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E-commerce Design Interaction with Voice User Interface using User-centered Design Approach

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***Abstract*—The rapid expansion of e-commerce has encouraged many platforms to serve their consumers better, including by providing state-of-the-art user interaction. Voice user interface is integrated in the e-commerce in order to allow users doing multitask while having handful activities and simplify features whose discoverability is low. The interface is designed using user-centered design approach, specifically ISO 9241-210:2010 methodology. In addition, the interface is verified by usability testing conducted in three iterations for two personas. Verification process of the design shows that high-fidelity prototype is 83.0% helpful and 70.0% effective.**

***Index Terms*—e-commerce, human computer interaction, speech recognition, speech synthesis, voice user interaction**

I. INTRODUCTION

Total e-commerce transaction in Indonesia is predicted to increase eight times from 2017 to 2022 [1]. In worldwide, the pervasiveness of e-commerce has driven Amazon and Google to integrate voice user interface in their e-commerce platform. The purpose of the research to identify a desired voice user interface for e-commerce in Indonesia.

There are several reasons why people are using voice user interface in online buying, such as busy hands, mistyping, and feature discoverability issues [2]. At a glance, research methodology conducted by the authors includes validating problem, designing, and testing. Those three processes are repeated throughout three iterations.

Based on questionnaire spread across 116 respondents in Indonesia, there are two types of e-commerce users, i.e. elder and youth group. The elder group is dominated by the age of 36-45 years old while the youth group is dominated by the age of 21-35 years old. These two groups are facing different kind of problem sets.

For elder group, the use cases are they want to input words into textbox easily and find some hidden features faster. In this research, elder group tends to have more mistyping words than youth group and therefore they want to be able to input the correct words faster. In addition, elder group also finds it painful to find several hidden features like track order, give review, and chat with seller. Whereas, in youth group, users tend to have online shopping while doing another handful activity, which is renown as multitasking. As a result, design process is aimed to answer problems from both elder and youth group by identifying the correct voice user interface in e-commerce.

II. DESIGN CONCEPT

Design approach used for the interface is user-centered design (UCD), instead of activity-centered, system, or genius design. Among other three approaches, UCD has the closest relation with users; therefore, this approach is considered as the most relevant approach for this use-case [3]. When implementing design with UCD, there are several methodologies that can be used, e.g. ISO 9241-210:2010, Albani-Lombardi, and Lowdermilk. ISO methodology is chosen as it is one of the most standard methodology used widely [4]. The methodology consists of planning, analyzing scope of work, analyzing users' needs, designing, and evaluating.

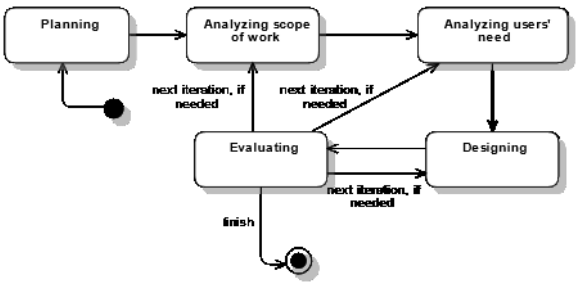

Fig 1. ISO 9241-210:2010

As seen in Fig 1, design process at least includes five main stages. As a result of evaluating stage, there will be several comments based on users' feedbacks. Feedbacks can later be categorized into three types of negative findings, i.e. minor, serious, and catastrophic. Serious and catastrophic negative

findings are then analyzed to improve prototype in the next iteration.

III. DESIGN IMPLEMENTATION

Design process took three iterations. In first iteration, the main goal is to acquire functionality and its corresponding command. In second iteration, the main goal is to design and test helpfulness of the prototype. In third iteration, the main goal is to design and test effectiveness of the prototype. Second and third iteration are done by following interaction design guidelines [5].

A. First Iteration: Functionality and Command

Methodology used in first iteration is questionnaire and interview. Questionnaire is conducted to gather functionalities to solve pain points, which are busy hands, mistyping, and low level of feature discoverability. There are seven identified functionalities which are closely related to those pain points, i.e. search product, hear review, chat seller, add to cart, make order, track order, and give review. Meanwhile, interview is conducted to acquire as many choices of word as possible for each functionality. From the list of words, the majority words are chosen to represent each command as below.

TABLE I. CHOICE OF WORDS FOR MAIN FUNCTIONALITIES

Functionality	**Command**
Search product	search [product's name]
Hear review	[hear/play/start] review
Chat seller	chat seller
Add to cart	add to [cart/trolley]
Make order	[checkout/proceed/next]
Track order	track [order/status]
Give review	submit review

B. Second Iteration: Helpfulness

After the functionalities and commands are gathered, design process is started. Design process in the second iteration starts from searching functionality. Searching can be done through typing a product's name to search bar or tapping microphone icon on the right side of search bar. Microphone icon is used to insert product with a long name. By saying the words rather than typing down, user can input the words faster. There is no difference between the search result from standard graphical user interface and this voice user interface. Else than tapping the microphone icon, user can also say keyword 'search', followed by product's name, in every page to let user search a product.

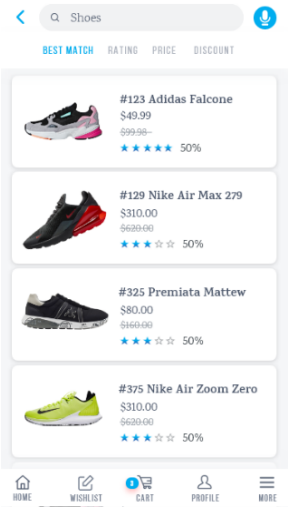

Fig 2. Search product

After search product, design process continues to give and hear review. Users who can give review are those who already have bought the product. The same design concept is taken from search product. Users can type down their reviews by tapping the text field. Another way, users can also tap a microphone icon in the right side of text field to say their reviews instead of type it down. Review itself consists of comment and rating. Initially, users give their comments, then system asks user to give the rating. After that, user can say the command 'submit review' to send their review about the product.

Reviews about product are presented in reviews tab. Not only rating and comments exist, but only a playback button. The button is used by other users to hear the previously recorded review. As a result, review becomes more real since users can also hear intonation during the recording.

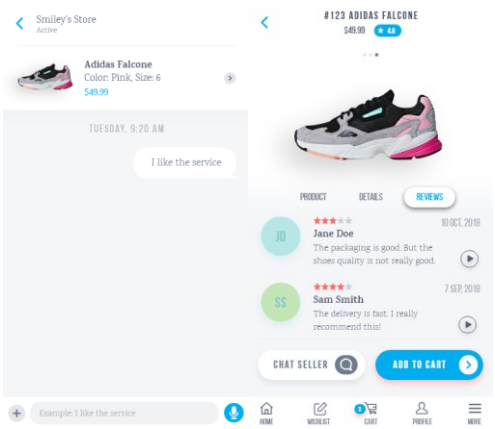

Fig 3. Give & hear review

After give and hear review, design process continues to chat seller that can be seen in the Fig 4 below. Design concept used is similar to give review. Users can type down or say the words. There are also two option users can pick to get them into the chatroom, first by tapping the chat seller button in the

product detail or say the command 'chat seller' in the product detail page as well.

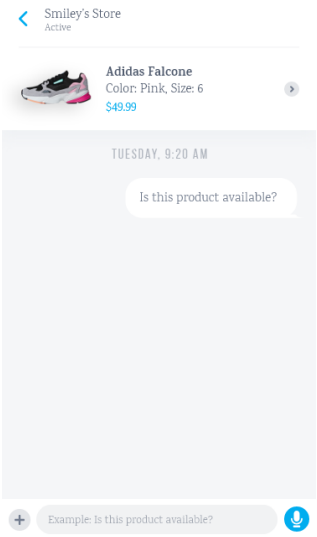

Fig 4. Chat seller

After chat seller, design process continues to add to cart and make order. There are two options for users to find add to cart page, first by tapping add to cart button from product detail page, second by saying the command 'add to cart' in product detail page. In add to cart page, users can adjust the quantity of the product by saying 'minus' to decrease the number, and 'add' to increase the number.

From add to cart page, users can go to make order page. There are also two options for users to reach the page, first by tapping checkout button from add to cart page, second by saying the command 'checkout' in add to cart page. In make order page, users can change their payment methods either by tapping or saying 'change payment method' followed by saying their desired payment method. To finally make order, users can tap make order button or say 'make order'.

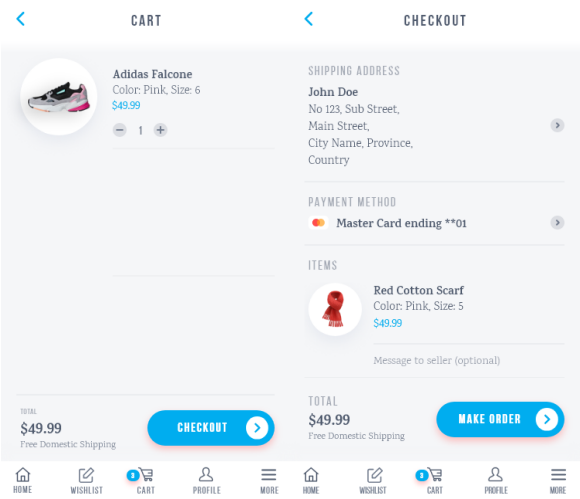

Fig 5. Add to cart & make order

After the add to cart and make order, design process continues to track order. The easiest way for users to get into the tracking page is by saying the command 'track order' from any other pages. If there is only one tracking status, then system directly shows the page. However, if there are more than one tracking status, system will show all tracking status and let users say their desired tracking status.

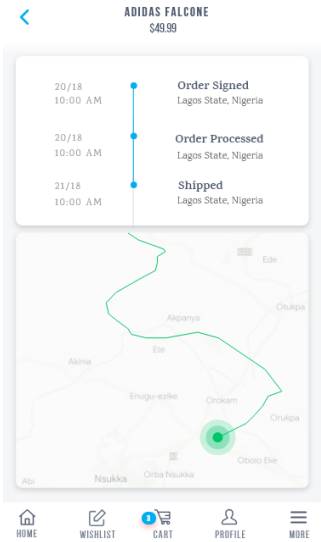

Fig 6. Track order

C. *Third Iteration: Effectiveness*

After helpfulness has been achieved in the second iteration, there is a need to make sure that this voice user interface effective to use. Therefore, there are three supporting functionalities, i.e. onboarding session, help page, and error message. Each supporting functionality is explained as below.

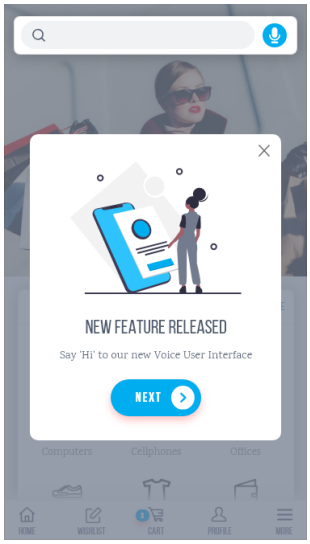

Fig 7. Onboarding Session

Fig 7 above shows onboarding session. This session is only shown once to all users. The onboarding session contains steps to highly important information, i.e. where to activate microphone and where to access help page. The onboarding session

drives users to do those actions. As a result, users are encouraged to get into the help page where information about all commands are located as shown below in Fig 8.

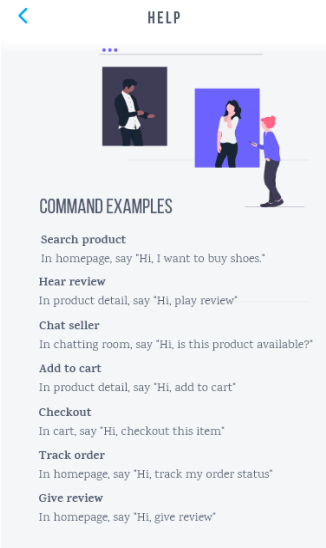

Fig 8. Help page

Other than help page, there is also a helping page to direct users saying the right command, i.e. error message. This error message is highly customized depending on users' active page. The command suggestion is related to users' current page in order to bring users to the most relevant page.

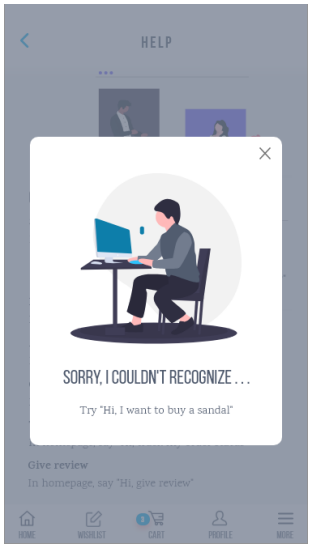

Fig 9. Error message

IV. Verification of Design Goal

The design goal is divided into two types of goal, usability and user experience goal [6]. For usability goal, Single Easy Question (SEQ) is used to calculate the score of effectiveness. For user experience goal, System Usability Scale (SUS) is used to calculate the score of helpfulness. These SEQ and SUS are evaluated during first, second, and third iteration. However, in first and second iteration, SEQ and SUS responses are gathered from each persona. Whereas, in third iteration, SEQ and SUS are taken from five respondents regardless their persona, since the focus in third iteration is to evaluate only supporting functionalities that interact the same way with both personas. Therefore, the final score is taken from the second iteration, as third iteration's focus is mainly about supporting functionalities, instead of the main functionalities. Final score for SUS is 83.0% helpful and for SEQ is 73.0% effective, as shown in the diagrams below.

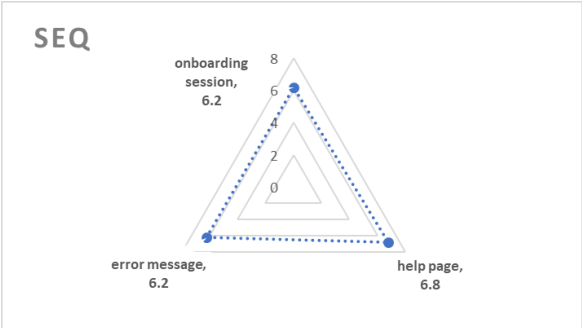

Fig 10. Average SEQ score

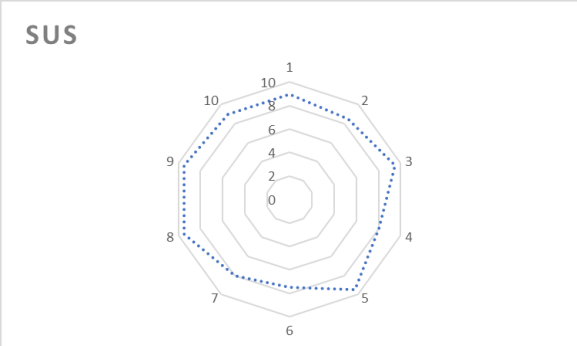

Fig 11. Average SUS score

V. Conclusion

Voice user interface for e-commerce in Indonesia is desirable with effectiveness as its usability goal and helpful as its user experience goal. The desired interface consists of seven main functionalities, which are search product, hear review, chat seller, add to cart, make order, track order, and give review. In addition, it also covers three supporting functionalities, which are help page, error message, and onboarding session.

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