Intelligent Service Robots to enter the Hospitality Industry: Job Termination or Gospel to Waiters

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Abstract—**This research builds on the existing capabilities of the EUREKA Robotics Lab at Cardiff Metropolitan University and aims to disrupt and enhance humanoid robotic programs by studying the public's acceptance of the use of AI robots in the hospitality industry in Wales. As the first Humanoid Robotic Waitress pilot in Wales, the research develops a novel robot serving program and allows intelligent robots to serve in a café in Cardiff. In addition, the study first proposed an cutting-edge interactive model for hospitality robots. Data were collected through questionnaires, interview and observation to explore the acceptance of service robots in Wales.**

Index Terms—**Service robot, Robot acceptance, Robot and human interaction**

I. BACKGROUND AND PURPOSE

Since its inception, robots have been widely used in industrial manufacturing and automation control. With the continuous development of technology, robots have gradually begun to shift from large-scale automation in manufacturing to small-scale of autonomous and social services. There are increasing trend for humanoid robots toto assist humans to complete simple service tasks in the hospitality industry in China and Japan. However, as the hospitality industry itself is an industry with services as its core product, the acceptance of robots by stakeholders is particularly important. Although robots as an emerging product have been used in the service industry to a certain extent to attract customers, not all of the known cases have shown promising results. The world's first robot hotel certified by the Guinness Book of Records, Henn-na has been operating in Japan since 2015. Hotel receptionists, messengers, cleaners and luggage carriers are almost robots, however, Japan's Henn-na Hotel has laid off half of its 243 robots after they created more problems than they could solve, as first reported by The Wall Street Journal [1].Why is this happening? Is there a deficiency in the "intelligentisation" of the hospitality industry? Are there concerns about these service robots? With the application of robotics blowouts in the Fourth Industrialisation era, exploring public acceptance of service robots is essential: are smart robots entering the hospitality industry lead to job termination or the gospel to waiters and waitress? The research builds on the existing capabilities of the EUREKA Robotics Laboratory at Cardiff

Metropolitan University, with the aim of researching and designing humanoid robot programmes to disrupt and enhance the hospitality sector in Wales. By investigating the public acceptance of AI robots working in the hospitality industry.

II. METHODOLOGY AND RESEARCH APPROACH

Researchers use investigative research method to pilot the conceptual Human-Robot Interaction (HRI) model by experimenting a humanoid service roobot, namely Robot EUREKA Gen-1, in a restaurant environment in Cardiff. Researchers collect both qualitative and quantitative data by surveying customers while they were being served by Robot EUREKEA. Sitecore [2] is a customer experience management company that provides web content management and multi-channel marketing automation software, with the proven experience and reliable architecture for assessing the maturity of the customer experience. A service robotics programme for managing the HRI is designed and developed(see Figure 1,2,3). The core flow of the service robot model is to employ the information collected by the robot through various sensors, gesture actuators and advanced face recognition capability to respond and provide interaction between the robots and customers. The experiment placed the robot in an obvious position in the restaurant. In-house customers and public passing-by could easily be served by the robot and are attracted to interact with the robot. The core flow of the service robot model is to apply
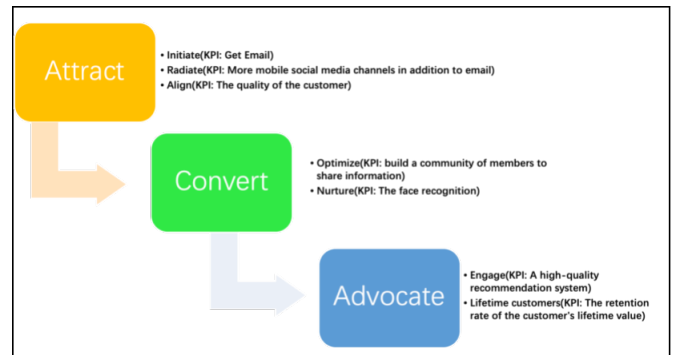

Fig. 1. .Intelligent Robot for Customer eXperience Maturity (iRCXM) Model [3]

the information collected by the robot through various sensors, gesture actuators and advanced face recognition capability to

the interaction between the robot and the customers after a certain amount of processing and feedback. The experiment placed the robot in an obvious position in the restaurant. In-house customers and public passing-by could easily be served by the robot and are attracted to the store to interact with the robot.

Fig. 2.   Robot and human are interacting)

Fig. 3.   Robot interaction system interface

The research used questionnaire and informal interview, triangulated with researchers' observation and automated data collected by Robot Eureka to collect initial stakeholders' experiences. The research was conducted in three-fold:

- Customersrobot interactivities: demo of the humanoid service robot, customers viewed menu on the robot and took order, followed by other interactions such as customers' face registration & FAQs with Robot EUREKA; Gesture control of the robot with hands, Robot-following registered customer and duck- run game; and entertainment such as customer chose the favourite videos or songs for Robot EURKEA to play;

- Both online (iPad) and paper-based questionnaire with ethical consent;
- Automated captured data during the HRI triangulated with informal interview with customers and researchers' observation.

III. INITIAL RESULTS AND PILOT FINDINGS

A total of 23 customers' survey results were obtained from the study. The overall results confirmed that most customers showed a positive attitude towards the acceptance of the service robot. 52% of customers are not worried that robots will replace their jobs in the future, but 43% of customers indicated that they are slightly worried about this situation. All customers are able to accept robots as their colleagues and co-work together with well entertained. Among the customers, 52% are happy to work with robots, and 26% can accept but feel uncomfortable. It is worth noting that 48% of customers can accept occasional errors in robots, and only 9% of customers can accept frequent errors in robots. This means that robots need to improve the accuracy of task execution to gain greater customer acceptance. In addition, 36% of customers worry that their information will be stolen from the robot by others, indicating that data security technology and privacy protection should be considered in the application scenario of intelligent service robots. All customers were happy to provide the consent for Robot EUREKA to capture their face and names for customer registration and their faces captured by the robot showing positive and happy emotion. Researchers observed that all HRI sessions satisfied the "Attract" stage and most HRI session satisfied the "Convert" stage for the iRCXM model (see Figure 1). Only one customer, who refused to interact with Robot EUREKA, and contended the below quote: "I am afraid of your robot and I don't like to see this. He will take over my job!". After a further conversation, that customer is found as a part-time waitress and is resistant against the idea of a "Robotic Waitress". The pilot study demonstrates that users show a positive acceptance of service-type intelligent humanoid robots, but simultaneously they have concerns about information security and the efficiency and reliability of robots completing tasks.

IV. RESEARCH LIMITATIONS AND FUTURE WORK

The initial research population in the survey is limited and at small-scale. Due to the influence of environmental factor of noises, testing in a real environment will reduce the efficiency of the task completion during HRI, which has a certain impact on the results of customer acceptance surveys. Future work will focus to a larger-scale of empirical experiment with the machine learning algorithm to be integrate with iRCXM model for enhancing the "Convert" and "Advocate" stage. The changes of perception from "robot taking over my job" to "service robot enhance my work" and is "the extension of man" [4] need to be catalysed. Policy and ethical recommendations for potential job lost issues and mindset changes for upskilling are necessary.

REFERENCES

[1] 1.The Verge. (2019). 'Japan's robot hotel lays off half the robots after they created more work for humans'. [online] Available at: https://www.theverge.com/2019/1/15/18184198/japans-robot-hotel-lay-off-work-for-humans [Accessed 14 Mar 2020].

[2] itecore (2017). 'customer experience maturity model'. [online] Available at: http://mediacontent.sitecore.net/webinars/CX_Maturity_Model_NA/CX_Maturity_Model.pdf [Accessed 26 Sep 2019]

[3] Yang J.J. & Chew E. (2019) MSc Dissertation in Service Robotics and Approved PhD Proposal. Cardiff School of Technologies, Cardiff Metropolitan University.

[4] McLuhan, M. (2001). Understanding Media:(Routledge Classics).