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Development of a School Inventory Management System

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Abstract

The General Services Office provides support services for the different units of the school. Among its many functions is inventory management. One critical component of this function is the requisition system for office supplies, which is currently served by a forms-based scheme. This study focused on the evaluation of the prevailing system in terms of usability, the development of a web-based client-server application to eventually replace the prevailing system, the evaluation of this proposed system in terms of usability, and finally the attempt to address whether there was a notable difference between the usability assessments of the prevailing and proposed systems. Aware of negative anecdotal opinions voiced by various school employees regarding the perceived shortcomings of the prevailing manual system for office supplies requisition, a need for an innovative approach to addressing this concern arises. With this in mind, the study aimed to determine the answers to the gap in knowledge as to whether the prevailing system was truly ineffectual and if the proposed system was a truly more usable alternative by discovering what the prevailing system's level of usability was, what the proposed system's level of usability would be, and whether there was a notable difference in the usability level of the two systems. Brooke's System Usability Scale was used as the instrument for measuring system usability.

Keywords: software usability, system usability scale, inventory management,, PHP development, client-server architecture

Introduction

The General Services Office is the primary school entity providing a host of support services for the other business and academic units therein. Among the sub-units under its supervision is the Office of the Property Custodian.

The proponents have taken favorably to the suggestion put forward by the General Services Director that the school would benefit from the development of an Inventory Management System for the Property Custodian and were therefore interested in providing a software-based asset management system that would allow the efficient and effective performance of the Property Custodian's tasks with outstanding system usability as the ultimate goal.

In order to achieve this, there is a felt need to develop a software based inventory management system customized for the use of the Property Custodian's Office. A study comparing the usability of both the prevailing and proposed systems was then carried out to determine whether a notable difference between the two existed. Specifically, it aimed to determine the level of usability of the prevailing system and proposed systems, and explore the difference in the level of usability between the aforesaid systems.

Asset management is "the management of the plant and equipment during its whole life", from specification through useful life, maintenance and deactivation. (Koronios, 2006) This definition entails the inclusion of features within the software that allow the user to create, retrieve, modify and remove specifications for the acquisition, receiving and utilization of current assets, especially supplies and inventory, and further; the monitoring, maintenance and decomissioning or disposal of tangible fixed assets.

Tangible fixed assets should include land and buildings, plant and achinery, fixtures, fittings, tools, and equipment. (Reid & Myddelton, 1971) Kwok (2017) states that it includes "property, plant and equipment held by the organization for use in the production or supply of goods and services, or for rental to others, or for administrative uses and are expected to be used during more than one financial year." This definition will guide the researchers in terms of outlining the project scope as well as the categorization of the different types of assets the proposed system is capable of managing.

The scope of the study included the prevailing physical asset management system (or its partial components) of the Property Custodian's Office, its associated data, parameters, users and clients, and the policies governing the said system. Current assets, with a focus on supplies and inventory, and tangible fixed assets including land, buildings, plant, machinery, fixtures, fittings, tools and equipment, were all included in the scope of the study. The proponents were concerned that the results of the study may have less impact in non-education sectors as the respondents are confined to that specific segment of industry, and as the software itself was designed for an educational organization. However, such segment of users remains a sizeable portion of the industry user base and the study remains significant. Another limitation concerned other types of assets that are not included in the scope of the study. These are human assets, information assets, financial assets and intangible assets.

Methodology

A quasi-experimental design, specifically the one-group pretest posttest type, was the method chosen to undertake this study. In this approach, a single case was observed at two points in time, one before the treatment and the other after the treatment. Hence, client satisfaction was measured once before treatment was implemented and once after it was implemented. The treatment took the form of the usage of the proposed system. The non-randomly selected respondents were tested first under the control condition and then under the treatment condition. This was to eliminate some of the more pressing confounding variables, however, difficult to ascertain whether it was the treatment that caused the change in the direct variable versus other factors such as maturation over time (Allen, 2017).

The research environment was the selected school primarily its Property Custodian's Office, and the associated educational and support units it serves. The respondents of the study involved the population of employees of the selected school who had requested support from the Property Custodian's Office over at least twelve months from the academic year 2021-2022. These employees were what are considered client users or end users. The respondents were classified into two categories: non-academic

personnel and academic non-teaching personnel, as well as office heads and office staff. Twenty-six (26) respondents in total representing all academic and support units of the school were identified and included in the study. Twelve (12) were academic non-teaching personnel, and fourteen (14) were non-academic personnel. Eighteen (18) of the respondents were office staff; eight (8) were office heads.

The research instrument used was the System Usability Scale (SUS) developed by John Brooke of Digital Equipment Corporation in 1986. The SUS is a ten-item Likert scale developed from a pool of 50 potential questionnaire items. The ten SUS items alternate between positive tone and negative tone, compelling the respondent to read each statement and decide how the response should be (Brooke, 1986). The System Usability Scale employs the following mechanism for scoring a response: all odd-numbered items in the positive tone are scored by subtracting 1 from the scale response; all even-numbered items in the negative tone are scored by subtracting the scale response from 5. The sum of all item scores is then computed and the result is multiplied by 2.5. The resultant SUS score, which ranges from 0 – 100, is then inferred accordingly: scores above 81 are interpreted as "Excellent", scores of above 68 to 81 are interpreted as "Good"; a score of 68 is generally considered to be at the 50th percentile and is interpreted as or "Fair". Scores of 51-67 are considered "Poor" and those below 51 are interpreted as "Awful". In general, a score below 68 should cause the developer to pay more attention to improving the usability factor of the system under consideration.

The prevailing system was evaluated by the respondents first. Using an online survey tool configured to implement the System Usability Scale, the researchers individually approached each respondent over a period of three months and asked them to fill out the SUS questionnaire using a mobile device. In a few cases, the respondent preferred to fill out a printed copy of the survey as they were either preoccupied with other tasks, or their work area had no online connectivity available. These responses were then later recorded into the online survey tool for a single centralized data repository. The proposed system was assessed by the respondents after a period of approximately 12 months. The procedure for data collection in this case was identical to that undertaken during the pretest phase.

For each response, all odd-numbered items (stated in the positive tone) were scored by subtracting 1 from the scale response. Next, all even-numbered items (stated in the negative tone) were scored by subtracting the scale response from 5. The scores therefore had a range of 0 to 4. The sum of all the item scores was then computed and the result multiplied by 2.5. The result is the raw SUS score, which ranged from 0 – 100. All the responses were processed to arrive at the raw SUS score. The mean, or average of all the raw SUS scores was then calculated to provide a value from which the over-all usability level of the prevailing and proposed systems was interpreted. The mean is utilized to determine the level of viability of the prevailing system and proposed systems; the same is used for its comparison.

Results and Discussion

The over-all average SUS score of the prevailing system for all respondents is 56.44, which is interpreted as "Poor". Fifty percent (50%, 13 cases) evaluated the prevailing system as "Awful", while twenty-three percent (23%, 6 cases) evaluated it as "Poor". "Good" and "Excellent" evaluations constituted twelve percent (12%, 3 cases) and fifteen percent (15%, 4 cases) of the responses, respectively. None of the scores was interpreted as "Fair".
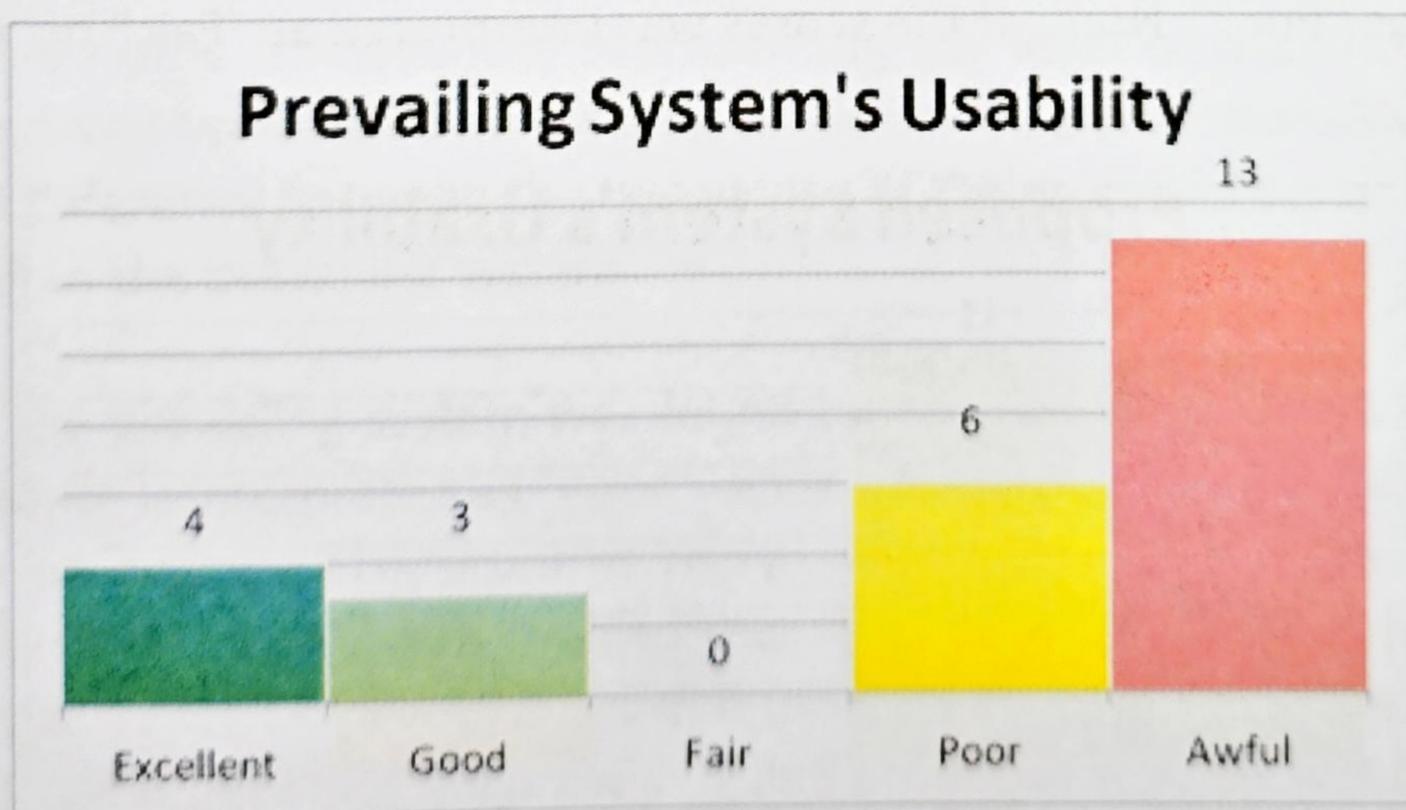

Figure 1. Histogram of SUS Scores Adjectival Interpretation for the Prevailing System

Among academic non-teaching personnel, the average SUS score was 55, which is interpreted as "Poor". Fifty-eight percent (58%) of them evaluated the prevailing system as "Awful", twenty-five percent (25%) as "Poor", and seventeen percent (17%) as "Excellent". Among non-academic personnel, the average SUS score was 57.68, which is interpreted as "Poor". Forty-three percent (43%) of them evaluated the prevailing system as "Awful", twenty-one percent (21%) as "Poor", twenty-two percent (22%) as "Good", and fourteen percent (14%) as "Excellent".

The average SUS score among office heads is 56.25, interpreted as "Poor". Fifty percent (50%) of them evaluated the prevailing system as "Awful" and twenty-five percent (25%) as "Poor". "Good" and "Excellent" evaluations constitute thirteen percent (13%) and twelve percent (12%) of the office heads responses, respectively. The average SUS score among office staff is 56.53, interpreted as "Poor". Fifty percent (50%) of them evaluated the prevailing system as "Awful" and twenty-two percent (22%) as "Poor". "Good" and "Excellent" evaluations constitute eleven percent (11%) and seventeen percent (17%) of the office staff responses, respectively.

The over-all average SUS score of the proposed system for all respondents is 78.75, which is interpreted as "Good". Forty-two percent (42%, 11 cases) of the respondents evaluated the proposed system as "Excellent". Forty-two percent (42%, 11 cases) evaluated it as "Good". Sixteen percent (16%, 4 cases) of the respondents assessed the proposed system as "Poor". None of the scores was interpreted as "Fair" or "Awful".
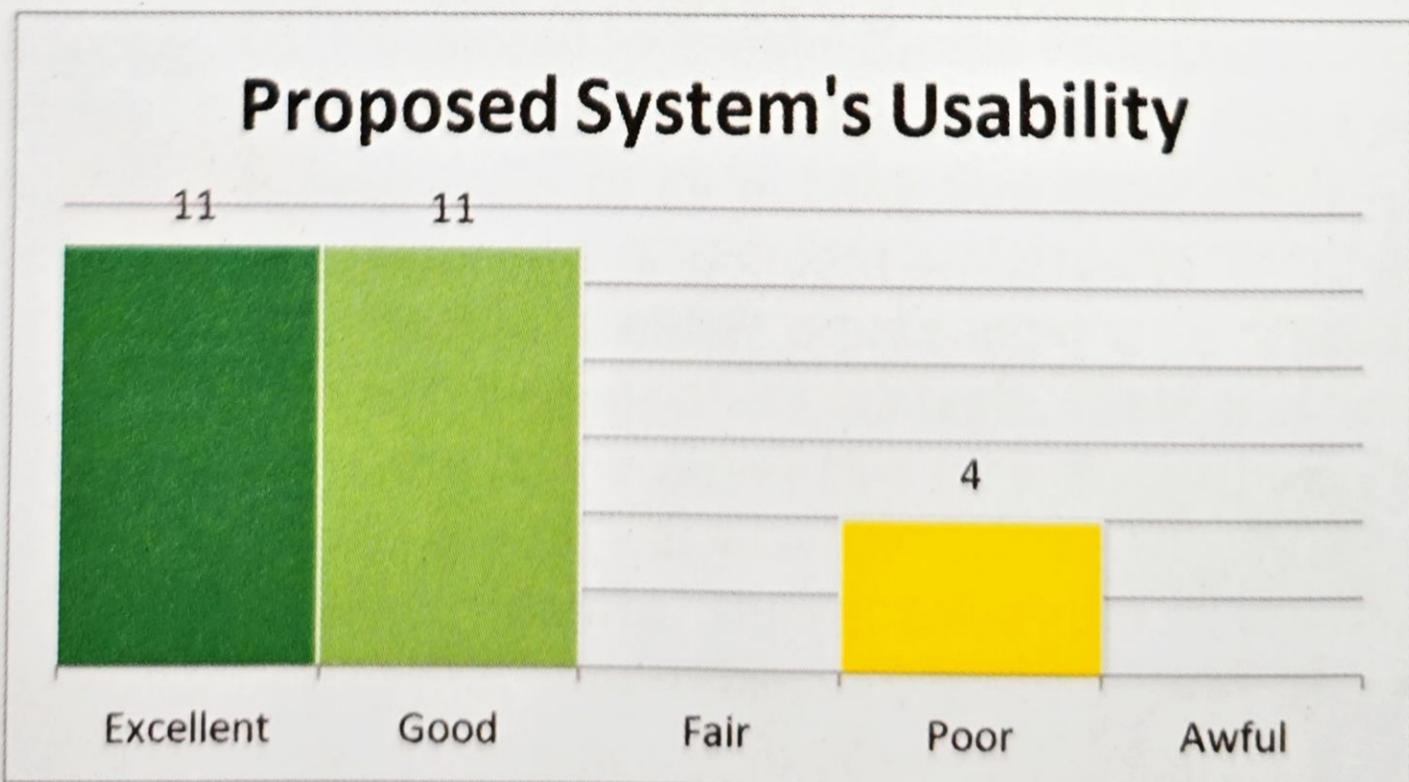

Figure 2. Histogram of SUS Scores Adjectival Interpretation for the Proposed System

Among academic non-teaching personnel, the average SUS score was 76.04, which is interpreted as "Good". Fifty-eight percent (58%) of them evaluated the proposed system as "Good", twenty-five percent (25%) as "Excellent", and seventeen percent (17%) as "Poor". Among non-academic personnel, the average SUS score was 81.07, which is interpreted as "Excellent". Fifty-seven percent (57%) of them evaluated the proposed system as "Excellent", twenty-nine percent (29%) as "Good", and fourteen percent (14%) as "Poor".

The average SUS score among office heads is 80.31, interpreted as "Excellent". Fifty percent (50%) of them evaluated the proposed system as "Good" and thirty-seven percent (37%) as "Excellent". "Poor" evaluations constitute thirteen percent (13%) of the office heads responses. None assessed the proposed system as "Fair" or "Awful". The average SUS score among office staff is 78.06, interpreted as "Good". Forty- four percent (44%)of them evaluated the proposed system as "Excellent" and thirty-nine percent (39%) as "Good". "Poor" evaluations constitute seventeen percent (17%) of the office staff responses. None assessed the proposed system as "Fair" or "Awful".

The SUS score obtained representing the level of usability of the prevailing system is 56.44, indicating a "Poor" adjectival interpretation. The same numerical quantity representing the level of usability of the proposed system is 78.75, indicating a "Good" interpretation. There is a notable difference between the two values as the proposed system scored better than the prevailing system.

The prevailing system was found to have an average SUS score of 56.44, which is interpreted as "Poor", while the proposed system was found to have an average SUS score of 78.75, which is interpreted as "Good". From these results it was surmised that the proposed system had better usability qualities as viewed by its end users. In addition, the difference in usability levels between the prevailing and proposed systems was found to be notable, as the difference between the prevailing system's "Poor" score versus the proposed system's "Good" score is evident.

The System Usability Scale used as the research instrument in this study is a favored tool among usability practitioners. It has numerous use cases going back into the 1980s and various studies have shown that the decades of data generated indicate that the SUS is a valid and versatile instrument.

A higher level of viability rated by the respondents about the proposed system should be the catalyst for the adoption of the said system as an operational component of the school's asset management infrastructure. There are no obstacles hindering the successful acceptance of the proposed system as there is an adequate data center facilities, structured networking, or support facilities in the school. The users themselves have indicated that they are most willing to adopt the system as part of their daily work. It would therefore benefit the selected school to institutionalize the use of the proposed system as soon as possible, especially with the global Covid-19 pandemic driving the use of remote management technologies at present.

References

Allen, M. (2017). The SAGE Encyclopedia of Communication Research Methods. SAGE.

Brooke, J. (1986). SUS - A quick and dirty usability scale. Earley, Reading, United Kingdom. Retrieved from https://bit.ly/3x1f1rP

Koronios, A. L. (2006). A data quality model for asset management in engineering organisations. *Engineering Asset Management*, (pp. 473-482).

Kwok, B. K. (2017). *Accounting irregularities in financial statements: A definitive guide for litigators, auditors and fraud investigators.* New York: Routledge.

Reid, W., & Myddelton, D. (1971). *The meaning of company accounts.* New York: Routledge