Usability of the Department of Health Website Amidst the COVID-19 Pandemic in the Philippines

PRECIOUS MARIE T. TORRES
ANDREA G. ATENDIDO
ALEXANDRA BEA CAMILLE T. TAN
LORELIE C. GREPO

INTRODUCTION

Following the rise of COVID-19, both facts and misinformation spread rapidly online, making it difficult for the public to distinguish one from the other. Consequently, this resulted in anxiety, confusion, and wrong actions taken (Department of Global Communications 2021). Due to the prevalence of misinformation, there arose a need for a centralized source of accurate information that could be easily accessed online—a role to be fulfilled by the Department of Health (DOH), as the Philippines' authority on health. Crisis communication is essential for public reassurance and order (Mohamad and Azlan 2020), and people are more likely to trust local health authorities than international bodies, due to the latter having language and cultural barriers (Mohamad et al. 2020).

For a government website, such as that of DOH, to be effective in providing easy access to information and services to the public, it needs to be credible and a trustworthy source for the public (Huang and Benyoucef 2014; Tan et al. 2008; Teo et al. 2008), and this can be achieved by ensuring website usability. E-government websites with high levels of usability are seen as more credible (Huang

and Benyoucef 2014). Similarly, trust in an e-government website is significantly associated with perceived website quality (Teo et al. 2008). Moreover, unusable websites reduce the effectiveness of communication between users and the organizations (Asiimwe and Lim 2010).

Unfortunately, many Philippine government websites are difficult for citizens to use due to lack of usability (Clemmensen and Katre 2012), leading users to turn to other less credible sources of information, thereby placing them at risk of various health concerns due to acting on misinformation. Through this study, we evaluate the usability of the DOH website with respect to relevant COVID-19 information, identify key issues and strong points in the website's current design and content, and recommend design improvements. It should be noted that although the term e-government puts emphasis on the services that a government offers using electronic media (Almarabeh and AbuAli 2010), the terms government website, e-government website, and e-government will be used interchangeably in this study, particularly to refer to websites that provide information and services to the public (Huang and Benyoucef 2014).

LITERATURE REVIEW

Usability. According to the International Standard Organization (ISO), usability is defined as an outcome, or "the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use". Web design is an area of application that is most concerned with usability. As the importance of websites rise as a communication and information dissemination tool, many studies have been conducted to evaluate the usability of varying types of websites, such as Library websites (Jeng 2005; Manzari and Trinidad-Christensen 2006), School and E-learning websites (Basher et al. 2014; Harrati et al. 2016), and e-commerce websites (Hasan et al. 2012; Shehzad et al. 2017).

High usability offers multiple benefits to users and website owners. Noted usability engineering specialist Jakob Nielsen emphasizes that engineering usability principles should apply to web design to increase functionality (Nielsen, 2020). Another prominent benefit of high usability is the ease of finding information. Spool, et al. (1997) found that usability issues often lead to the failure to find information. Thus, Nielsen et al. (2001) formulated the 10 Main Usability Principles, which is a set of heuristics that can be used to evaluate the usability of a website or system.

Usability of Government Websites. Despite the importance of usability in government websites to be perceived as credible and trustworthy, several studies (Ornager and Verma, 2005; Siar, 2005; Asiimwe and Lim, 2010; Clemmensen and Katre 2012); Urbina and Abe 2017) suggest that a large proportion of government portals, web sites, and software systems are difficult for citizens to use due to complicated systems and unusable interfaces. As a result, e-government websites are often criticized for paying more attention to the technology itself rather than the users' needs and expectations (Verdegem and Verleye 2009), and the Philippines is no exception. Siar (2005) expands upon the Philippine government's usability failures, which mainly included lack of information and difficulty to navigate the website. Common usability issues when it comes to government websites include: lack of breadcrumb trails, lack of search capability (Youngblood and Mackiewicz 2012), broken links (Asiimwe and Lim, 2010; Huang et al. 2009; Urbina and Abe 2017), overloaded information presentation, inconsistent colors (Huang et al. 2009), and generally poor navigation capabilities (Huang et al. 2009; Huang and Benyoucef 2014; Asiimwe and Lim 2010; Youngblood and Mackiewicz 2012).

Developing countries face challenges of e-government development, with most problems relating to the adoption of new technologies and the unwillingness of bureaucrats to accept innovations (Bojang 2019). For example, these nations often have poor information technology infrastructures (Dada 2006; Pangaribuan 2019); and those with existing infrastructure still may face challenges with equal internet access and the digital divide (Nkohkwo and Islam 2013). Aside from deficits in administrative, financial,

and technological terms, most people lack interest and awareness about e-government facilities (Siddiquee 2016). Moreover, problems concerning e-government staffing, stemming from lacking financial resources, pose a challenge because local governments may find it hard to compete with the private sector for skilled information technology staff (Coursey and Norris, 2008). Bojang (2019) also mentions how corruption, a problem that is most common in developing nations, especially the Philippines, is among serious contextual constraints that challenge e-government implementation.

User Testing. Different usability evaluation techniques have been developed and incorporated into website design and development. Liljegren (2006) investigated four common methods, namely, hierarchical task analysis, cognitive walkthrough, heuristic evaluation, and user testing, based on their thoroughness, validity, reliability, cost effectiveness, and clarity. Findings show that user testing is recommended as the primary method in usability evaluations, as they fulfill the criteria and address the 'difficulty to make errors' aspect of overall usability.

Being an international body that specializes in establishing global standards, ISO 9241-11:1998 explains that to measure usability, decomposing efficiency, effectiveness, and satisfaction into sub-components with measurable and verifiable attributes is necessary. Furthermore, ISO 9241 indicates quantitative and qualitative metrics that measure efficiency, effectiveness, and satisfaction that are in line with their respective definitions, shown below:

- ◊ *Efficiency* refers to the resources expended in relation to the accuracy and completeness of goals achieved. ISO suggests task time or the total time the user takes to complete a particular task as a reliable measure for efficiency.

- ◊ *Effectiveness* is defined as the accuracy and completeness with which specified users can achieve specific goals in particular environments. As such, effectiveness is measured through Completion Rate, which is computed using the formula (1), wherein NTCS is the Number of Tasks Completed Successfully and TNTU is the total number of tasks undertaken.

Completion Rate = (NTCS / TNTU) x 100% (1)

- ◊ *Satisfaction* refers to the comfort and acceptability of the work system. The System Usability Scale (SUS) is a well-researched and widely used questionnaire for assessing the usability and user satisfaction with respect to web applications. This tool asks users to rate their level of agreement or disagreement with the 10 statements about the software under review (Harrati et al. 2016).

METHODOLOGY

This study employed a mixed methods design that involved experimental and qualitative methods to accommodate the quantitative and qualitative metrics that measure efficiency, effectiveness, and satisfaction, as seen in the framework suggested by ISO 9241.

An experimental design involving user testing was used for the quantitative aspect of the study. This aligned with the study of Liljegren (2006), which found that user testing was the most promising among three other usability evaluation techniques based on thoroughness, validity, reliability, cost effectiveness, and clarity. A convenience sample of 12 participants was selected among college students and young professionals between the ages of 18-24. All participants had adequate exposure to technology and the internet but did not have prior experience of using the DOH website and prior web evaluation experiences, as required by the user testing method. The experiment involved the participants performing tasks with the objective of locating certain COVID-related information, which were based on general information that the public should know according to the websites of two specialized agencies focused on health, namely, the World Health Organization and Centers for Disease Control and Prevention.

The qualitative aspect of the study was used to determine which factors affected perceived usability when using the DOH website and, consequently, the areas for improvement of the website. Throughout the experiment, participants were encouraged to actively voice out their thoughts through Thinking Aloud, a highly valuable usability engineering method (Halzinger 2005). Through this, the researchers understood how the users viewed the system, and facilitated the identification of misconceptions and possible difficulties in navigation. After completing the performance task, participants were given a 10-question Likert scale survey based on subjective evaluation, followed by a semi-structured interview to document the users' experience with the tasks, likes and dislikes regarding the website, and suggestions for improvement.

Completion rate of each research participant was computed using the formula defined by ISO 9241. These values and their overall average were compared against a benchmark value of 78%, which was consistent with those in other usability studies (Basher et al. 2014, Shehzad et al. 2017). To further understand which tasks were relatively difficult and light for the participants, completion rates per task were computed and compared to the established benchmark. To know the extent of the effect of each question on the computed overall average completion rate, failures were counted per question and were used as a basis in arranging them from greatest to least. Afterwards, their cumulative percentages were computed.

Researchers recorded in seconds the duration each participant took to complete each task to obtain the Task Duration value. The maximum acceptable task time was computed for each task and the number of participants (N) whose task times fell within the specified benchmark. The maximum acceptable task time was computed using the method by Sauro and Kindlund (2005).

SUS survey scores of all participants were calculated and averaged. The average score was compared to the standard of 68, which was used by Thomas (2015).

The primary sources of information for the qualitative research aspect of this study were the Think Aloud comments and the insights gathered from the post-test interview. Transcripts were analyzed to derive common themes, wherein the most recurring ones were identified as factors in affecting the perceived usability of the DOH website.

RESULTS AND DISCUSSIONS

QUANTITATIVE RESULTS

Effectiveness. Figure 1 shows that throughout user testing, only three out of 12 participants completed enough tasks to meet the benchmark of 78%. This implies that at least 75% of the participants had difficulty completing tasks, or in this case, finding the information in the DOH website.

Table 1 shows the overall average Completion Rate across participants. As shown, the overall average task completion is at least 10 points below the benchmark, implying that the system overall is below average in effectiveness. Note that this average is the same for participant completion rate and task completion rate.

Task Completion (%)		Benchmark (%)
Overall Average Task Completion	68.75	78

TABLE 1. OVERALL TASK COMPLETION RATE (N=12)

To further understand what led to the below average rating, the completion rates per task were computed. Figure 2 shows that only seven out of 16 questions (i.e., tasks A1, A5, B1, B2, B6, B7, and B8) are above 78%. Thus, more than half failed to meet the standard. Moreover, the case of task B4 warrants attention because it has a 0% completion rate, indicating that all participants failed to retrieve the information required for the question: What should you do if you find out that you have COVID-19?

FIGURE 1. COMPLETION RATE PER PARTICIPANT

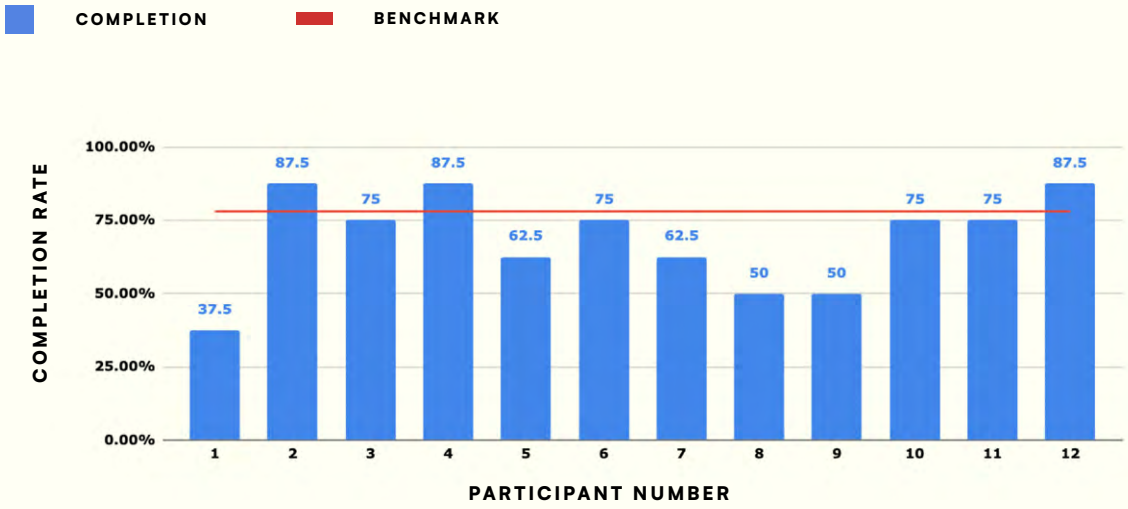
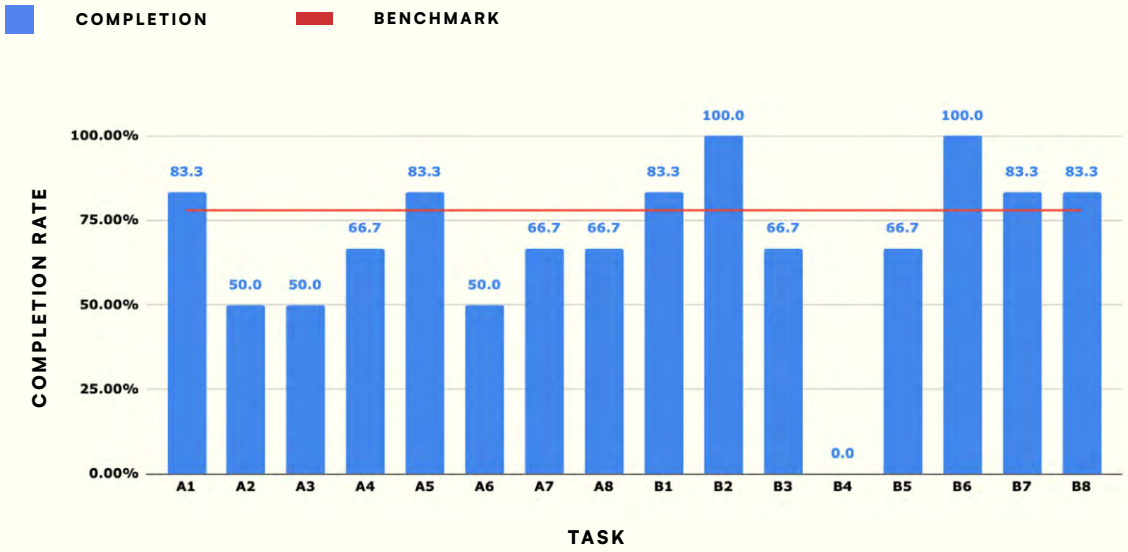


FIGURE 2. TASK COMPLETION RATE PER TASK



Task	Failures	Cumulative %
B4	6	20.00%
A2	3	30.00%
A3	3	40.00%
A6	3	50.00%
A4	2	56.67%
A7	2	63.33%
A8	2	70.00%
B3	2	76.67%
B5	2	83.33%
A1	1	86.67%
A5	1	90.00%
B1	1	93.33%
B7	1	96.67%
B8	1	100.00%
B2	0	100.00%
B6	0	100.00%

TABLE 2. CUMULATIVE PERCENTAGE OF ERRORS

More than half of the tasks fell below 78%; thus, the task that contributed the most to the overall average completion rate needed to be ascertained. Table 2 shows the accumulated effect of failures counted from each task. As shown in the table, 50% of the failures come from only four tasks, namely, B4, A2, A3, and A6, out of the 16 tasks.

Data showed that the completion rate of the participants fell below the given benchmark, thereby indicating that the system inhibits accurately accomplishing tasks. Furthermore, tasks B4, A2, A3, and A6 were found to contribute to at least 50% of the total failures, thereby indicating that among the 16 tasks, B4, A2, A3, and A6 were relatively the most challenging for the

To reiterate, the information used in the performance tasks was taken from the WHO and CDC public advisories that were also reflected on their websites, implying that the information was highly relevant to people during the pandemic. Therefore, results suggest that participants had difficulty finding the information most relevant to them.

Task Duration (s)		
Task	# of Participants who completed within the benchmark time	Benchmark (s)
A1	4	77.40
A2	4	126.84
A3	5	329.81
A4	5	147.25
A5	4	154.94
A6	3	188.80
A7	4	104.40
A8	5	83.42
B1	5	108.16
B2	5	97.76
B3	5	311.36
B4	-	-
B5	4	78.17
B6	5	725.17
B7	5	39.57
B8	5	103.28

TABLE 3. TALLY OF TASK TIMES

Efficiency. Table 3 shows the computed benchmark and number of participants who met the said benchmark per task. No task was accomplished by all six participants within the computed benchmark, but nine, namely, A3, A4, A8, B1, B2, B3, B6, B7, and B8, out of 16 tasks were successfully accomplished within the maximum acceptable task time by at least five out of six participants. Five tasks, namely, A1, A2, A5, A7, and B5, were finished by at least four participants with task durations within the computed benchmark. Furthermore, task A6 was finished within the benchmark by at least three out of six participants.

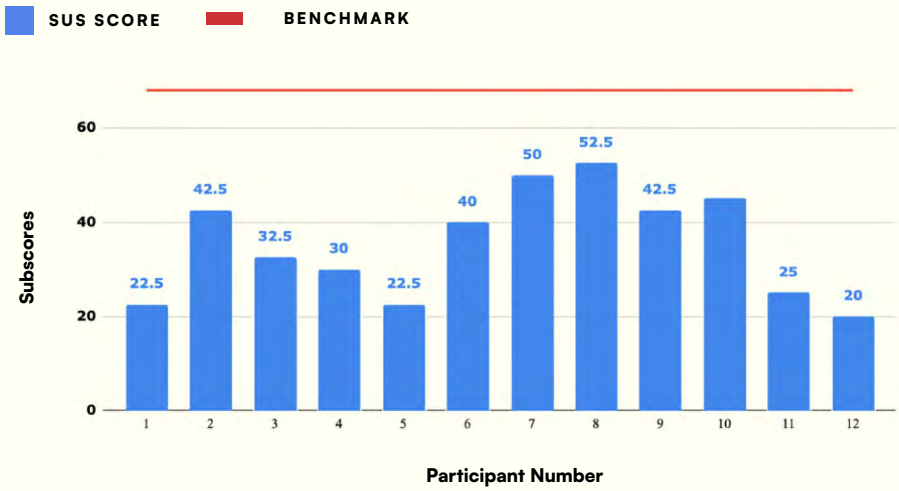
All failed attempts must be included when computing for the maximum accepted task time. Thus, the maximum accepted task time for task B4 was not computed because no participant successfully accomplished the task.

The task duration results were favorable in denoting the system's efficiency, because at

least half of the participants accomplished the tasks within the computed benchmark. However, the favorable numbers for efficiency only considered success cases because failed tasks were excluded in computing for the maximum acceptable task time. What this means is that efficiency and effectiveness of a system are related: users complete tasks accurately while not needing to expend too much of their resources.

Satisfaction. Figure 3 describes the participants' satisfaction in using the DOH website. All 12 participants scored the website below the established benchmark of 68, with the highest being 52.5 and lowest being 20.

FIGURE 3. SUS SCORES PER PARTICIPANT



Overall Average SUS Score	Benchmark
35.42	68

TABLE 4. OVERALL AVERAGE SUS SCORE AND INDUSTRY BENCHMARK

Table 4 shows the overall average SUS of participants in using the DOH website in comparison with the industry standard. An SUS of almost half the established benchmark indicates the participants' dissatisfaction with the system.

The below average overall SUS can be expected given the below average completion rate. This is consistent with the findings of Sauro and Dumas (2009), where the task completion rate and error correlate with satisfaction. This implies, therefore, that making the necessary improvements so users can complete tasks faster and commit fewer errors will increase satisfaction with the system. Furthermore, another factor that may have contributed to the unfavorable SUS scores was that all research participants were first-time users of the system. This was consistent with the studies of Sauro (2011) and of Mclellan and Muddimer (2012), which stated that more experienced users of websites tended to provide higher and more favorable SUS scores over a first-time user group.

QUALITATIVE RESULTS

Prior to the study, participants did not have high expectations on the quality of the DOH website, as Philippine government websites are known for delivering low quality services. The general sentiment taken from the Think Aloud methodology and semi-structured interview was that the DOH website already contained all the necessary data for COVID-19 concerns, and the information only needed to be arranged and presented in a user-friendly way.

Many participants remarked that they had difficulty looking for pertinent information and that the site would be even more inaccessible for people who are not as familiar with using technology. Some responses regarding this include:

> "The website was complete and very informative mahahanap mo naman 'yung [answer to] whatever concern you have with regards to COVID ... I just don't think it's the most accessible. Most especially if you need information [immediately]."*

> "I don't feel like much thought was given to the usability ... Like, intuitively I would assume some information would be in places where it did not end up being and it felt like ... I could find [the information] eventually, it's just that [the design was] adding additional friction to me finding information. So, it was not as user friendly as what I would have wanted it to be."

*Responses from participants have been lightly edited for the sake of clarity and readability.

During the task completion period and the semi-structured interview, several main factors that influenced perceived usability of the DOH website were brought up by the different participants. These were (1) disorganization of information, (2) non-intuitive navigation, and (3) visual design.

Disorganization of information. In response to the question "Was information organized in a logical manner?", all participants except one answered "No"; the only participant who said "Yes" was referring to the organization of information in the FAQ page being logical. The main explanations for the disorganized presentation of information, as well as examples cited by the participants, are summarized in Table 5 below.

In a separate interview question that asked participants what they disliked about the website, they reiterated that information was highly spread out, different pages had duplicate information, and the divisions were not sensible. Thus, the website came across as if "different people added different things [and] no one had the task of managing everything to make it [cohesive],"; the disorganization was "adding additional barriers to ... finding [information] when it should be really easy."

TABLE 5. PARTICIPANTS' FEEDBACK ON THE DISORGANIZED PRESENTATION OF INFORMATION

Reason	Examples
Information about similar topics or concerns are scattered across different pages	◊ The page titles "Public Advisory" and "Gabay sa Publiko" have similar meanings, but are two separate pages, each with different information presented in different languages. The same case is present for the pages "FAQs for COVID" and "Tanong ng Bayan." ◊ Frequently asked questions about vaccines are split from the main FAQ page. ◊ Information from "Know Your Vaccine" are reused in "Policies."
Headings of some pages are unclear or even misleading.	◊ Instructions on mask wearing arefound under "Gabay sa Publiko"; the relationship between the two is not immediately apparent. ◊ The page "Beat COVID-19" does not show any actual information on how to beat COVID-19. ◊ Information on how a vaccine works can only be found under "Vaccine Updates," when it is not related to recent developments regarding the vaccine.
Non-intuitive arrangement of elements	◊ The Resources sidebar displays most of the pages that contained the answers to common questions about COVID-19, but because of its location at the side of the screen, isn't the first thing seen by visitors on the COVID-19 home page. ◊ The FAQs are hard to read because each answer has its own dropdown menu..

Non-intuitive Navigation. In response to the question "Does the appearance of the site make it easy to navigate?", 75% of the participants answered "No." They cited that the information was highly spread out, that the search bar was ineffective in providing relevant answers to queries, and the unnecessary links required many tabs to be opened to search for information. Moreover, elements were arranged in a confusing hierarchy, with the pages containing important information being less visible at the side of the screen, and less useful information was always visible in the fixed header.

> "It's not easy to navigate ... There are tabs for everything, and it's all presented to you sa homepage nila ... andaming page na nag-oopen when you go from one [page] to another, pag naghahanap ako ng answer, [I have to open another tab in my browser]."

> "I think [the search bar] could be optimized more. For the first question it worked naman agad ... but then after that, [if] you don't know [what] you're looking for, then [the information] will be hard to find even with the search option."

> "It would be better if the [important] buttons were in the middle. Usually, when I look at the right side ... it's the ads that are placed there. So usually hindi ko iniisip dito na 'Ah, important buttons.'"

> "When you first look at the website, [the first thing you see are] updates on Novel Coronavirus, [but] the font is like, super small. . . like may overview title doon, it's even bigger than the headline."

Important information was buried in pages that were not immediately visible, and less relevant information was given a spotlight. For example, a regular person would be more concerned with caring for a loved one with COVID or determining COVID symptoms, but these are not the first things a user sees on the home page; instead, the case tracker is placed first, and this is not relevant to the situations aforementioned.

Important information was buried in pages that were not immediately visible, and less relevant information was given a spotlight. For example, a regular person would be more concerned with caring for a loved one with COVID or determining COVID symptoms, but these are not the first things a user sees on the home page; instead, the case tracker is placed first, and this is not relevant to the situations aforementioned.

> "It's kind of hard for me to ... find something that's immediately friendly for [a] civilian ... I'm assuming [I]'m not there to look for [or] to read for how many COVID cases there are ... if I was going to answer the questions [from the performance task], it's assumed na I'm protecting myself from COVID, or I'm taking care of someone with COVID and I can't do that immediately if [lahat] ng information about COVID [is] presented there. So, siguro ... something more direct for people who might be handling the sickness or who might be exposed to the sickness."

These factors confused participants, with many mentioning that information was hard to find, and some describing their preference to use Google, as it "has the algorithm to show me direct answers to my question right away ... I would rather do that than open [the DOH website] and try to search."

Visual Design. Participants described the DOH website to be more aesthetically pleasing than other Philippine government websites. Participants who answered that the appearance of the site facilitated navigation cited the visual aspect of the website as a factor; it was easy to view, had a clean and basic layout like other websites, and the font of the text was

Suggestions for Redesign. Usability principles from literature and insights directly taken from participants were referenced in crafting suggestions for the improvement of the DOH website. Moreover, the 10 Main Usability Principles from Nielsen et al. (2001) was used as a main guide in implementing participant feedback on specific DOH pages. The suggestions for redesign are outlined below.

TABLE 6. 10 MAIN USABILITY PRINCIPLES (NIELSEN ET AL., 2001)

Principles	Characteristics
Visibility of System Status	Always keep users informed about what is going on, through providing appropriate feedback within reasonable time.
Match between system and the real world	Speak the users' language, using words, phrases and concepts familiar to the user, rather than system-oriented terms.
User control and freedom	Provide ways of allowing users to easily escape from places they unexpectedly find themselves, by using clearly marked 'emergency exits'.
Consistency and standards	Avoid making users wonder whether different words, situations, or actions mean the same thing.
Help users recognize, and recover from errors	Use plain language describing the nature of the problem and suggest a way of solving it.
Error prevention	Where possible prevent errors occurring in the first place.
Recognition rather than recall	Make objects, actions, and options visible.
Flexibility and efficiency of use	Provide accelerators that are invisible to novice users, but allow more experienced users to carry out tasks more quickly.
Aesthetic and minimalist design	Speak the users' language, using words, phrases and concepts familiar to the user, rather than system-oriented terms.
Help and documentation	Provide information that can be easily searched and provide help in a set of concrete steps that can easily be followed.

Simplify information. In line with Nielsen's principles of "aesthetic and minimalist design" and "recognition rather than recall," participants suggested making website pages less text-heavy, adding more images, and hiding information not relevant to average users. These changes would make the home page of the DOH website less overwhelming and lessen the general information overload.

> "[The DOH website is] supposed to be [made more for] general information. ... the secretary [pages], we don't really care about that, we want to know if the vaccine works. So, I think they should prioritize the [information] on the side panel because I wouldn't have seen that at first glance until I scrolled down to explore the page."

> "I think there's too much stuff on the screen ... People who go to the DOH website, just the average person using this, does not need to see everything. Like I don't need to see all these graphics competing for my attention, all these advisories. It's just cluttering the screen and it's not—I'm getting analysis paralysis by looking at it. So, simplify. That's my suggestion."

Organize information clearly and accurately. Participants suggested that information should be presented in such a way that main questions will be immediately answered. The home page should be revised to accommodate users' most imminent concerns, considering that it is the page users see first. Information relevant to the concerns of the

public should be shown before (e.g., How to care for someone with COVID) the case tracker. Moreover, the different subpages related to COVID-19 should be easily visible and accessible from the main page.

Pages with similar or related content should be merged, and a legend or guide should be added for different categories. The "Resources" bar should be moved to the middle of the home page to be more visible and emphasized. These changes will simplify navigation and make the website user-friendly, even to those with low technological or computer proficiency. One participant's comprehensive suggestion regarding this aspect is as follows:

> "So, for example ... there should be a tab specifically for COVID Care or where to get tested, like, where can I get tested if I am suspecting that I have COVID ... I'm assuming [t]he website is designed to give more information to the public. [It would be better] if it's organized according to people's questions, so ... I'm thinking like, one portal for prevention, one portal for investigation or if you're. ... suspecting of COVID, what will you do next? Another portal for management ... another portal for vaccines. So, these make it more specific to what the public is experiencing, rather than just like, here's all the miscellaneous information about COVID. It makes it easier for people to navigate it."

These are in line with Nielsen's principles of "visibility of system status" and "recognition rather than recall."

Proper execution of website features. The DOH website already features a search bar and website translation, but functions should be expanded. The search bar should be optimized to respond to most queries in different languages and with only a few keywords. All pages showing information about COVID-19 should feature a translation option for different languages (e.g., Tagalog, Cebuano, Ilokano, etc.), not just the FAQs page. One participant emphasized the importance of COVID-related information available in different languages:

> "Nagulat ako nung nakita ko yung first FAQs, sabi ko "wow, we have it in 11 languages!" And pagdating [sa] vaccines, especially its importance, we have to encourage people to take vaccines, [it's too bad that] dalawang languages lang and scattered pa, and they don't have it in the main FAQs ... they could really be more consistent with how they present information."

Overall, the DOH should revisit the goals for their website and use the revised goals as a redesign guide. One participant remarked, "Maybe along the line [the DOH] tried to make it organized, to make it logical, but they lost it the more information that had to be put out. So, I [would suggest they] re-evaluate it, look at it, stick to what they were trying to do in the first place and then re-execute."

CONCLUSIONS AND RECOMMENDATIONS

This study evaluated the DOH website's usability, identified factors that affected perceived usability, and suggested DOH website improvements. The results indicated low effectiveness and satisfaction through the below average completion rate and SUS scores, thereby showing that participants had difficulty finding answers to performance task questions and had an unpleasant experience in using the site. Efficiency was acceptable because at least half of the participants accomplished tasks within the maximum acceptable task time. The negative factors that hampered the participants were the website's disorganized information, inconsistency, design, and non-intuitive navigation. Comparing these experiences with existing literature, they align with the unfulfillment of usability design principles (Nielsen et al. 2001).

Thus, quantitative and qualitative results showed that the DOH website was unusable, thereby validating the results of previous studies.

Given this, the following key improvements were suggested:

- Simplification and re-organization of information
- Addition of a fixed navigation sidebar
- Optimization of the search bar
- Consistency of overall visual design
- Options for translating pages to different languages of the Philippines

This study has some limitations. First, the study only evaluated the usability of the DOHDOH website in terms of its ability to provide COVID-19 information relevant to the public and not specialized fields (e.g., healthcare workers, organizations, and researchers). Future studies may focus on these populations to speculate the usability of the DOH website as a source for specialized information on public health. Second, the DOH website evaluated was the March 2, 2020 version, which was the latest version at the time of study; any updates or modifications made to the website after this version were not included in the evaluation. Therefore, potential barriers that were identified may have already been addressed. Third, this study only evaluated COVID-19-related pages of the website. Future researchers may evaluate the usability of the whole DOH website. Lastly, this study ends with recommendations for improved usability; future studies may include actual implementation and deployment of the improvements to test for usability.

REFERENCES

Albert, J., Santos, A., and Vizmanos, J. (2018). *Profile and Determinants of the Middle-Income Class in the Philippines* [Ebook] (pp. 6-7, 36). Quezon City: PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES. Retrieved from https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps1820.pdf?fbclid=IwAR1cUiN7OWcI_be8kZNwYMgvKKVFrbGIozW1-3NtRk4PZ7bfqafqf5XmBBk.

Almarabeh, T., and AbuAli, A. (2010). *A general framework for e-government: definition maturity challenges, opportunities, and success. European Journal of Scientific Research,* 39(1), 29-42.

Ahmad, A., and Murad, H. (2020). *The Impact of Social Media on Panic During the COVID-19 Pandemic in Iraqi Kurdistan: Online Questionnaire Study. Journal Of Medical Internet Research,* 22(5), e19556. https://doi.org/10.2196/19556.

Asiimwe, E N., and Lim, N. (2010). *Usability of government websites in Uganda. Electronic Journal of e-Government,* 8(1): 1-12

Basher, H. T., Gacus, D. M. K. C., Mingo, R. P., and Ambe, A. M. H. (2014). A user-centered evaluation of a university website. Journal of Industrial and Intelligent Information, 2(3).

Bojang, M. B. (2019). *Challenges and successes of e-Government development in developing countries: A theoretical review of the literature. International Journal of Research and Innovation in Social Science,* 3(4), 410-414.

Clemmensen, T., and Katre, D. (2012). *Adapting e-gov Usability Evaluation to Cultural Contexts. Usability in Government Systems,* 331–344. https://doi.org/10.1016/b978-0-12-391063-9.00053-5.

Centers for Disease Control and Prevention. (2019). CDC Clear Communication Index: A Tool for Developing and Assessing CDC Public Communication Products. (Report No. CS309804-A). https://www.cdc.gov/ccindex/pdf/ClearCommUserGuide.pdf.

CDC. (2020, February 11). Coronavirus (COVID-19) frequently asked questions. Retrieved June 16, 2021, from Centers for Disease Control and Prevention website: https://www.cdc.gov/coronavirus/2019-ncov/faq.html.

Coursey, D., and Norris, D. F. (2008). *Models of e-government: Are they correct? An empirical assessment. Public administration review,* 68(3), 523-536.

Dada D. (2006). *The failure of E-government in developing countries: A literature review. The electronic journal of information systems in developing countries,* 26(1), 1-10.

Dadaczynski, K., Okan, O., Messer, M., Leung, A., Rosário, R., Darlington, E., and Rathmann, K. (2020). *Digital health literacy and online information seeking in times of COVID-19. A cross-sectional survey among university students in Germany* (Preprint). *Journal Of Medical Internet Research.* https://doi.org/10.2196/24097.

Datta, R., Yadav, A., Singh, A., Datta, K., and Bansal, A. (2020). *The infodemics of COVID-19 amongst healthcare professionals in India. Medical Journal Armed Forces India,* 76(3), 276-283. https://doi.org/10.1016/j.mjafi.2020.05.009.

Department of Global Communications. (2021). *UN tackles 'infodemic' of misinformation and cybercrime in COVID-19 crisis | United Nations.* United Nations. Retrieved 6 May 2021, from https://www.un.org/en/

un-coronavirus-communications-team/un-tackling-%E2%80%98infodemic%E2%80%99-misinformation-and-cybercrime-covid-19.

Fan, K., Ghani, S., Machairas, N., Lenti, L., Fan, K., and Richardson, D. et al. (2021). *COVID-19 prevention and treatment information on the internet: a systematic analysis and quality assessment.* BMJ Open. Retrieved 6 May 2021, from https://bmjopen.bmj.com/content/10/9/e040487.abstract.

Hasan, L., Morris, A., and Probets, S. (2012). *A comparison of usability evaluation methods for evaluating e-commerce websites. Behaviour and Information Technology,* 31(7), 707-737.

Harrati, N., Bouchrika, I., Tari, A., Ladjailia, A. (2016). *Exploring user satisfaction for e-learning systems via usage-based metrics and system usability scale analysis. Computers in Human Behavior*, 61, 463–471. Retrieved from https://doi.org/10.1016/j.chb.2016.03.051.

Huang, Z., and Benyoucef, M. (2014). *Usability and credibility of e-government websites. Government information quarterly,* 31(4), 584-595.

Huang, Z., Brooks, L., and Chen, S. (2009). The assessment of credibility of e-government: Users' perspective. In Human Interface and the Management of Information. Information and Interaction: Symposium on Human Interface 2009, Held as part of HCI International 2009, San Diego, CA, USA, July 19-24, 2009, Proceedings, Part II (pp. 26-35). Springer Berlin Heidelberg.

Kemp, S. (2021). Digital 2021: THE PHILIPPINES. DataReportal. Retrieved 6 May 2021, from https://datareportal.com/reports/digital-2021-philippines.

Liljegren, E., (2006). *Usability in a medical technology context assessment of methods for usability evaluation of medical equipment. International Journal of Indus-trial Ergonomics* 36 (4), 345–352.

Manzari, L., and Trinidad-Christensen J. (2006). U*ser-centered design of a web site for library and information science students: Heuristic evaluation and usability testing. Information technology and libraries,* 25(3), 163-169.

McLellan, S., Muddimer, A., and Peres, S. C. (2012). *The effect of experience on System Usability Scale ratings. Journal of usability studies,* 7(2), 56-67.

Mohamad, E., and Azlad, A. (2020). *COVID-19 and Communication Planning for Health Emergencies* [Ebook] (pp. 1-2). Universiti Kebangsaan Malaysia. Retrieved 6 May 2021, from https://ejournal.ukm.my/mjc/article/view/38718/10355.

Mohamad, E., Tham, J., Ayub, S., Hamzah, M., Hashim, H., and Azlan, A. (2020). *Relationship Between COVID-19 Information Sources and Attitudes in Battling the Pandemic Among the Malaysian Public: Cross-Sectional Survey Study. Journal Of Medical Internet Research,* 22(11), e23922. https://doi.org/10.2196/23922.

Nielsen, J. and Tahir, M., *Homepage Usability: 50 Websites Deconstructed.*, New Riders Publishing, Indianapolis, ISBN 0-73571-102-X, 2001

Nielsen, R. K., Fletcher, R., Newman, N., Brennen, J. S., and Howard, P. N. (2020). *Navigating the 'infodemic': How people in six countries access and rate news and information about coronavirus.* Reuters Institute.

Nkohkwo, Q. N. A., and Islam, M. S. (2013). *Challenges to the Successful Implementation of e-Government Initiatives in Sub-Saharan Africa: A Literature Review. Electronic Journal of e-government,* 11(1), pp252-266.

NNgroup (2017, October 21). Usefulness, Utility, Usability: 3 Goals of UX Design (Jakob Nielsen) [Video]. YouTube. https://www.youtube.com/watch?v=VwgZtqTQzg8 .

Ornager, S., and Verma, N. (2005). E-Government Tool-Kit for Developing Countries. This Toolkit has been prepared by National Informatics Centre (NIC), Department of Information Technology, Ministry of Communication and IT, Government of India at the behest of UNESCO, New Delhi, Asia-Pacific Bureau for Communication and Information.

Pangaribuan, A. A. (2019). *The Challenges of E-government Implementation in Developing Countries.* JPAS (Journal of Public Administration Studies), 4(1), 260-29.

Shehzad, R., Aslam, Z., Ahmad, N., Iqbal, M. W. (2017). "Web usability and user trust on e-commerce websites in Pakistan," *International Journal of Advanced Computer Science and Applications,* 8(12), pp. 509-517.

Sanchez, M. (2021). *Number of internet users in the Philippines as of January 2020 (in millions).* Statista. Retrieved 6 May 2021, from https://www.statista.com/statistics/221179/internet-users-philippines/.

Sauro, J., and Kindlund, E. (2005). *How long should a task take? Identifying specification limits for task times in usability tests.* In Proceeding of the Human Computer Interaction International Conference (HCII 2005), Las Vegas, USA.

Sauro, J., and Dumas, J. S. (2009, April). *Comparison of three one-question, post-task usability questionnaires.* In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 1599-1608).

Sauro, J. (2011). Does prior experience affect perceptions of usability? Retrieved 6 June 2021, from http://www.measuringusability.com/blog/prior-exposure.php.

Shumacher, S., and Kent, N. (2020). 8 charts on internet use around the world as countries grapple with COVID-19. Pew Research Center. Retrieved 6 May 2021, from https://www.pewresearch.org/fact-tank/2020/04/02/8-charts-on-internet-use-around-the-world-as-countries-grapple-with-covid-19/.

Siar, Sheila. (2005). *E-governance at the local government level in the Philippines: An assessment of city government websites.* Philippine Journal of Development. 32. 135-168.

Siddiquee N. A. (2016). *E-government and transformation of service delivery in developing countries: The Bangladesh experience and lessons. Transforming Government: People, Process and Policy,* 10(3), 368-390.

Social Weather Stations. (2020). Fourth Quarter 2019 Social Weather Survey Special Report: 45% of adult Filipinos are Internet users. Social Weather Stations. Retrieved 6 May 2021, from http://sws.org.ph/swsmain/artcldisppage/?artcsyscode=ART-20200908150946.

Tan, C. W., Benbasat, I., and Cenfetelli, R. T. (2008, January). *Building citizen trust towards e-government services: do high quality websites matter?.* In Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008) (pp. 217-217). IEEE.

Tan, W. S., Liu, D., and Bishu, R. (2009). *Web evaluation: Heuristic evaluation vs. user testing. International Journal of Industrial Ergonomics,* 39(4), 621-627.

Teo, T. S., Srivastava, S. C., and Jiang, L. I. (2008). *Trust and electronic government success: An empirical study. Journal of management information systems,* 25(3), 99-132.

Thomas, N. (2015). How To Use The System Usability Scale (SUS) To Evaluate The Usability Of Your Website. Usability Geek.

Urbina, A. U., and Abe, N. (2017). *Citizen-centric Perspective on the Adoption of E-Government in the Philippines. Electronic Journal of e-Government,* 15(2), 63.

Verdegem, P., and Verleye, G. (2009). *User-centered E-Government in practice: A comprehensive model for measuring user satisfaction. Government information quarterly,* 26(3), 487-497.

Youngblood, N. E., and Mackiewicz, J. (2012). *A usability analysis of municipal government website home pages in Alabama. Government Information Quarterly,* 29(4), 582-588.