

Chapter 4

Automation in Ghost Kitchens: Exploring the Role of Robotics in Revolutionizing Food Service Operations

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ABSTRACT

Ghost kitchens, sometimes called cloud or dark kitchens, are a fast growing subset of the food service industry that focusses solely on delivery and does not have any dining areas. These facilities offer a cost-effective and scalable strategy to meet the growing demand for online meal delivery. However, they face substantial challenges, such as the need for stringent quality control and sanitary measures, intense operating pressure, and a lack of available workers. In order to tackle these difficulties, automation—especially through robotics—is becoming an essential tool for creativity and efficiency. In this chapter, we look at how robotics is changing the face of ghost kitchen operations by automating mundane but necessary tasks like chopping, cooking, plating, packaging, and cleaning. Autonomous cooking systems, robotic arms, and AI-driven inventory and order management technologies are all investigated. This chapter delves into how modern technologies are changing the nature of the workforce, looking at the pros and cons of job loss and new skill acquisition.

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INTRODUCTION

The hospitality and food service sector in the world is facing a paradigm shift, most of it being as a result of technological advancement and evolving tastes and preferences of consumers. One of the most important innovations is the emergence of ghost kitchens or cloud kitchens, virtual kitchens, or dark kitchens. These restaurants have no physical restaurant where people can dine but solely prepare food to be delivered using digital applications (Sigala, 2018). The model has seen a quick spread, especially in urban markets, where the increased demand of online delivery food services are matched with limitations of high real-estate prices and the changing life style to convenience-based consumption (OECD, 2021). This trend has increased with the growing involvement of robotics in ghost kitchens. Robotics is being implemented in a variety of processes, including food preparation, packaging, visual inspection and even in the last-mile delivery process. Robots can be used to repeat and complete tasks precisely and quickly, which means that reliance on human labor is lessened, that fewer errors occur, and that food is hygienic (Ivanov and Webster, 2020). As an example, burgers, fry foods, or beverage dispensing are assembled by the help of robotic arms, customer experience is being improved by autonomous delivery robots and drones, which are being tested in metropolitan areas (Cohen, 2021). Not only is the dynamism of the operations being transformed by these advancements, but they are also transforming the expectation of customers of quality of service in a highly competitive food delivering market.

The implementation of robotics in ghost kitchens was accelerated by the COVID-19 pandemic even more. Ghost kitchens were a savior to restaurants and business owners amid the limitation of dine-in services, providing hygienic and contactless services (Zhang et al., 2023). Robotics was critical in combating the wave of delivery demands as well as in maintaining compliance to protective measures and labor shortages due to lockdowns. Automation has become central to the post-pandemic recovery as companies aim to find a strong and scalable model to meet the changing conditions of the market (Kraus et al., 2022). Economically, robotics can save on labour costs and maximize on resources. Robot-powered ghost kitchens also tend to employ fewer workers than a conventional restaurant, thus being economical to investors and operators (Choudhury et al., 2021). Additionally, robotic technologies enable operators to ensure the quality of the products remains consistent, and this aspect is becoming more significant when it comes to sustaining brand loyalty in the digital market. Meanwhile, implementation of robotics also adds some problems concerning costs, recalibration of workers, standardization of technologies, and perceptions of robot-ready food in the consumer market (Gursoy et al., 2019).

Ghost kitchens have added to the greater discourse of smart hospitality and service automation on an academic level, including the role of robotics. Researchers

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