Exploring Conditions for Successful Adoption of Fully Automated Delivery Systems

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Applied Business Research

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Introduction

Before the COVID-19 pandemic, online deliveries have been adopted as a novel and innovative approach to daily necessities, such as having lunch and dinner. Due mainly to the pandemic it has now been accepted as a legitimate means to provide support to those who would otherwise be at risk of being infected. This paper proposes the advancement of autonomous delivery into the greater population necessitates the identification of factors which would contribute to a more general level of adoption. Delivery robots are ideal for adoption research due to their fully automated nature and their effect on existing human-based services. However, since they will be operating within the general populace, it is expected there will be potential liability concerns.

Campus demographics make for an ideal user base for introducing new products and services and for market research and prototyping. University campuses have a limited scale which allows for quantitative and qualitative analyses to be carried out within budget. As the state of the art of Artificial Intelligence branches out from the digital domain into the physical realm, universities would make an ideal choice to research the adoption of Autonomous Robots within a limited setting prior to launching at a wider global scale. Starship Technologies, a startup based in San Fransisco, has developed small form-factor robots for its autonomous delivery service and has been doing trial runs in various university campuses. One of the universities selected is the University of Houston, located in downtown Houston, Texas (AUVSI, 2019). This research will monitor and observe the robotic activities for research on successful adoption.

Literature Review

Popular opinion mistrusts autonomous activity in general and according to a study by Dubljevic (2021) robotic participation in society will be met with suspicion and skepticism. The study documents skeptics who believe that eventually the profession of taxi drivers will be replaced by autonomous drivers. It also documents a consensus among truck and taxi drivers that the transition to full automation will have drastic effects in society and recognizes the need for retraining programs for those directly affected. Anderson, et al. documented a more holistic set of concerns, citing economies based on human-driven vehicles will suffer which will affect the value it contributes to the GDP (i.e. petrol services, logistics, etc). The study also posits how insurance liability inconsistencies due to shared driving responsibilities between self-driving tech and human occupant will lead to heavy regulation.

Studies describing opportunities with autonomous robotic services have been reviewed to support the goals of this research. This research will determine how humans are able to do more productive work, since efficiencies are gained by allowing self-driving vehicles in traffic. A study by Severino, et al. measured how mechanical responses on average were more consistent and performed better than humans in reflexive situations. It also demonstrated how shared contact areas in fully automated delivery services are minimized as compared to deliveries made by humans, resulting in less infection rates (Severino, 2021). Another study by Campisi (2021) serves as an inspiration for this research, showing how fully automated vehicles and transportation systems will increase human productivity. It describes how an interconnected ecosystem of autonomous vehicles serve as a central component of next generation smart cities (Campisi,2021).

Purpose of Research

Although risks for this technology to be adopted has been well documented, not enough studies have led to the discovery of factors which lead to successful general adoption. By deploying Starship's robotic delivery service on a limited basis within

Texas A&M University premises, measuring key metrics, and conducting qualitative research, this research will identify critical variables which indicate favorable adoption of autonomous robot delivery system. Based on the results of our study, further efforts by companies using autonomous robotic services will have a chance of being successfully adopted into a community given the appropriate conditions. This research will also identify conditions in which such deployment will be incompatible with a community. This research will assume that a combination of factors will lead to adoption or rejection of this technology, as opposed to a few key factors. Some areas of concern to be explored: 1) monetary incentives offered by competing human-based delivery services, 2) Privacy concerns from robotic activity, 3) how many robots per number of pedestrians would make people feel uncomfortable, 4) occurrences of safety related incidents involving robots.

Research Design

Qualitative and quantitative methods analyzing trip data from robots and service usage will drive the purpose of this research. Observations will be conducted with respect to privacy and personal student information will not affect the quality of data collected. The population sample will include service users, namely market suppliers and end users. The research activity conducted on University of Houston campus premises will have the following components: 1) Third party merchant interviews, 2) Student interviews, 3) Robot observation, where user metrics will be gathered for evaluation, with respect to individual students privacy. Robotic telemetry data will also be gathered. Some technical metrics to be measured will be as follows 1) distance traveled between pickup & deliveries, 2) package price types and purchase data, 3) service related issues, 4) robot related telemetry data & energy efficiency.

Budget

Table 1

Item	Cost Estimate (USD)	Service Provider
Research team expenses	10000	Texas A & M University
Hardware parts & equipment	1000	Texas A & M University
Command & control facility	1000	Texas A & M University
Database & analytics tools	1000	Texas A & M University

Time Schedule

Table 2

Task	Weeks (from launch date TBD)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Third party merchant interviews	■	■	■												
Student interviews	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Robot observation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

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