Exploring User’s Perception toward Automated Checkout Trolley in Developing Countries

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Abstract: - Retailers nowadays have relied on technology-based self-service options such as the self-checkout system to provide better customer value through pleasant shopping experience. Recently, automated checkout shopping trolley technologies have taken a further step than the previous introduced self-checkout system in terms of greater convenience, ease-of-use and greater efficiency. As this technology is considerable new in the market of developing countries, hence it is vital to explore the perception of consumers toward the use of automated checkout trolley. The purpose of this paper is to understand the perceptions and expectations of both enterprise users and end users toward the new checkout system. Findings of this study indicate that both consumers and retailers from developing countries possess positive attitude toward the automated checkout trolley system, and are enthusiastic to try this emerging technology. The main concerns of the users are the secureness of payment and the variability of payment methods, which forms their core criteria in determining whether to adopt the system. The feedbacks from them are valuable in providing better automated checkout system and facilitate adoption rate of the technology.

Key-Words: - Technology-based self-service (TBSS), Automated checkout, Technology management

1 Introduction

Technology-based self-services (TBSS) have gradually repositioning as one of the important mechanisms to deliver superior customer value, especially in retailing sector [1]. Mass retailers such as hypermarkets and department stores are the pioneers and main adopters of self-service technologies (SST). In this emerging trend of technologically-oriented service, customers utilize self-service technologies in order to provide service for themselves with or without help from a retail contact employee [2]. Studies postulate that self-service technologies create customer value by helping customer checkout more quickly, providing them a simple convenience and usually leading to higher perceived service quality [1, 3, 4]. One of the most of common self-service technologies in retailing sector is the self-checkout system.

Provision of the technology-based self-service options such as self-checkout system entails advantages to both the enterprise users (retailers) and end users (shoppers). Benefits from the enterprise users mainly derive from cost efficiency resulted from reduced staff requirements, indirectly reduce personal training costs and other variable costs which proportionate to the number of staffs employed [5]. On the other hand, shoppers are benefited from the reduced checkout time, better service, perceived privacy and anonymity [4].

Despite the advantages offered, researches indicate that adoption of self-service technologies not necessary contribute to better customer value [6, 7]. Instead, customer dissatisfaction may occur due to frustration in using the SST. In fact, in order to reap the time efficiency benefit of using the self-service checkout system, shoppers required to able to use the system reasonably competent. An inexperienced customer can cause even more delays than an inexperienced cashier on a conventional register, and older customers may expect the attendant to assist them directly with scanning items, preventing the attendant from dealing with other customers who actually require intervention [7].

Recently, the introduction of automated checkout trolley indicates the potentiality to alleviate the shortfalls of existing self-checkout system. The differences between two, are the self-checkout system commonly exists as a stationary kiosk which located in close proximity to cashier-driven cash register in a retail setting, and there is often a head cashier nearby who oversees user interaction with the self-checkout system. Whereas the automated checkout trolley, by its name, it is a trolley features
a built-in computer which allow users or shoppers to scan the items that being put into the trolley and to check out the trolley of items by simply passing through the sensor device.

As the automated checkout trolley is a variation of self-service technology, it may inherit the common problem of SST that the end user’s adoption rate is lower than enterprise user’s adoption rate [1]. In order words, enterprise users (retailers) is comparatively more aggressive in adopting the technology, but the end users (shoppers) is less willing to adopt the technology, which eventually lead to the failure of the self-service technology given the fact the successfullness of the technology will ultimately depend on the acceptance of end users. Hence, this implies that perceptions and expectations of both end user and enterprise user toward the automated checkout trolley are vital inputs to the development and enhancement of the automated checkout trolley. In addition, the main streams of technology-based self-service researches have focused on the user behaviors and assessment of acceptance of the technology through service quality measurement. Scarc research has studied the system requirements from practical level which able to provide sufficient details of system requirements for the use of practitioners. Moreover, main stream of TBSS studies usually are done in Western context, application of TBSS in Asian context are less well understood. Their perceptions and expectation constitute the requirements of the technology to become success, especially in Asian contingent.

Therefore, the purpose of this paper is to assess the perceptions and expectation of both end users and enterprise users toward automated checkout trolley system. The understanding of the user requirements will able to provide better solution to the existing model and enhance the adoption rate by end users.

2 Automated Checkout Trolley
2.1 System Overview
Automated checkout shopping trolley (ACT) system presented in this paper refers to the whole system working together to make the “trolley” or “cart” capable to conduct automatic checkout. In other words, the under discuss trolley system not only refers to the tangible “trolley”, but also the database system, networks, technologies used to identify sale items, sensors and the software as well.

In general, the most tangible module of automated checkout trolley system is trolley itself that attached with a built-in computer and sensor, which connected with the database system. In this environment, sale items are often tagged with automatic identifier such as Radio Frequency Identification (RFID) tag. The trolley automatically scans the items which the items are put into the trolley. The ultimate goal of the ACT system lies on its capability to check out the trolley of items at once, by pushing the trolley through the sensors. At the same time, the total amount of item purchased will be deducted from the user’s credit card or cash card.

The automated checkout trolley system puts service and checkout in the consumer’s hands, reducing reliance on the point-of-sale for customer service and freeing store personnel to provide customer service in the aisle.

2.2 Developed Conceptual Prototype of ACT
In order to enable evaluation by users, the research team has produced a conceptual prototype of the automated checkout trolley system, named as S-Cart with details of its feature and functionalities. The proposed S-Cart has a mounted computer and sensor device on near the end of trolley which facing the user. User can interact with the system through the touch-sensitive monitor or navigational buttons. Users can access to various information using the interactive display. The following list shows the type of information provided by the S-Cart.

- Promotion and advertisement information
- Product details (e.g. contents, ingredients, tips)
- Check location of particular merchandise
- Check price of item
- Sum up prices of all items in the trolley
- Live chat function with supporting staffs

In order to use the S-Cart, users need to insert their credit card or cash card (a member card issued by the retailers, which users can reload the card with money at the customer service counter) into the card slot. The mounted computer on the trolley is connected to the retailer’s database system and credit card verification system through WiFi 802.11 network. Data of Credit card and cash card are sent over the network to be verified. Other information aforementioned is transmitted to the trolley using the WiFi network as well.

When the merchandises are put into the cart, the RFID sensor will update the list of items added into the cart and display the updated total price of items. The S-Cart adopts passive RFID tags as the automatic identification technique to identify merchandises in the trolley. The main reason of
adoption of passive RFID tag is the cost efficiency and energy efficiency provided by the method.

After the checkout process, customers are required to push the S-Cart back to the trolley collection area, in order to remove their credit card or cash card from the S-Cart. The S-Cart will produce alert message and sound to remind customer to retrieve their card from the S-Cart.

3 Methodology
The purpose of this study is to explore the perceptions and expectation of Asian users toward the S-Cart system. Both enterprise users (retailers) and end users (consumers) are included in the study. In the first part, this study adopts questionnaire survey to identify the existing service problems faced by consumers prior to S-Cart adoption and consumer’s acceptances toward the S-Cart. Second part of the study involves the enterprise users (employees of retailers) in in-depth interviewer, in order to understand their perceptions toward the idea of S-Cart.

3.1 Questionnaire Survey for End-Users
In this part, the unit of analysis was the individual shopper. Questionnaires are distributed to individual shopper in hypermarkets. The research team collected back 86 sets usable questionnaire. The questionnaire can be divided into three session, which first session examine the perceived service quality of hypermarkets, the second session examine the acceptance of users toward the S-Cart and the payment method in S-Cart, whereas third session contained open-ended questions which attempt to solicit subjective perception of user toward to idea of S-Cart and the features they would like to S-Cart to have. Both sessions one and two are in the form of five point Likert Scales, which coded from strongly agree with value of 5 and strongly disagree with value of 1. The purpose of first session of the survey is to identify the service problems in the hypermarkets, thus new feature of S-Cart can be proposed to confront the problems. It attempts to examine the perceived service quality, by the factors from “The Service Quality Model” and “Evaluation of Customer Satisfaction”. Table 1 show the factors and aspect which the factor attempt to measure. The details of items used to measure each aspect aforementioned are as shown in Table 2. It is an administrated survey so that researchers able to explain the idea of S-Cart to respondents in better pictures, and to solicit further response whenever it is necessary.

Table 1. Constructs used to measure perceived service quality

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Aspects</th>
<th>Service Quality Model</th>
<th>Customer Satisfaction Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfortable</td>
<td>Storehouse environment</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Consistency of price tag</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Service Quality</td>
<td>Service Quality</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ease of Access</td>
<td>Efficiency and Timeliness</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Accountability</td>
<td>Service Quality</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2  Items used in Questionnaire

<table>
<thead>
<tr>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storehouse Environment</strong></td>
</tr>
<tr>
<td>• Store atmosphere and décor are appealing.</td>
</tr>
<tr>
<td>• A good selection of products was presents.</td>
</tr>
<tr>
<td>• Merchandise displays are attractive.</td>
</tr>
<tr>
<td>• Advertised merchandise was in stock.</td>
</tr>
<tr>
<td>• The store layout makes it easy for customers to find what they need.</td>
</tr>
<tr>
<td><strong>Consistency of Price Tag</strong></td>
</tr>
<tr>
<td>• Price tags are consistent with the cashier's scan.</td>
</tr>
<tr>
<td>• Prices are known by cashier in order to avoid arguments.</td>
</tr>
<tr>
<td><strong>Service Quality</strong></td>
</tr>
<tr>
<td>• Promoters are in full support and helpful.</td>
</tr>
<tr>
<td>• Sincerity in solving customer’s problem</td>
</tr>
<tr>
<td>• Employees in this store are able to handle customer complaints directly and immediately.</td>
</tr>
<tr>
<td><strong>Efficiency and Timeliness</strong></td>
</tr>
<tr>
<td>• Payment process is fast and efficient (&lt; 5 Minutes)</td>
</tr>
<tr>
<td>• Sufficient counters are available</td>
</tr>
<tr>
<td>• Staffs able to handle unexpected case effectively and avoid customer waiting</td>
</tr>
</tbody>
</table>

3.2 In-Depth Interview with Enterprise Users
Three interviewees of a selected case company, who holding different positions (ranged from front end manager to customer service staff) are interviewed. The result of interview is recorded and transcripted. Research team first informs the interviewee regarding the result of survey – consumer’s perception toward the S-Cart and the perceived problem with existing service. The purpose of the interviews is to understand the perceptions of enterprise users toward idea of S-Cart, and their
concerns or expectations on the S-Cart system. The general questions asked are:

a. What is your comment on the S-Cart?
b. What is your concerns regarding the S-Cart?
c. What functionality or features which you would like to have on the S-Cart?
d. Do you think the S-Cart system is applicable in the hypermarkets?

4 Result
Customer satisfaction is the vital contributor to competitive advantage. Thus, a new creation or development of system to be used by customer must be able to meet their requirements and help them to solve existing problem. Otherwise the system is developed only for the sake of development. The results of this study are organized into two parts, which first part is the result of questionnaire survey whereas the second part is the result of in-depth interviews with the representatives of the hypermarkets.

4.1 Result of Questionnaire Survey by Shoppers
The 86 samples constitute of 49 female shoppers and 37 male shoppers, which as illustrated in Fig. 2.

Table 3 indicates the result of session 1 which attempt to examine the customer satisfaction in existing shopping environment, in order to identify the service problems.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storehouse environment</td>
<td>1.83</td>
</tr>
<tr>
<td>Price Tag Accuracy</td>
<td>2.70</td>
</tr>
<tr>
<td>Service Quality</td>
<td>2.81</td>
</tr>
<tr>
<td>Efficiency and Timeliness</td>
<td>3.10</td>
</tr>
</tbody>
</table>

The finding indicates that consumers or shoppers are satisfied with the storehouse environment of the hypermarkets, but dissatisfied with the other three aspects which are price tag accuracy, service quality, and efficiency and timeliness, with increasing dissatisfaction from tag accuracy to efficiency timeliness. These results indicate that the hypermarkets can improve customer satisfaction by solving the problems of efficiency and timeliness, service quality, and price tag accuracy.

In addition, the finding of survey indicates that approximately 70 percent of respondents agreed that they overspent when shopping in the hypermarkets, as shown in Fig. 3.

This implies that behavior of overspending is prevalent. Hence a mechanism which is able to help shoppers to control their spending is much appreciated. In other words, the budget control and alert feature proposed in the S-Cart system is a practical and appropriate system requirement.

Session two of the survey examine the acceptance of shoppers toward the use of S-Cart and the payment methods used in the S-Cart, which the credit card and cash card methods. As illustrated in Fig. 4, about 88 percent of respondents are willing to use S-Cart or automated checkout trolley system when shopping in hypermarkets. This finding indicates that majority of the shoppers in hypermarkets are willing to embrace the S-Cart or Automated Checkout Trolley (ACT) system, which also implies of the practicality of implementing this system in the hypermarkets of developing countries.

On the other hands, 59 percent of the respondents not accept the credit card and cash card as payment methods used in the S-Cart, as shown in Fig. 5.
With the complementary qualitative response acquired, shoppers responded that they feel unsecure and worry to use credit card or cash card as the payment method used in S-Cart. The use of credit card as payment method is much concerned by respondents as the risks and amount of money involved are considerable high. This finding implies that security is single most important system requirement of S-Cart system. Mechanisms which allow to users to verify the transaction, password encryption of card information, and secured transmission of transaction information should be implemented in order to increase the acceptance level of the payment method. In addition, alternative payment methods must be provided, which able to cater for the needs of customer who not own credit card and avoid customer frustration by forcing customer to use certain payment methods.

Session three of the survey consists of 2 open-ended questions to solicit subjective comments of respondents toward the S-Cart and the features that they would like to S-Cart to have. The advantages of open-ended question are that it allows respondents to provide creative, unconstrained feedbacks about the S-Cart. The following are the comments from respondents.

- Respondents are impressed with the convenience and efficiency which realizable by the S-Cart
- Multi language supports should be provided
- Respondents wish to have item-location associated floor directory function to help them navigate effectively
- Respondents are pleasant with the budget control and alert functions.
- Respondents suggest use cash as alternative payment method.
- Respondents concern about the security of the system since credit card or cash card is used, and amount is deducted automatically from the account. The risk of forgetting the card in S-Cart is perceived as high.
- Password verification should be used to initial the card access, and also to verify the transactions.
- The robustness of S-Cart is concerned as well as customers often put their child inside the cart during shopping.
- Respondents request for adding “Touch and Go” card as one the payment method. “Touch and Go” card is a multi-purpose cash card in Malaysia that can be used in public transportations and road tolls.

Based on the qualitative feedbacks from respondents, it indicates that most shoppers responded that they are excited about the idea and enthusiastic to try the S-Cart, provided if it is use-to-use, convenience, and secure. As reconfirmed by finding from session 2 of the survey, system security is the main concern of shoppers, which form the vital system requirements of the S-Cart system in order to be succeeded. The second most prevalent comments from the respondents are regarding the payment methods, they request that the various payment methods such as cash should be available to make the S-Cart usable by wider range of users.

4.2 Result of Interviews with Enterprise Users

Enterprise users of the S-Cart system are referred to the staffs of the retailers or hypermarkets. Their perceptions and expectations toward the S-Cart system are paramount as they potentially influence the decision of whether adopting the automated checkout trolley system or not. As aforementioned, staffs ranged from frontline manager to customer service staffs are interviewed.

Overall, the interviewers possess of positive attitude toward the ideas of S-Cart. They believe the use of S-Cart will significantly improve the checkout process, reduce personnel-related expenditures, improve the customer service, and increase customer satisfaction. At the same time, they have valuable comments as well as concerns on the S-Cart system, which are the main concerns that sought by this paper. The following are the comments or concerns of the interviewees.
5. S-Cart solve Retailers’ Problem

Through the questionnaire and interviews, the following are the common problems identified in the hypermarkets which agreed by both customers and the retailers. This section presents how the adoption of S-Cart able to solve the various service-related problems. Solving these problems implies improved service quality, customer value, and eventually leads to customer satisfaction. Table 4 shows the solution provided by S-Cart to service-related problems.

Table 4 Solutions provided by S-Cart System

<table>
<thead>
<tr>
<th>Problems</th>
<th>Solution offered by S-Cart System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistency of price tags</td>
<td>All prices are directly retrieved from central database. No longer need to physically change the price tags, retailers can change the price and other information from the database system.</td>
</tr>
<tr>
<td>Limited price checker device</td>
<td>S-Cart itself has price checker function. Users just need to drop an item into trolley and it would display price, as well as other product information such as expire date, content, ingredients, and tips.</td>
</tr>
<tr>
<td>Trolley stolen</td>
<td>S-Cart as a solution to prevent shopping cart lost, as users need to push the cart back to its dedicated storage area in regain their credit card in the S-Cart.</td>
</tr>
<tr>
<td>Long Queuing Time</td>
<td>S-Cart is an automated checkout system that significantly fastens the checkout process. It helps to reduce the loads of cashier counters, while maintaining the service level.</td>
</tr>
</tbody>
</table>

Additionally, as the S-Cart utilizes RFID tag, it make possible for the hypermarkets to create a vast database of customer information [8]. Later the retailers can extract business intelligence from the knowledge base, which help the retailers delivery product and service based on customers’ needs, preferences, or past transaction [9].

6. Discussion

The findings from this study indicate that respondents possess of positive attitude toward the S-Cart system and most of them are enthusiastic to try the automated checkout trolley system. On the retailers’ side, they are willing to adopt this automated checkout system, given its advantage to reduce operational and personnel costs. These results suggest that the shoppers and hypermarkets in developing countries have considerable high level of acceptance toward this evolutionary way of shopping. In other words, the rate of adoption and successfulness of the automated checkout system are likely to be high in developing countries.

The most common concerns of the both enterprise and end users are the security of payments and the method of payments to be used for the automated checkout trolley system. The developers of such automated checkout system must ensure that the transaction made using the system is highly secured and users are allowed to verify the transaction. The transaction security forms the core functionality of the system which must be fulfilled in order for the users to accept the system.

Moreover, the findings indicate that the payment method used for the automated checkout trolley should convenience and allow cash as one of the payment method because the credit holders in developing countries are not prevalent as in...
developed countries, and cash payment may provide great convenience and the feeling of secured. Besides, forcing customers to use certain payment methods are tend to result in frustration [7].

Enterprise users (retailers or hypermarkets) perceived the compatibility of the automated checkout system with their existing operations or activities as important criteria in the evaluation of adopting such systems. In fact, hypermarkets tend to have their own unique business process. Hence, the automated checkout trolley system must flexible enough to enable the system to customized or tailored to existing business process or practices. For instance, the system must be able to handle items which must paid in internal counter, rather require the hypermarket to change their process. On the other hand, a standardized system is more likely to be perceived as disruptive and risky since the adopter need to change their existing structure or process in order to use the system, and thus the likelihood of adoption would be lower.

The automated checkout trolley system is a complementary mechanism to the conventional checkout line, but not a total replacement of it. Consumers should be given the freedom to choose among the automated checkout trolley or conventional checkout line. Solely dependent on the automated checkout trolley system is not practical as well, given that certain customer would prefer to feel of customer service provided by real human [7, 10]. Additionally, social pressure might make it impractical; because of fully adoption of the automated system potentially impair the employment opportunities.

6. Conclusion
The findings of this study provide information about the perceptions of population in developing countries toward the automated checkout trolley, which is useful for the providers and suppliers of automated checkout trolley. The findings provide insights for these practitioners in defining the system requirements, from the users’ point of views. Additionally, this study forms the foundation for more sophisticated or specific research which wishes to investigate in the domain of automated checkout trolley system.

This study is subjected to certain limitation as well. Firstly, the sample used in the study is the consumers from Malaysia, which the results might not be able to fully generalize to represent all the developing countries. Secondly, the assessment of users in this study is based on the conceptual prototype of the system, which might be varied from the assessment using fully developed system.

Future works can assess the perceptions of users based on the fully developed system, in order to represent their real experiences and perceptions of actual use of the automated checkout trolley system. Furthermore, future works can apply theories or models to derive at fortified hypotheses and statistical testing on the hypotheses, in order to enhance the result of questionnaire survey.

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References: