Chapter 107
Improving Productivity: A Review of Robotic Applications in Food Industry

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ABSTRACT

The role of robots is becoming substantial for industrial applications and business competitiveness. The purpose of this paper is to review robotic transformation concept and to investigate its business applications in the food industry. The robot transformation in food industry provided a robust support in raising business productivity, reduced cost and enhanced customer's loyalty, besides the food safety and quality. Its service in production systems for material handling and packaging operations is inevitable. Despite the importance of robotics in improving productivity, small scale food companies are often reluctant to invest in robotization of their operations. Since it involves high initial investment, maintenance and costs associated with training skilled employees for programming of robotics. Mainly, two points have raised concerns in the discussion of this paper. First, the robot technology has been enhanced to deliver services for the large scale food companies. Meanwhile, the experiences gained in the food service sector which implement robots can replace the human touch. At the end of this review, several solutions are recommended to shed light on the applications of the robot in the food industry.

1. INTRODUCTION

In the beginning of 21st century, increased technological transformation and the huge requirement in various industries has raised the requirement of robotic automation (Manshi & Shukla, 2012). The role of robots is becoming significant for different industrial applications and competitive business. The robotic

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applications have expanded the domestic industry, promoted technological standard and development of the small and medium manufacturers (Chiu-Chi, 1995). Ironically, several research challenges have been raised related with the use of robots in the food industry (Peters, 2010).

The International Federation of Robotics (IFR) reports showed that 178,132 industrial robots were sold worldwide in 2013, out of 6,200 (3.5%) constituted for the food and beverage industry (DLG-Expert report, 2015). The market research report on service robotics shows that service robotics sector is the largest portion in the market by value or volume (San Jos, 2010). It has been estimated that about 13,741 units of service robots were sold in 2010 with an increase of 4% compared with 2009 which were worth 3.2 billion US dollars which surpasses the value in 2009 by 15 percent (Rui, 2015). On a short note, these figures demonstrate the significant usage of robots over the course of time.

In recent times, there has been increased concern for an individual's health and wellbeing, which is threatened by the foods consumed and the environmental issues.However, greater attention has been paid towards the production processes, packaging, storing and distribution (Nayik et al., 2015). In this context, the robots serve for much purpose, mainly in production systems for material handling and packaging operations (Rene et al., 2010; Wallin, 1997). Robots are used in promoting product quality and reducing costs associated with such issues (Chiu-Chi, 1995). Meanwhile, industries are focusing on implementing automation and robotics to help in achieving these goals (Rene et al., 2010). The prime advantage for the robots is low cost maintenance with high productivity in the business (Zongwei, 2015). Baxter, for example, is a new inexpensive robot which provides user friendly operations and performs various tasks in small manufacturers (Ben, 2012).

Food industry aimed the use of robots for various applications to improve the efficiency and reduced work space (Zongwei, 2015) and to reduce the cost (Rene et al., 2010; Bogue, 2009). For example, many restaurants have extended robot implications to increase business productivity, attract and retain customers (Qingxiao et al., 2012). Given this subject is of great importance to scholars, practitioners and academicians, this paper will increase industry awareness and the implications of robotics in the food industry.

Therefore, the objective of this paper is to review robotic applications in food industry as the productivity is vital for business success. The remainder of the paper is as follows. First, this paper discusses the literature review and robot transformation in business. Second, the paper detailed the benefits and shortcomings of robot application in food industry. The paper ends with a brief conclusion and derives few practical solutions.

2. LITERATURE REVIEW

2.1. Service Robots

International Standard Organization gives one definition for the robot which can be used in when counting the number of robots in each country. A "robot" as: "Automatically controlled, reprogrammable multipurpose manipulator programmable in three or more directions" (International Standard Organization, 1997). From this definition, it can be seen that that a robot should include some characteristics. For example, the robot is computing hardware and software, and actuators and sensors often with more than three degrees of freedom, giving the ability to move in a three- or two-dimensional space with at least three joints (Mannan et al., 2012).