between the two, but the emergence of a new type of artificial intelligence called "generative AI" is challenging this notion.

It is crucial to acknowledge the author's role and the means through which an object is articulated or produced, hence the significance of comprehending the agency and mechanism as a method to interpreting an object, in this case digital art, and the necessity of identifying their connection.

For digital art competitions, we can expect AI to be involved in a great portion, if not all, of the process. An acceptable amount of AI involvement should be part of the discussion. Assuming participants use AI, I suggest technical proficiency in other design and drawing software be given more consideration. As most digital art contests in the Philippines target art and design students, judges would like to see the mastery that the participants have developed from their school training. Prompt engineering may also be part of the judging together with the other criteria.

For photography competitions— to better inform judges in selecting winners; I propose that shortlisted artists provide a comprehensive documentation of their process; including the raw file and every step from pre-production to post-production— if ever post-production is permitted. Post-production can take on various forms depending on the software used by the artist. One such tool is the AI image generator, Midjourney, which allows the artist to blend their own images with elements produced by AI. This documentation should be mandatory for creative photography categories. If AI-generated elements are being considered in the process for the creative photography category, which in SPWA's statement that they did allow, clear guidelines must be provided.

One potential solution to the challenge of distinguishing between photography and promptography is to create a new category specifically for AI-generated images. This would allow for a clear differentiation between the two mediums and avoid any confusion in the judging process. Additionally, this could provide a platform for promptography artists to display their work and gain recognition. However, there must be clear guidelines and criteria for this new category to ensure fairness and consistency in judging. Another option could be to integrate promptography into a broader digital art category, which may already exist in some competitions. This would acknowledge the unique process of promptography. It is crucial for the photography community to engage in open and ongoing discussions about the relationship between photography and AI to ensure a clear understanding and progression in the field.

In the end, the use of AI in photography competitions should be approached with caution and promoted with transparency. Competitions should have clear guidelines for the use of AI, and participants should disclose any use of AI in their images. Judges and organizers should also be well-versed in AI technology to ensure that ethical concerns are addressed and that the creative process is not stifled.

In conclusion, the landscape of digital art competitions is evolving rapidly with the integration of AI technology. While it may be difficult to distinguish between traditionally produced digital art and entirely AI-produced artwork presently, the incorporation of AI technology into the creative process of digital art may become a distinct quality of the art form. As digital art continues to develop, it is essential to identify the new properties and qualities that it develops into. The final cause of digital art, that is, the purpose and context provided by the artists, must be

given consideration in digital art competitions. As technical proficiency of traditional art-making processes still holds significant value, judges must weigh in on the appropriate level of AI involvement. The future of digital art competitions may see the integration of AI technology in varying degrees, but it is the artists' mastery and expression that will always be the key factor in conveying a message or storytelling.

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The Little Brown Brother "Shoots" Back: Postcolonialism in Filipino Cinema at the Turn of the Century, 2000-2010

Elvin Amerigo Valerio

Abstract

Throughout most of the 20th century, the dominance of Hollywood hindered the development of a distinct film identity and tradition within Philippine cinema. However, from this seemingly uninspiring state, a vibrant independent film community emerged and thrived during the first decade of the 21st century. This transformation was made possible by the introduction of more accessible digital video cameras in the 1990s. The digital medium provided independent filmmakers with the opportunity to explore various storytelling approaches centered around Philippine realities, which resonated with younger audiences.

This paper posits that Filipino independent, or "indie," cinema experienced a surge in creativity during the first decade of the 21st century and established what I refer to as a "postcolonial aesthetic" to counter the dominance of the Hollywood cinematic structure. I draw upon the ideas of Renato Constantino and Bienvenido Lumbera as my primary framework to trace the trajectory of independent and mainstream Filipino cinema during this period. Through an examination of two films from that era—one independent (*Ded na si Lolo* [Grandpa is Dead], 2009) and one mainstream (Baler, 2008)—I argue that Philippine cinema truly came into its own between 2000 and 2010, and its unique characteristics continue to influence the post-Covid era.

Keywords: Cultural imperialism, American hegemony, Philippine cinema, period movies, independent films

The movie industry is both a victim and an ally of American cultural aggression. It is a victim precisely because it is an ally of Hollywood, not by conscious design but by the conditioning effect of decades of exposure to Hollywood movies. At the same time, it is an ally in the sense that the Hollywood model is pervasively the frame of reference [...] Hence, the movie industry is a reflection of Philippine society for it is the clearest and simplest depiction of the neo-colonial situation.

~ Renato Constantino (1977, p. 131)

In just a few sentences, Renato Constantino was able to accurately describe the state of the Philippine movie industry of his time. American cultural imperialism has reduced the industry to a caricature of Hollywood. If Hollywood had Charlie Chaplin, we Filipinos had Canuplin, a vaudeville comedian whose appearance and gestures resembled Chaplin. If James Bond/Agent 007 is an international super spy (and unremitting ladies' man) of the British government, Filipino movies used to have Tony Falcon/Agent X44, also a super spy (sans the "international" label but an unremitting ladies' man nonetheless) with thick sideburns as his trademark. In the age of the Hollywood blockbusters in the 1980s as exemplified by *Ghostbusters, Indiana Jones and the Temple of Doom*, and *Dune* (all released in 1984), Filipino comedy king Dolphy starred in a movie that referenced all three – *Goat Buster: Sa Templo ni Dunê* (Goat Buster: In the Temple of Dunê, 1985). Indeed, the specter of Hollywood movies since the beginning of the 20th century has stunted the development of a distinctly Filipino cinema, and the cinema that the Filipino movie industry conceived was a mere distortion or poor imitation of Hollywood. Lacking technological resources and skilled artisans, the movie industry simply did not have the means to be at par with the Hollywood films that it was trying to imitate; and in the absence of a clear artistic vision, movie producers simply resorted to doing mostly parodies and spoofs as film production was primarily regarded as a commercial venture intended to produce a quick profit. Therefore, despite the industry's considerable output from the 1950s up to the 90s and the fact that movies were once known as the country's "national pastime" (David 1990), only a handful of films today are hailed as cinematic gems. What we have in abundance are senseless flicks anywhere from *Sabi Barok Lab Ko Dabiana* (Barok Said I Love Dabiana, 1978) to *Wrong Rangers* (1984, a parody of the Lone Ranger film and television series) to movies with absolutely meaningless titles (e.g., Horsey-horsey Tigidig-tigidig, 1986; *Haba-baba-doo! Puti-puti-poo!*, 1998; *Tiktaktoys: My Kolokotoys*, 1999; *Isprikitik: Walastik Kung Pumitik*, 1999).

Likewise in the 1990s, advancements in film technologies (e.g., the introduction of CGIs or computer-generated images) combined with America's push for glo-

balization paved the way for the spectacle cinema of Hollywood to systematically dominate all modes of cinematic imagery, production, and reception, resulting in a standardized film culture not just for the Philippines but for most of the world. Unable to keep up, the movie industry's production declined. From an average of two hundred films annually in the 1970s and 80s, the output has gone down to an average of fifty per year since 2003 (Alberto, 2008, para. 3).

However, at the onset of the twenty-first century, the Philippines saw a surge of independent, or "indie" films produced by a new generation of filmmakers. This was made possible by the introduction of the high-resolution digital video camera in the 1990s. The changing of format from celluloid film to digital video freed the independent filmmaker from the high costs of mainstream filmmaking and the commercial demands of the studios. It gave them the liberty to tackle more unusual or controversial subject matters and present new modes of storytelling. By 2005, indie cinema took center stage when two film festivals exclusively devoted to digital indie films were established – the Cinemalaya Independent Film Festival and the Cinema One Originals. In its first year alone, the hugely popular festivals produced now-classic indie films such as Auraeus Solito's *Ang Pagdadalaga ni Maximo Oliveros* (The Blossoming of Maximo Oliveros), Doy del Mundo's *Pepot Artista* (Pepot Superstar), Mario Cornejo and Monster Jimenez's *Big Time*, and Jon Red's *Anak ng Tinapa* (A Kipper's Child). In 2009, indie filmmaking reached its peak when Brillante Mendoza became the first Filipino to win the Best Director award at the Cannes Film Festival for his unapologetically brutal film *Kinatay* ("The Execution of P").

Inspired by independent films, mainstream studios began adapting the "indie approach," whether in terms of style, mode of production, or both. The result was more movies were made with better production values and more interesting narratives. The first decade of the twenty-first century also saw the establishment of new film companies whose output seems to appeal to both indie and mainstream audiences. For instance, newcomer Unitel Pictures was the studio behind Mark Meily's *Crying Ladies* (2003) and *La Visa Loca* (2005) and Peque Gallaga's *Pinoy Blonde* (2005); Seiko Films bankrolled Jeffrey Jeturian's two successful forays into comedy – *Bridal Shower* (2004) and *Bikini Open* (2005) – and Brillante Mendoza's award-winning *Foster Child* (2007); and, closing the decade, Star Cinema produced Chris Martinez's quirky comedy *Here Comes the Bride* (2010) and distributed Dondon Santos' socially relevant *Noy* (2010). *Here Comes the Bride* was also co-produced by Quantum Films, another newcomer in the industry at the time. Founded by lawyer-turned-producer/director Josabeth Alonso, Quantum Films is worth noting as the company will emerge as one of the major movie studios by the next decade, producing movies by premier directors such as Marlon Rivera's *Ang Babae sa Septic Tank* (The Woman in the Septic Tank, 2011), Jeffrey Jeturian's Ekstra (The Bit Player, 2013), Jerrold Tarog's *Heneral Luna* (General Luna, 2015), and Jun Lana's *Ang Dalawang Mrs. Reyes* (The Two Mrs. Reyes, 2018) and *About Us But Not About Us* (2022). The movie industry's output

may have indeed declined over the years, but it encouraged studios to improve the quality of their films.

In this paper, I argue that the surge in creative energy in indie and mainstream filmmaking in the period between 2000 to 2010 led to the development of a Philippine national cinema; a cinema that neither defines nor measures itself using Western (i.e., Hollywood) standards. Drawing from the writings of Renato Constantino and Bienvenido L. Lumbera, I posit the idea that many independent films produced in that period manifested a postcolonial aesthetic that confronted issues of Filipino identity in opposition to a homogenous global culture and that these independent films exerted a considerable influence on mainstream cinema. In arguing this point, I will first discuss the nature of globalization and its effects on local art and culture. Then I will briefly examine the history of the Filipino movie industry to illustrate how American cultural imperialism that began in the early twentieth century thwarted the growth of national cinema. Finally, I will present my reading of two Filipino films from the period — one produced independently, Soxie Topacio's *Ded na si Lolo* (Grandpa is Dead, 2009, APT Entertainment), and one from a mainstream studio, Mark Meily's *Baler* (2008, Viva Films) — to demonstrate how the postcolonial aesthetic is manifested in audiovisual language.

Globalization and its Discontents

> *As the bloody twentieth century drew to a close, God's promise of peace on earth remains unfulfilled; it was now incumbent upon the United States, having ascended to the status of sole superpower, to complete God's work – or, as members of a largely secularized elite preferred it, to guide history towards its intended destination.*
>
> Andrew J. Bacevich (2002, p. 1)

Towards the last decade of the twentieth century, we Filipinos were introduced to a new word, or to be more precise, a new worldwide doctrine: Globalization. "Globalization" became the centerpiece program of then-President and West Point graduate Fidel V. Ramos, with not-so-subtle prodding from the White House and its allies at the IMF-World Bank. Ramos, a former military general and one of the architects of the 1986 failed *coup d'etat* which transformed into the historic People Power Revolution, believed that globalization would give the Philippines a chance to develop into what Western economists refer to as a "newly industrialized country." He began implementing economic reforms intended to open the once-closed national economy, extolling the virtue of foreign investments over local businesses and agricultural development. He subjected the country to foreign exchange deregulation, banking liberalization, tariff and market barrier reduction, and foreign entry

into the retail trade sector (Timberman, 2000, para. 3). In reality, all these simply translated to a hassle-free entry of American products and businesses into the Philippines. On the military front, we witnessed the return of U.S. military forces on Philippine sovereign soil, thanks to a colonial-oriented Senate's ratification of the Visiting Forces Agreement in 1998; barely seven years after the U.S. military bases in Clark and Subic closed.

But what exactly is globalization? The word seems to elicit a multitude of meanings. It touches on so many of the traditional disciplines that there seems to be no end in sight to the discourse provided by globalization — economists, political scientists, anthropologists, sociologists, historians, communication researchers, and artists all have a say on this phenomenon. First, the term "globalization" is not exactly a late twentieth-century concoction. We can even argue that European and U.S. imperialism in the eighteenth and late nineteenth centuries respectively are the earliest signs of globalization because these involve the entry of foreign goods into colonized countries. However, globalization as it is understood today is primarily the product of the end of the Cold War between the Soviet Union and the United States. The fall of the Berlin Wall in 1989 followed by the dissolution of the Soviet Union in 1991 ended the long era of totalitarian domination, leaving the United States to become the sole superpower. This enabled the U.S. to dictate global trade policies which would allow American businesses to expand worldwide. It is for this reason that globalization today is typically defined in economic terms. Thus, globalization often denotes a "process of removing officially imposed constraints on movements of resources between countries in order to form an open and borderless world economy" (Scholte, 2005, p. 56). On this understanding, globalization occurs as governments reduce or abolish protective measures like trade barriers, foreign exchange restrictions, capital controls, and visa requirements. This phenomenon resulted in what George Ritzer (1995) refers to as "McDonaldization," an allusion to the global dominance of the McDonald's fast-food chain. The standardization of McDonald's food (e.g., the Big Mac) and its production and delivery (the "fast food" concept) resulted in massive economic efficiency gains, signaling a new phase in capitalist development. But the global success of McDonald's and other American companies should not be interpreted purely in economic terms for they also represent a cultural message. The Big Mac is not only consumed as an oversized hamburger but is consumed culturally as an image and icon. In other words, the Golden Arches (McDonald's famous symbol) is clearly American, and it stands, first and foremost, for the American way of life. Thus, according to the noted cultural critic Douglas Kellner (1999), globalization, stripped of its false promises, is nothing more than "Americanization" (p. 216).

The worldwide homogenization as exemplified by McDonald's has produced a culture that is identical in all parts of the globe. The influx of homogenous products allows for very little local variety, rendering local cultures to be rapidly

undermined by the constant flood of such imports (Redner, 2004). It is therefore important to not look at globalization simply in terms of trade liberalization or market barrier reduction but rather in its cultural element, the extent to which the social and cultural lives of individuals and societies are influenced by international and/or transnational phenomena. Hence, it is equally significant to investigate the globalization of culture that lies underneath the globalization of economies. This is where the culture industry such as the media makes its contribution; and nowhere is the dominance of American culture more seen or felt globally that in the production of its media.

America did not achieve its global dominance simply through economic exploitation or an interventionist foreign policy but, to borrow U.S. President Lyndon B. Johnson's philosophy for the Vietnam War, by winning the "hearts and minds" of the rest of the world. Seen from this front, the American media is arguably the most effective advertising tool in America's arsenal. Technological advancements in the field of communication in the 1990s (e.g., the Internet and Cable TV) enabled the binding together of larger expanses of time-space not only on an intra-societal level but increasingly on an inter-societal and global level (Featherstone, 1995). Furthermore, these advancements have created a borderless world, making it easier for American cultural products such as pop music and television programs to penetrate even the most conservative nations.

For Hollywood, the 1990s was an era of successive mergers and acquisitions. The big movie studios, most of which were originally founded by Jewish businessmen in the early 1900s, are now owned by multinational corporations. Warner Bros. Pictures — the movie studio established in 1923 by brothers Harry, Albert, Sam, and Jack Warner, immigrants from Poland — is now known as Time Warner, currently the world's largest media conglomerate. Time Warner is made up of three different companies: Warner Communications Inc. (the parent company of Warner Bros. Pictures) and Time Inc. (the largest magazine publisher in the U.S.) merged in 1990 and six years later acquired Turner Broadcasting System Inc. (a Cable TV network whose assets include CNN, HBO, and the Cartoon Network among others). Columbia Pictures, founded in 1919 by brothers Jack and Harry Cohn and Joe Brandt, was acquired by the Japanese electronics giant Sony in 1989. Universal Pictures — one of the oldest Hollywood movie studios established in 1912 by Carl Laemmle, a Jewish immigrant from Germany — has been taken over by Japan's Matsushita Electric Industrial Co. in 1990 and is currently owned by General Electric, an American multinational conglomerate. Because of these mergers, Hollywood studios were able to adopt synergistic marketing techniques giving them control over the exhibition and distribution of their films worldwide. Furthermore, these corporate synergies allowed studios to spend lavishly on advertising to bolster their high-budget spectacle films in theatrical and ancillary markets (e.g., video distribu-

tion, cable TV) and overwhelm smaller indigenous films that could not compete in such a high-stakes environment.

Because of Hollywood's dominance of the global film market in the 1990s, cinemas from other nations, with their images of cultural alterity, were marginalized to the somewhat obscure "other" film traditions. Hollywood assumed the masculine role of the master cinema, while the traditionally feminine role of the dominated was assigned to the "other" cinemas. Moreover, these other cinemas were subjected to the exoticizing gaze of Western audiences. To some extent, the marketing and promotion in the West of other cinemas such as those from Asia, Africa, and Latin America recontextualized the films as mere travelogues, further reinforcing their otherness. These are instances of what Graham Huggan (2001) calls the "postcolonial exotic," or the global commodification of cultural difference.

Even though a big part of Asia was (and continues to be) entangled in neo-colonial globalization, some Asian cinemas have already developed unique filmic traditions, thus giving birth to their own national cinemas (Eleftheriotis & Needham, 2006). On the other hand, our long history of subservience to colonial masters and dependence, for better or for worse, on America's economy has blurred the notion of a "Filipino identity." This loss of identity further marginalized Philippine cinema from the rest of the world. While American media products such as movies, television programs, video games, books, and pop music have penetrated the Philippine cultural landscape, America, and indeed the rest of the world, have received very little of our vast cultural production. The problem, according to Ella Shohat (2006), was not in the exchange but in the unequal terms on which the exchange took place (p. 42). But this disparity was not just economic as Shohat implied but also ideological. Indeed, how could the rest of the world appreciate Filipino films when most Filipinos had such low regard for them? To borrow from Isagani R. Cruz's (1996) view that Philippine literature has been greatly overlooked, Philippine cinema in the 1990s has also been consistently neglected and marginalized that our movies can actually be called the other "Other" cinema.

Hollywood and Its Little Brown Brother

> *I went down on my knees and prayed to Almighty God for light and guidance. And one late night it came to me this way… that there was nothing left for us to do but to take them all, and to educate the Filipinos and uplift and civilize and Christianize them… And then I went to bed and went to sleep and slept soundly."*
>
> ~ U.S. President William McKinley (in Schirmer and Shalom, 1987, p. 22)

In 2019, we celebrated the centennial anniversary of the first Filipino film, Jose Nepomuceno's *Dalagang Bukid* (Country Maiden, 1919). *Dalagang Bukid* was

produced by Malayan Movies, the first Filipino-owned film company founded by Nepomuceno and his brother, Jesus. They boldly declared that Malayan Movies' primary goal is to adapt the production of films to the conditions and tastes of the Filipinos, *"a las condiciones y los gustos del pais"* (Pilar, 1983, p. 14). Their statement was meant to challenge the Hollywood film aesthetic which, as early as Nepomuceno's time, already had a pervasive influence on many Filipinos. *Dalagang Bukid* proved to be faithful to Malayan Movies' vision. The film was based on a popular *sarswela* (musical stage play) by Hermogenes Ilagan which made it readily familiar to audiences. It starred two of the most popular stage actors at the time, Honorata "Atang" de la Rama and Marcelino Ilagan. Filipinos responded enthusiastically to the film, equalling the financial success of its stage version (Pilar, 1983, p. 15).

Now, the question that one may be asking is — if Philippine cinema started with such nationalist aspirations, how did it evolve into a caricature of Hollywood?

First, it must be clear that filmmaking is not a native art form invented by Filipinos. The technology of motion pictures was brought to the Philippines by European entrepreneurs in 1897. It coincided with a pivotal chapter in Philippine history — the revolution against Spanish colonization which culminated in the declaration of Philippine independence on June 12, 1898. However, the celebration proved to be short-lived. Spain was also at war with the United States and Spain was on the verge of losing. Finally, on December 10, 1898, Spain and the United States signed the Treaty of Paris which officially ended the war. Included in the treaty was the U.S. offer to buy the Philippines from Spain for the sum of US$20 million. After three centuries of living under Spanish rule, the Philippines has a new colonial master.

The American colonization of the Philippines was not just a display of American military and economic might; this expansionist move was also the product of what historian Servando Halili (2006) referred to as America's "racialized ideology" (p. 18). The immense industrial and economic progress enjoyed by America at the turn of the 20th century convinced Anglo-Americans of their racial superiority. At the same time, they also felt the need to spread the American democratic way of life to countries they considered uncivilized. In emphasizing his belief that the Filipinos were unfit to govern themselves, William Howard Taft — the first American Governor-General in the Philippines (1901-1904) who also coined the term "little brown brother" — informed President William McKinley that their "little brown brothers would need fifty or one hundred years of close supervision to develop anything resembling Anglo-Saxon political principles and skills" (Miller, 1984, p. 134). Halili (2006) suggests that this conviction shared by U.S. officials was expressed in several ways, including "the concoction of hegemonies that not only avowed Anglo-American superiority but also justified oppressive and genocidal measures towards the so-called inferior races" (p. 18). Patterned after the European notion of the "White Man's Burden," Anglo-Americans assigned to themselves "the right, the duty, and the mission to carry the blessing of civilization to the far

reaches of the world… taking all the risks for imperial glory" (Weston, 1973, p. 35). Thus, by the end of the Filipino-American war (1899-1913), approximately 16,000 Filipino insurgents died and there were at least 200,000 civilian casualties (Ninkovich, 2001, p. 51).

In probably the first display of its pivotal role as an agent of the culture industry, Hollywood films were instrumental in pacifying the growing resistance against U.S. colonialism. As American colonization went on, more and more Hollywood films flowed into the Philippines; and because the Hollywood movie industry is obsequious to the U.S. government (DeBauche, 1997), Hollywood movies easily became an ideological apparatus used by the state in their implementation and articulation of foreign policy. Indeed, Hollywood films became so embedded in the minds of Filipinos that when several cash-rich Filipino families started forming their own movie companies in the 1930s, they instinctively scouted for Caucasian-looking actors because Filipino audiences had already adopted Anglocentric attitudes. The first generation of movie stars promoted by the studios in the 1940s were mostly Filipinos with either European or American blood: Fernando Poe, Sr., one of the first major Filipino movie stars and father of movie icon Fernando Poe, Jr., was half-Spanish; Paraluman, whose elegant beauty can be likened to Greta Garbo, was actually Sigrid Sophia Agatha von Giese in real life, a half-German movie fan who grew up in the quaint town of Tayabas, Quezon; Rogelio de la Rosa, one of the most popular matinee idols of his generation and the first actor to successfully parlay his fame into a substantial political career, was also half-Spanish; and there is the original queen of Philippine movies, the majestic half-American Gloria Romero, among others. Traditionally, these Caucasian-looking actors were given the lead roles while those with distinctly Filipino features (brown skin, flat nose) were usually cast as the villain or were more successful in comedic roles.

But for some scholars, Filipino movies are not entirely copycats of Hollywood. During the early days of the movie industry, there were attempts by producers and filmmakers to create a native identity for Philippine cinema. Nicanor Tiongson (1983) notes that the nature of Filipino films came from the traditions of a much older art form — Philippine theater. Prior to the arrival of motion pictures, the theater was the most popular form of entertainment among Filipinos, so it was not surprising that when filmmaking began in the Philippines, the approach used by the filmmakers descended from theatrical forms such as the *komedya, senakulo, sarswela*, and *moro-moro*. These theatrical forms, on the other hand, were local versions of the Spanish *comedia*, *cenakulo*, *zarzuela*, and *moro-moro* that Filipinos adopted over the centuries of Spanish presence in the Philippines.

Clodualdo del Mundo, Jr. (1998) takes a more political reading of Tiongson's essay by suggesting that this is a form of the native's response of resistance: "Political and armed resistance originate in the realm of culture. Philippine cinema during the American colonial period is one such site of resistance… While the *moro-moro*

and *sarswela* movies manifest native qualities… these movies also betray the influence of the colonial look" (p. 126). In other words, the cinema that was introduced by the colonizer was eventually used by the colonized in articulating their resistance to colonization. The *sarswela* and *moro-moro* movies were not just mere adaptations of popular theatrical forms; it was also a show of opposition to American culture. Finally, del Mundo (1998) concludes that the native resistance displayed by the early filmmakers was also the beginning of the "indigenization" of cinema in the Philippines.

On the contrary, Nick Deocampo (2003) notes that this "resistance" to American culture stems from the threatened Hispanized culture of the Filipino elite. It was the Hispanized *"ilustrado"* or upper class who had control over the production of local films and thus it was their sentiments that were reflected in these so-called "indigenized" films:

Indigenization is not the full expression of resistance. It is not the ultimate means by which we could liberate film and transform it into a satisfyingly national cultural expression… Seen in this light, indigenization can hardly be considered an act of resistance but merely a phase in cinema's development towards achieving it. Of course, as cinema matures, what started in indigenization may possibly result in nationalist expression on film. But this can only come in time. (p. 11)

Despite its differences, both del Mundo and Deocampo's writing of Philippine film history can be traced back to Nick Joaquin's (1988) earlier thesis that the idea of being "Filipino" is descended not from a pre-colonial native culture but from a mixture of cultures and blood that began as recently as the 16th century with the onset of Spanish colonization. To begin with, the "Philippines" or "Philippine Islands" ("Las Islas Filipinas") was named after the king of Spain, Philip II (Felipe II). Therefore, the Philippine islands were the property of the king. Vicente L. Rafael (2000) expounds on this notion further by stating that we Filipinos "live in the modern nation-state that not only bears his [Philip II] name but whose historical reality was initiated by that act of naming" (p. 17).

Joaquin (1988) also believes that the Filipino identity is still an identity in progress. Thus, del Mundo and Deocampo's views on the mapping of Philippine film history, however incongruent, suggest that the development of a national and cultural identity for Filipino movies has yet to reach its conclusion. Nevertheless, it is interesting to note that both studies deal with the acculturation of the Filipinos when they came into contact with the colonizers. Therefore, in the pursuit of an identity, it is more appropriate to include the eventual modification of our culture under the hands of the colonizers instead of simply going back to a pre-colonial native culture that has ceased to exist.

Cinema and Nation

To wish class or nation away… is to play straight into the hands of the oppressor.

~ Terry Eagleton (1990, p. 23)

Within the discourse of "nation" and "identity," the dominant views have always underscored the ways in which national identity is textualized, mediated, and "imagined" (Anderson, 1983), just as the traditions perpetuated by nationalism are "invented" (Hobsbawm & Ranger, 1983). Similarly, Ernest Gellner (1983) argues that nationalism invents nations where they do not exist and not the other way around. Both Anderson and Gellner believe that nations are ideological constructs creating abstract or imagined communities that we loosely refer to as "the nation" or the political construct known as "the nation-state." In contrast, traditions and culture are reified by nationalism to enable its subjects to talk about their culture as though it is constant and distinctive. Therefore, according to Thomas Erikson (1993), nationalism leads us to think in terms of bounded cultural objects; that is, "cultural artifacts are *made* to represent a nation, to function as evidence of the nation's distinctiveness" (p. 103). As a cultural artifact, one cannot deny the role of cinema in disseminating the concept of the "nation." Jesus Martin-Barbero (1993) surmises that film in many countries gave the people of the different regions and provinces their first taste of nation: "Cinema was the living, social mediation that constituted the new cultural experience, and cinema became the first language of the popular urban culture… Film formed [the people] into a national body; not in the sense of giving them a nationality but in the way they experienced being a single nation" (pp. 51-53).

Conversely, globalization has produced various permutations of the word "national" (e.g., internationalism, transnationalism, multinationalism, etc.), thus overshadowing the idea of the national as the "basic cornerstone of film studies" (Hjort & MacKenzie, 2000, p. 2). Furthermore, these provide no criteria for distinguishing exactly what is worth retaining in the "national tradition." However, Benjamin Barber (1995) claims that the "global" and the "national" are so inextricably linked that film scholars should be intent on refining its relationship and clearly defining its continued, albeit changing, pertinence for film studies. Andrew Higson (2000) was among those who addressed this issue when he considered the effects of transnationalism in the formation of national cinemas: "To argue for a national cinema is not necessarily the best way to either achieve cultural diversity or cultural specificity… The contingent communities that cinema imagines are much more likely to be local or transnational than national" (p. 73). For her part, Susan Hayward (2000) concludes that the cinema is not a pure product, that it is inherently a hybrid of many cultures: "The framing of national cinemas is one which

perceives cinema as a practice that should not conceal structures of power and knowledge, but which should function as a *mise-en-scène* of scattered and dissembling identities as well as fractured subjectivities and fragmented hegemonies" (p. 101). Similarly, Shohat (2006) tried to coalesce the global and the national by suggesting that global forces have compelled the concept of the "nation" to continually evolve and expand: "Any definition of nationality must see nationality as partly discursive in nature… seeing the 'nation' as an evolving, imaginary construct rather than an originary essence" (p. 43).

Yet, Constantino (1977) reminds us that "the task of a cultural struggle in the Philippines must be based on an intimate and concrete knowledge of Philippine reality. We cannot apply blindly the experiences of other nations" (p. 121). Therefore, it would be presumptuous to simply place these foreign concepts within the context of Philippine cinema without first considering the inherent features common in the production of Filipino movies. Indeed, it is true that the Philippines is home to a multitude of businesses owned and operated by multinational and transnational companies; however, the production of films (in purely financial terms), whether mainstream or independent, has remained relatively free from foreign capital. In other words, Filipino films, whether mainstream or independent, are generally financed by Filipino capitalists or Filipino-owned companies, while independent filmmakers sometimes receive state sponsorship or funding from private organizations. The problem, as Constantino noted, lies in the colonial mentality of the Filipinos who make movies.

Sources of Tradition

In the search for a native identity, the filmmaker's primary task is to identify the artistic tradition from which his/her films will be borne. According to Bienvenido L. Lumbera (2000), this ought to begin with "confronting the problem of the Filipino artist's alienation from the indigenous soil in which his/her art should sink roots" (p. 7). Thus, it is necessary for the filmmaker to examine the society where cultural production takes place, noting how social, economic, and political forces compete for hegemony within that society. This should translate to a formulation of aesthetic norms that are markedly "Filipino" and the formation of a new identity for Philippine cinema, one that confronts — as opposed to merely reflecting and propagating — the Filipinos' neo-colonial state.

If Lumbera recommends that artists should investigate the society where cultural production takes place, this should include a critical re-evaluation of history. Philippine history, especially the canonical texts taught in primary and secondary schools, is largely written by scholars who have marginalized the immense contribution of the inarticulate — the masses. Therefore, it is one arena in which we must struggle to decolonize their minds. It is now the task of the filmmaker to construct

within filmic spaces a people's history and evaluate it in terms of how they affected the people.

Lumbera (2000) also recognizes that while the artists' process of creation is intensely personal, their views are forever shaped by their environment. The concept of artistic freedom is relative for there may be spaces where artists can work freely but these spaces are clearly delineated by socio-political forces. The filmmaker must realize that the question of identity is not a personal quest but rather a national and political one. Therefore, the creation of art is inevitably political which means the struggle for cultural self-definition and political self-determination cannot be separated from one another.

When it comes to the question of *native identity*, Lumbera (2000) indicates that the problem with the Filipino artists' search for this elusive identity lies in the country's overtly Anglocentric system of education which means that the language in which the rudiments of art and its evaluation were conveyed to Filipino students was the language of imperialist masters (p. 7). For example, the study of film in most Philippine universities has marginalized the study of Filipino movies by focusing more on Western cinema, thus denying students the chance to watch and analyze local films. Even in film criticism, Filipino critics tend to measure Filipino films by Western standards. For example, Emmanuel Reyes (1989) points out four common flaws of Filipino movies that most Filipinos complain about: scene-oriented narratives, overt representation, circumlocutory dialogue, and stories that emphasized the centrality of the star. Using a seemingly nationalistic tone, Reyes asserts that the above-mentioned characteristics are actually "traits" rather than flaws (p. 14). However, a closer reading of Reyes' essay will reveal his condescending attitude. By using Western authors as references and discussing each trait in opposition to the Hollywood aesthetic, Reyes suggests that these traits are also the reason why Filipino movies fail to live up to the standards set by Hollywood. In concluding his essay, Reyes holds on to the dream that "even with limited resources, it is not impossible to go strictly by the norms of the classical Hollywood narrative and produce a marvelous Filipino film" (1989, pp. 25-26). Clearly, Reyes' Anglocentric education, as well as that of his peers, taught them to look at the Hollywood aesthetic as the criterion by which all other films will be measured. Such hasty comparisons, under the deceptive guise of American and European neo-universalism, serve to wrench Filipino cinema from its own cultural and economic particularities. They prove Constantino's view that the Hollywood model is the frame of reference, not just for Filipino filmmakers, but for Filipino critics and audiences as well.

Lumbera (2000) also suggests that artists use a set of criteria that will allow us to appreciate and validate all artistic expressions even as these are now marginalized by Western critics (p. 9). This means that filmmakers can make use of existing movie genres that are already familiar with the masses (e.g., melodrama, love story, comedy, fantasy, etc.) in the same way that the early filmmakers used the sarswela as

a form of "native resistance" (del Mundo, 1998) to American cultural imperialism. In other words, as the normative modes of storytelling are modified, they must be integrated with the old to create a feeling of a continuous development from the past; in stark contrast with the elitist attitude of some "indie" filmmakers who tend to disregard audience reception in favor of "personal expression." This egotistical illusion, I believe, is one of the main means by which artists are kept chained to the ideology of capitalism; if they adhere to the ruling class view that creative activity is metaphysical, subjective, and unrelated to class interests, they are permitted to cherish the pretense of 'freedom' to compensate for their impotence.

The Little Brown Brother "Shoots" Back

Soxie Topacio's *Ded na si Lolo* ("Grandpa is Dead," 2009) was produced by APT Entertainment, a relatively small film company founded by Antonio P. Tuviera in 2005. Inspired by the production grants being given by the Cinemalaya Independent Film Festival and Cinema One Originals to help aspiring new directors, Tuviera decided to spearhead the Sine Direk Series in 2008. The series' aim was to fund the works of six noteworthy veteran directors who have projects that the big studios could not finance because it was deemed commercially unpromising, regardless of their artistic aspirations. Out of the six, *Ded na si Lolo* proved to be the most successful, both commercially and artistically. The film was even chosen to be the official Philippine entry to the 2010 Oscar Awards.

When the patriarch of the family dies, his children — Isidro (Dick Israel), Dolores (Elizabeth Oropesa), Mameng (Gina Alajar), Charing (Manilyn Reynes), and Joonee (Roderick Paulate) — come together at their family home to mourn his passing. But the children all have a flair for the dramatic (each of them fainted when they heard of their father's death); and as they gather around at their father's wake, all their issues with each other come to the fore. The story that unfolds is a brilliant and comical exploration of Filipino culture with all its strange superstitions about death and the sometimes difficult but often heartwarming feeling of love for one's family.

Ded na si Lolo best exemplified Lumbera's (2005) postcolonial prescription that Filipino artists should not turn their backs on traditions that may be considered overused because these provide the artist with a set of aesthetics that are readily familiar to Filipino audiences. The trick was to reinvent these traditions to make them recognizable and at the same time fresh to audiences. Topacio's script excelled in its reinvention of what we Filipinos are used to seeing in local comedies. It even had all of the so-called "traits" that Reyes (1989) earlier pointed out:

1. Scene-oriented narratives — According to Reyes, "[I]n contemporary Filipino narratives, conflict is used as a basis for indulging in confrontation

scenes... Tension in a scene can give way either to an emotional outburst, a harsh verbal exchange, or physical combat" (1989, p. 16). Topacio's film is filled with such scenes, but his well-written and hilarious script makes every scene work. The scenes effortlessly change from comedy to drama and vice versa. Audiences laughed at the film's physicality and harsh verbal exchange and empathized with the characters' excessive emotional outbursts as these were all handled very skillfully by the talented cast.

2. Overt representation — Reyes notes that the "strategies employed by Filipino movies... include reaching for the obvious, using dichotomy, exaggeration, repetition and being graphic in depicting screen action... Subtlety and symbolism are downplayed to heighten the impact of literal excess" (1989, p. 17). If there was one thing, we can say about *Ded na si Lolo*, is that it lacked any form of subtlety. The scenes, dialogue, and performance were indeed exaggerated and repetitious. Each scene was like a verbal match between the characters. But isn't this the way we Filipinos are in real life? This was the brilliance of Topacio's film — his uncanny ability to capture this cultural uniqueness. In one scene, Bobet (BJ Forbes) asks his uncle Joonee (Roderick Paulate) why, after hearing of their father's death, each one of them fainted. Joonee answers, *"'Pang-telenovela kasi ang buhay natin"* ("Our life is good for a soap opera"). Isn't it true that we sometimes compare our existence to one big soap opera?

3. Circumlocutory dialogue — Reyes proudly agrees with the Western notion that "good dialogue, as American screenwriting manuals would put it, must seek the essential… Writers must learn to cut, condense, intensify, and tighten… In contrast, dialogue in [Filipino movies] is less circumscribed as it is used to expand a scene. Characters try to outclass one another by rattling off the most vehement statements often fat with wit" (1989, pp. 20-21). Topacio's script is abundant with dialogue that would be deemed unnecessarily wordy by Anglocentric critics such as Reyes. *Ded na si Lolo* even starts with a deafening monologue by Charing (Manilyn Reynes) when she wakes up very early in the morning and scolds the whole household for moving so slowly. Topacio is simply showing this side of ourselves because we Filipinos are indeed garrulous.

4. Stories that emphasized the centrality of the star — In Filipino movies, Reyes observes that the movie star "does not vanish to emerge as a character. But rather, the script character must conform to the star" (1989, p. 23). Thus, it is common for Filipino actors to be typecast to a certain role or persona. Since typecasting is an important marketing consideration in the Philippines, film stories are created to fit the image

of the star. Scenes are conceived to showcase the star's most sought-after quality (Reyes, 1989, p. 24). *Ded na si Lolo* featured an all-star veteran cast and each star was given a moment to display his/her thespian abilities: Roderick Paulate's "grand entrance" when his character arrives at the wake wearing a red gown; the confrontation and verbal combat between Gina Alajar and Elizabeth Oropesa was their time to shine; Manilyn Reynes, as I have mentioned, has her moment in the opening scene; the revelation about their father having another family is given to Dick Israel (the only actor cast against type); and even BJ Forbes was given his moment to cry on camera. Before the funeral, Joonee reminds Bobet to prepare lots of ammonia because the funeral is going to be a showdown of who will pass out in the most flamboyant and dramatic way.

Ded na si Lolo also pokes fun at the various superstitious practices we Filipinos do when someone dies — e.g., putting money in the hands of the deceased and getting it back before the funeral will supposedly bring good luck while cleaning the house during a wake will bring bad luck, etc. But these are exactly what being Filipino means and Topacio skillfully exposed us for who we really are, with all our wonderful imperfections and cultural peculiarity.

On the other hand, *Baler* (2008) was one of those unusual occasions when a mainstream studio threw its support for a project seldom seen in local films — a period movie. Prior to Baler, historical or "period" films were hardly ever produced because local studios were aware of the soaring production costs for such films. Furthermore, period movies offered very little promise in terms of audience patronage. Nevertheless, if done right, these movies can be a tool by which filmmakers and audiences alike can re-evaluate their once uncritical view of historical events (the best example being Jerrold Tarog's award-winning and commercially successful 2015 historical film *Heneral Luna*).

Produced by Viva Films under the direction of Mark Meily, Baler tells the story of Celso Resurrecion (Jericho Rosales), a half-Spanish half-Filipino soldier stationed in the far-flung town of Baler. There he meets and falls in love with a beautiful local lass, Feliza Reyes (Anne Curtis). Celso and Feliza are forced to keep their love affair a secret because Feliza's father, Daniel (Philip Salvador), is a member of the rebel movement. Their love story unfolds amidst the true events that happened in Baler, Aurora when, on June 27, 1898, a group of Filipino rebels attacked a Spanish military outpost. The Spanish soldiers were forced to hide inside the nearby church. Instead of blowing up the church with cannons, the rebels decided that the more humane approach is to wait for the soldiers to voluntarily surrender. Convinced that Spain will send reinforcements, the soldiers decide to remain inside the church. The standoff lasted for an unprecedented 340 days. The incident came to be known as the Siege of Baler.

One of the film's significant contributions was to bring to light a historical event that has been marginalized from the canons of Philippine history. It also deconstructed the traditional notion of a Filipino revolutionary fighter (e.g., the image of Andres Bonifacio wantonly attacking the Spanish forces with a bolo) and a Spanish military officer. In the film, there was surprisingly a lot of civility between the Filipino rebels and Spanish soldiers despite the occasional armed assault. The lines of communication were always open. If one side wants to communicate with the other, a flag of truce is hoisted in front of the church. The rebel leaders even took the more Christian approach of waiting for the outnumbered soldiers to voluntarily surrender to avoid further bloodshed. When Feliza's younger brother Gabriel (Carlo Aquino), a sacristan of the church, decides to stay inside the church so he can be of service to the Spanish friar Fr. Candido Gomez Carreno (Michael de Mesa), the Spanish officer Capt. Enrique Fossi de las Morenas (Baron Geisler) made it clear to all the soldiers that Gabriel is neither a prisoner nor a hostage and that he is free to leave anytime. Even the refusal of Lt. Saturnino Martin Cerezo (Ryan Eigenmann), the officer who replaced Capt. Enrique, to surrender is the result not of his hatred for the Filipinos but of his pride as a soldier of the Spanish military and his loyalty to the monarchy. Finally, when the time came for the soldiers to surrender, they were neither executed nor sent to jail; instead, they were simply sent home to Spain.

Although somewhat panned by several critics for its overly melodramatic tone, unrealistic production design, and problematic casting, I submit that Baler follows Lumbera's postcolonial approach to cultural production. Instead of looking to Hollywood for stories to copy, Meily and screenwriter Roy C. Iglesias went inward and uncovered a story that Filipinos can use to examine the production of their own history. Indeed, one might wonder why the Siege of Baler is a mere footnote in Philippine history and is seldom taught in schools. One probable reason for this oversight is that none of the major players in the revolution (e.g., Andres Bonifacio, Emilio Aguinaldo, Apolinario Mabini, etc.) were involved in the siege. Another would be because Baler is already too far from Manila and the adjacent provinces of Cavite and Laguna where much of the writing of the history of the revolution was focused. Whatever the reason, the film showed the wealth of home-grown stories that Filipino filmmakers have yet to discover. Therefore, despite its purported technical flaws, Baler was a step in the right direction as it eventually encouraged the production of more films with narratives set in other pivotal moments of our colorful history. These films are then used as a pretext to present a critical (or even revisionist) perspective on historical events – e.g., *Heneral Luna, Goyo: Ang Batang Heneral* (Goyo: The Boy General, 2018), *El Presidente* (2012), *Bonifacio: Ang Unang Pangulo* (Bonifacio: The First President, 2014), *Katips: The Movie* (2021), *Maid in Malacañang* (2022), *Ako si Ninoy* (I Am Ninoy, 2023), and *Oras de Peligro* (Hour of Danger, 2023).

Cinema as Catalyst

We are a nation suffering from the lingering effects of colonialism. With an identity that was at best blurred, we have become a people with a history manufactured by colonial education, a present dictated by the economics of globalization, and a future that seems deemed to repeat the mistakes of the past. We must turn to our cultural productions and utilize them as a site of negotiation and struggle in the search for our identity. Renato Constantino reminds us that the development of our national and cultural identity should come from studying the struggles of our people against oppression and colonialism for they are the clearest expressions of the beginnings of a nation — a nation that contraposed its being to that of the colonial power: "National culture should be seen as emanating from a people in action, in an unending fight for freedom and progress. Thus, the real base of Filipino culture must be sought in the continuing struggle of the people against colonial oppression" (1977, p. 105). Cinema is one such space where we can articulate our struggle to break free from American hegemony and carve an artistic identity that is truly reflective of our being Filipino. *Ded na si Lolo* and *Baler*, along with other noteworthy films, whether mainstream or independent, have shown that it was indeed possible. These filmmakers have proven that we can create a cinema that is made to serve, first and foremost, the Filipino masses; a cinema that makes the masses its true subject; a cinema that can transform the political idea of nationhood into the daily experience of nationhood. In the words of Philippine National Artist for Film Lino Brocka (1983): "The sincere Filipino filmmaker should get over his hang-up about making the Great Filipino Film; he should, instead, think seriously about developing the Great Filipino Audience" (p. 264).

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