

QUALITATIVE ANALYSIS OF A DYNAMIC DISCOVERY OF ELECTRONIC PAYMENT SERVICES

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Abstract- The adverse effect of the static state of payment services discovery in the current electronic payments is a motivation to the developed semantic based application for providing a dynamic or runtime discovery solution to electronic payment services to solve the challenge of locating the best available services. In this paper, the developed dynamic payment system was compared with the current static payment System based on System Reliability and Effectiveness (SRE), System Ease of Usage (SEU) and System Degree of Efficiency (SDE) in a user evaluation study using 5-point Likert rating scale. The developed dynamic payment discovery and selection system has a better performance than the static payment system.

Index Terms- Dynamic discovery, Semantic web, e-payment service, Qualitative analysis, Likert rating scale.

1 INTRODUCTION

Modern day trade has almost completely evolved from direct cash or cheque transactions to the use of digital media either at point-of-sale terminals or via web page interfaces (Online) to effect transactions; the more flexible one being the use of web page interfaces. A key function of e-commerce websites is their ability to process online payments for products and services using digital media such as credit/debit cards and E-Cheques/Wallets [6]. A payment processor via appropriate interfaces receives relevant information about a transaction from or on behalf of a merchant website [4]. The payment processor provides encapsulated functionality on behalf of merchant websites thereby relieving merchant website designers of the complexity of functions involved in payment processing as well as relieving merchants of the exuberant cost of building a payment processor for their website. Merchants' websites need a payment processor only when an end user is making payment for a product online so most medium and small scale merchant websites prefer a third party payment processor[4]. Currently, performance attributes of e-payment services which includes availability, reliability, response time and cost are usually detected in the course of service usage on merchants' website. Also, payment service discovery involves a manual process where selected services are hard coded into the web application. This means that a prospective customer will not be able to complete online payment transactions when his/her payment card service provider is not listed or unavailable. This leads to loss of revenue for the merchant as disappointment on the part of such customer. Hence, a semantic based framework that dynamically finds the most suitable payment web service that satisfies clients' requirement at runtime via merchant's websites was developed. In this work, the developed system was evaluated to determine its relevance to the current state of e-payment provisioning. The evaluation was based on user's assessment to determine the efficacy in terms of system reliability and effectiveness, system ease of usage and efficiency of the

system. In order to achieve a thorough evaluation, the current e-payment discovery system was simulated independent of the developed system. System A is the simulated existing payment discovery system while system B is the developed payment discovery system from our research framework.

M2 METHOD

Thirty four (34) users in the categories of Business men, staff and students were invited to use both systems A and B individually in the pilot study approach. A Likert rating scale, most widely used questionnaires rating [3], was adopted on a 5-point to develop the questionnaires administered to individual users, after each of the system usage. When responding to a Likert questionnaires item, respondents specify their level of agreement to a statement. The most common scale is 1 to 5. Often the scale will be 1=strongly disagree, 2=disagree, 3=not sure, 4=agree and 5=strongly agree [1]. Currently the Likert rating scale has been applied to various fields of study, and researchers still confirm its reliability and validity [2].

Moreover, research has shown that the variance and the reliability of rating is normally highest when 5 or 7 point rating scales are used and rater bias is minimized when five (5) rating points or above are used [5]. Research has also shown that the variance of similar Likert items were combined using the Likert summing analysis to formulate the three parameters used for evaluation. These include System Reliability Index (SRI), System Ease of Use (SEU) and System Degree of Relevance (SDR). For the purpose of clarity and distinctiveness, the parameters were modified to System Reliability and Effectiveness (SRE), System Ease of Usage (SEU) and System Degree of Efficiency (SDE).

3 QUALITATIVE ANALYSIS

The users' response obtained from the administered Likert scale questionnaires formed the basis of the analysed data.

using Inference statistics, the null and alternative hypothesis were formulated and the median μ derived for each of the systems (A and B) formed the basis for the hypothesis tests. Non-parametric test is considered for the symmetrically distributed underlying population as there are marched pairs/repeated measure samples or independent samples. On this basis, responses are obtained from a dependent and marched pair samples and the Wilcoxon matched-pairs signed rank test is used for the test statistic. The hypothesis test of the research analysis is a one tailed test with significance level α of 0.05.

The value for the test static was computed from the sample data and the responses obtained from the questionnaire were entered into the Excel work sheet and were linked with GRET, a statistical package, used to carry out the Wilcoxon signed rank test on the data with R programming. The p-value obtained from the calculated Z value is compared with the actual 5% significance value α of the hypothesis test. The twelve (12) questions and Average Transaction Time (ATT) for each systems developed were grouped under the three performance parameters and their corresponding hypothesis test results were compared while the numbers of “rejects” of the null hypothesis determines the validity or strength of a performance parameters.

4 RESULT

Thirty four (34) of the questionnaires were returned, out of the 35 administered, representing 97.1% of the questionnaires administered. The level responses from the returned questionnaires as related to individual questions were polled together and analyzed using descriptive statistic. The results are shown on the bar chart of frequency of responses at individual level as related to individual question in Figure 1 and Figure 2. In all responses, analysis of Q1 shows that 100% of the respondents found both systems (A and B) clear, easy and familiar, while the remaining 5.88% in each system were not specific.

94.11% of the respondents found system A to be similar to other payment systems they have used as opposed

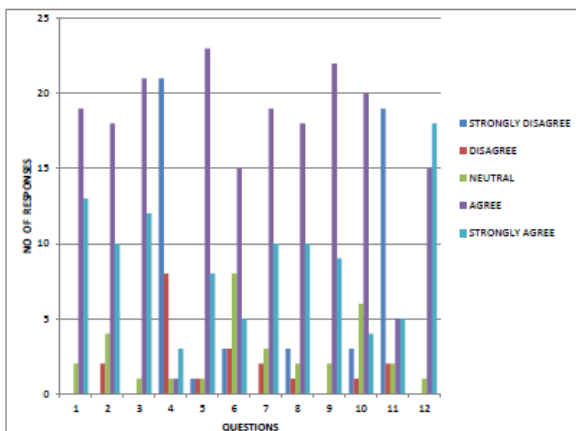


Figure 1: Bar Chart Representation of Numeric Frequency of Response of Table 4.1

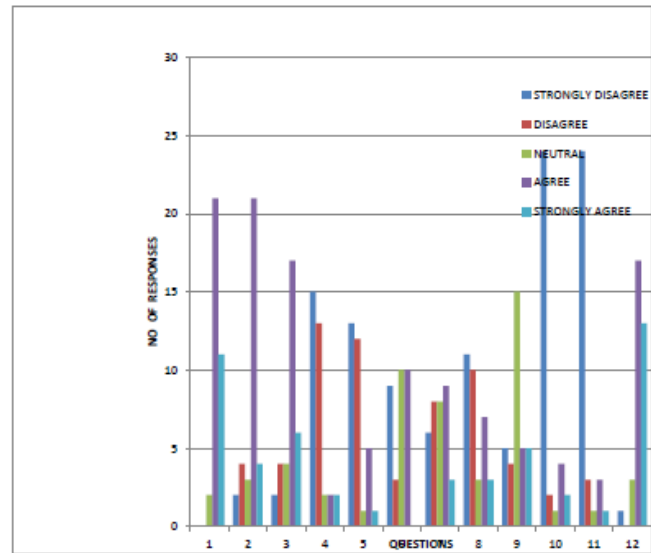


Figure 2: Bar Chart Representation of Numeric Frequency of Response of Table 4.1b

to the 82.35% in system A. 11.4% were not specific. 97.05% of the respondents were satisfied with the performance of system B with 69.7% in system A. 2.94% and 12.12% of the respondent in system B and A respectively were not specific. Only 11.76% responses for both systems were willing to wait for service availability (may not be applicable in system B), while 85.29% and 82.36% responses are not willing to wait for service availability in system A and B respectively.

Also, 91.18% of the respondents in system B successfully located alternative payment service using their default card information, while only 5.88% could not. 18.76% of the respondents in system A chose to locate their default payment service using the default card information, while 78.13% could not locate alternative payment service (as this may not be application in system A). A total of 91.18% respondents in system B were prepared for higher rate in transactional cost, as opposed to 31.25% respondents in system A. 85.29% of the respondents were willing to use system B for future payment transactions. This, however, opposed the 35.29% responses obtained for system A.

93.94% of the respondent recommends system B to online merchants, while only 29.42% recommends system A to online merchants. 44.12% of system A respondent were not specific. 63.64% of system B respondents had no need for extra card information, while 84.38% of system A respondents has need for additional card information. 97.06% and 88.24% of system B and system A users respectively found their systems to be user friendly, while only 2.94% respondents in system B were not specific.

5 Discussion

The results indicated that the developed system is not complex in usage, but it is rather simple and easy to use. Most respondent also derived satisfaction in the developed system and are even prepared to pay higher transactional charges rate as an expense for their need for prompt, rapid and timely payment system without delay. The results also revealed that current default card information is all that is required for alternative payment service to be located through the developed system's usage. Also, most respondent are willing to continue using the developed system for payment transaction and even encourage online merchant to switch over to its use. Similarly, the developed system was found to be more user friendly, while majority respondent clarified that additional information is not required to use the developed system.

Moreover, the mean and modal response values as related to individual questions, for both systems were compared in Line chart representation in figure 3 and 4. Response mean and response mode depict the overall users' satisfaction with most of the features of the developed system B and simulated system A. However, it was observed that the mean and modal values of response of system B are majorly in the upper classes of the rating scale, while those of system A are majorly in the lower and middle classes of the rating scale. This signifies that respondents are more satisfied with the features of the developed system than existing payment system.

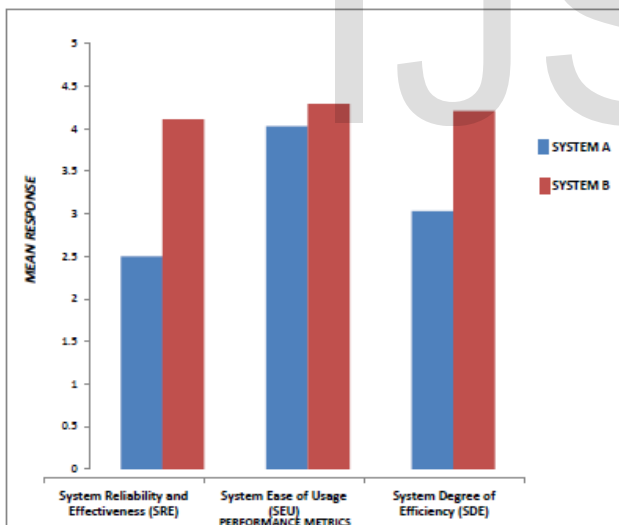


Figure 3: Evaluation Metrics for the developed Payment Discovery System (B) and Simulated Existing Payment System (A)

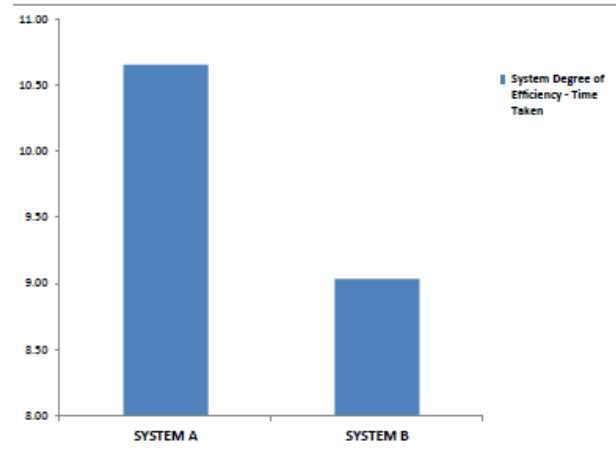


Figure 4: Bar Chart representation of the Average Time Taken (ATT) in carrying out the experiments on System A and B respectively

6 CONCLUSION

Based on users' assessment, the developed system was evaluated in parallel with a simulated existing payment system based on three performance parameters namely, system reliability and effectiveness (SRE), System Ease of Usage (SEU) and System Degree of Efficiency (SDE). The result revealed the developed system to be more reliable and effective with an appreciated degree of efficiency.

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