

DOI: 10.21767/1791-809X.1000483

A Study of Integration of Robotics in the Hospitality Sector and Its Emulation in the Pharmaceutical Sector

Mohammed Owais Qureshi¹ and Rumaiya Sajjad²

¹Department of Human Resource Management, College of Business, King Abdul Aziz University, Rabigh, Kingdom of Saudi Arabia

²Department of Health and Hospital Management, College of Business, King Abdul Aziz University, Rabigh, Kingdom of Saudi Arabia

Corresponding author: Mohammed Owais Qureshi, Department of Human Resource Management, College of Business, King Abdul Aziz University, Rabigh, Kingdom of Saudi Arabia, Pin Code 21911, Tel: 4230042; Fax: 4230053; E-mail: tehzeeb001@gmail.com

Received date: 11 December 2016; **Accepted date:** 19 December 2016; **Published date:** 29 December 2016

Citation: Qureshi MO, Sajjad R. A Study of Integration of Robotics in the Hospitality Sector and Its Emulation in the Pharmaceutical Sector. Health Sci J 2017, 11: 1.

Abstract

Objective: The main objective of the study is to highlight the integration of humanoid robots in the pharmaceutical industry at the medical dispensing stores by emulating robotic integration successes of the hospitality sector and ultimately developing strategies for its use in small, medium and large medical store provider's i.e., pharmacies.

Method: The research is based on desk research data, so as to investigate the most current and prospective applicability of robotics in healthcare, particularly in the pharmaceutical sector. The desk research data for this study has been obtained from diverse books on the topic of this research, different public portals, web portals of related departments for data and statistics, numerous journals, webpages of preferred healthcare centers and in addition to this, print materials like brochures etc. were collected from selected healthcare providers.

Result: Researchers unveiled that thus far no significant study has been done to emulate the successful robotic integration of the hospitality sector with the healthcare industry especially the pharmaceutical sector. Inevitably productivity and proficiency advancements by the implementation of automation will become more evident which in turn would result in the integration of robotics gaining thrust and shall play an ever increasing role in helping the pharmacists at the medical stores i.e., pharmacies, to complete their day to day duties, subsequently assisting in providing improved customer services.

Conclusion: The article concludes with a concise glance at some of the current progress of robotics in pharmaceutical sector and its useful employment in the areas that are anticipated to play significant roles in the times to come.

Keywords: Healthcare; Hospitality; Pharmaceuticals; Robots; Robotics

Introduction

In this time of tremendous development in the service sector, health care is an important pillar and which as a share of the economy, according to Centers for Medicare and Medicaid Services, is 16% of the GDP today up from 7.2% in 1965, of which pharmaceutical revenue has reached nearly one trillion U.S. dollars. According to a report published by the Pharma letter, nearly 1.3 million people work in the pharmaceutical industry. Given the rapidity at which awareness is developing, it is becoming tremendously challenging for businesses to stay at the forefront of development and learning [1]. One of the commonly overlooked or underestimated risk is human error, which is caused by misunderstanding of important aspects of job roles by employees and it poses one of the greatest risks to the success of a business [2].

The percentage of workforce that cannot figure out at least one important aspect of their work is around 23%. On average, companies with 100000 workforces are losing £31 million per year respectively, which equals to roughly about £315 per employee, while as the estimated total cost to US and UK companies is £18.7 billion. One of the top four industries with the highest level of workforce misunderstanding is pharmaceutical industry, mainly because employees are persistently dealing with substances that can prove fatal if mismanaged. According to IDC £23.9 million each year are the possible losses incurred by the pharmaceutical industry. This calculation is based on the total workforce population of UK pharmaceutical enterprises [3]. Therefore, advanced technological integration is required, in the form of introduction of robotics at various levels in the Pharmaceutical sector, especially so where the medical drugs are sold i.e., Pharmacies.

The hospitality sector has already stated this integration of technologically advanced humanoid robots at their customer services centers. The near future is undoubtedly, full of robots.

A case in point is Henn-na Hotel in Japan. Several receptionist robots are stationed in the lobby of Henn-na Hotel and their job is to greet the guests. The guests are helped by bots to check in to hotel rooms and also, at the time of check out from the hotel rooms. Human staff is always on call, but the company intends to make 90% of its operations automated. The hospitality sector of Japan, in fact, is already teeming with bots. From potters to cleaners to whatnot Japan may think of, all are bots [4].

In Spain and France, Pepper Robots, work in department stores, highlighting products and providing directions. It is thus time, for the Pharmaceutical sector especially the selling counters of the medical drug stores to emulate the robotic customer care successes of the hospitality sector by introducing robots at the selling counters of the pharmacies.

This research focuses on the robotic integration successes of the hospitality sector and finding ways in emulating the same in the pharmaceutical sector at the medical store customer services, drug dispensing and selling counters.

Problem statement

Healthcare sector is faced with ever greater frequency of human error cost, labour costs and a shortage of work force, and is thus laying out money in robotics at various levels. Pharmaceuticals Industry which is a part of health care industry is no different and has been able to integrate robotics at various levels of its functioning except at the customer care, drug dispensing and cash counters of medical stores i.e., pharmacies.

Objective of the study

The main objective of the study is to highlight the integration of humanoid robots in the pharmaceutical industry at the medical dispensing stores by emulating robotic integration successes of the hospitality sector and ultimately developing strategies for its use in small, medium and large medical store provider's i.e., pharmacies. In addition to this, the advantages and disadvantages of this approach are assessed. And this research also provides basis to study the various factors that should be responsible for attracting the medical stores i.e., pharmacies, to use robotics at customer services, drug dispensing and cash counters.

To achieve the main objective, the following sub objectives are set: -

- 1.To find the current status of robotics in healthcare industry.
- 2.To assess the current status of robotics in pharmaceutical sector.
- 3.To get an overview of robotic integration in the hospitality sector and its emulation in the pharmaceutical sector for medical dispensing jobs.

Method

The research is based on secondary data, so as to investigate the most current and prospective applicability of robotics in healthcare, particularly in the pharmaceutical sector. The desk research data for this study has been obtained from diverse books on the topic of this research, different public portals, web portals of related departments for data and statistics, numerous journals, webpages of preferred healthcare centers and in addition to this, print materials like brochures etc. were collected from selected healthcare providers. Considerable information has been gathered from these sources, in turn allowing the researcher for relevant analysis, interpretation, compilation and organization of the research. Furthermore, in an attempt to categorize and isolate the likely sources of the most current and prospective applicability of robotics in healthcare, particularly in the pharmaceutical sector, the available literature is reviewed.

Literature review

Current status of robotics in healthcare industry: Robots are virtual or mechanical objects that are used in facilitating the occurrence of multiplying everyday activities. Since 1961, the U.S. industry has heavily depended on robots and in healthcare after the mid-1980s [5]. Robots if compared with humans apparently are faster to train, economical to maintain, refilled easily and repaired and do not get jaded with mundane jobs. Robots may perhaps assist the ageing and chronically ill to stay independent, mitigating the requirement for carers and the demand for care homes [6]. Furthermore to giving hands-on patient care, robots have also worked as mentors and lifts for patients of various ages. Inventors from Japan created the "Robot for Interactive Body Assistance" for carrying patients weighing a maximum of 134 lbs to bedsides and wheelchairs using built-in sensors and foam support technology [7]. The Roball robot was invented, during the 1990s, to help in a child's development by providing autistic children with stimulation and interaction experiences. Its spherical ball, which encases sensors and processing elements, would facilitate the robot to steer hindrances in playroom surroundings for 60 seconds [8]. Apparently in the US and world over, there is shortage of nurses and direct care workers. This shortage of human resources in the healthcare sector is expected to rise as aging population grows and retires in the near future. Aiken et al. in a research of the effects of high patient-to-nurse ratio, pointed out that each additional patient per nurse was related with an increase of 7% in patient mortality and a 23% increase in nurse burnout. As a result, researches have suggested that decreasing the patient-to-nurse ratio would end in a reduced amount of missed patient care [9]. Thus robots can perform a role in helping nurses to complete their daily tasks in order to provide better healthcare. Robotic systems in nursing care to support the arduous work of the individual professional and to counteract the imminent staff shortages [10]. The pharmaceutical industry is unceasingly improving excellence and increasing amount of their products. Health care systems are set up in more and more countries. The demand for pharmaceutical

products world over is on the rise. The economic crisis hardly the pharmaceutical industry. Thus, investments in robots only slightly decreased in 2009. In the same manner, trends can also be observed in the medical devices industry. In both industries robot installations will gain momentum in the years to come [11].

Current status of robotics in pharmaceutical sector: Various tasks in life science, pharmaceutical applications and laboratories are performed by robots at a rate that's beyond human know-how. These robots work in dangerous environments in vicinity of biological hazards, the risk of radioactive contamination, and toxic chemotherapy compounds. Robotics are used to assemble and package a number of medical devices and implants, in addition to this, robotics are used in making prescriptions for mail-order pharmacies or hospitals [12].

Robots, which are slim, quick and flexible are suited for the pick and place and assembly work in a pharmaceutical environment. Vision technology lets industrial robots to place together customized orders and perform jobs like assemble blood sugar kits. Pharmaceutical industrial robots are particularly beneficial for drug discovery jobs, packaging and handling test tubes [13].

Packaging: According to a recent study by Association for Packaging and Processing Technologies (PMMI), robots are projected to be used for 27 percent of primary packaging for medical devices by 2018, compared to just three percent in 2013. For pharmaceuticals, robots are expected to handle 34 percent of primary packaging operations, up from 21 percent in 2013 [14].

A pharmacy automation system, PillPick helps hospitals eliminate the opportunity for medication errors during packaging and dispensing - ultimately increasing patient safety. PillPick decreases human touches in bar coding, packaging, storing and dispensing unit dose medications. By automating these tasks, the packaging and dispensing system streamlines hospital pharmacy operations and increases accuracy [15].

Laboratories: Equipment vendors have begun providing the industry with laboratory instruments that incorporate robots. For example, SciGene makes a laboratory bench that includes a robot that prepares DNA samples. Another example is Varian's auto-sampler, which includes a robot that picks up test tubes and loads them into a nuclear magnetic resonance imaging magnet [16].

Sustainability: Just like other industries, the pharma industry is increasingly looking to improve the sustainability of its operations, and in order to do this drug manufacturers have had to reduce waste and pollutants and conserve energy. Robots can certainly assist in achieving these goals as the motors, drives and gearboxes that run them have been found to be up to 95% energy efficient [17].

Robotic dispensing: One of the main problems faced by pharmacies is the loss of time management and search for drugs, causing negative situations as the delays, the lack of time for a more personalized attention and, as a result, the

loss of customers. This problem and the need for improvement in the management of the stocks have made to appear the systems of automatic dispensing of pharmaceutical products. Consulted pharmacy graduates have found that approximately 60% of the time spend on care customer invest it in search and dispense the medication [18]. The benefits of automated pharmacy systems are substantial & the widespread adoption of the technology attests to this, but until now, the reality has been that only large-volume, chain pharmacies and hospitals could justify the ROI [19]. In Germany, an industrial robotic device had been adapted to work in a rural community pharmacy. In this pharmacy there was a need to free space in order to create an area for counselling patients and to expand clinical services for the local community. Installing the robotic picking device in the basement created the space required [20]. Swisslog, a company that specializes in logistics solutions for healthcare - is taking up shop at North American hospital pharmacies. The Pillpick system automates the packaging, storing and dispensing of medications. Unit doses are placed in storage until ready for pickup. The system's inventory management software even allows remote hospital pharmacies to communicate directly with wholesalers, eliminating unnecessary clerical work. And this robot is somewhat intuitive. If a canister empties in the middle of making a batch, the system selects it out for the pharmacist to complete before continuing on to the other batches, which saves time and boosts quality in the long run. The next step in automating health care sector is robot pharmacists, and in the near future there will be robots, more efficient than humans in our hospitals. Nevertheless humans won't be going away anytime soon; even if reported errors are limited, user-friendly interfaces on these machines permit specialists to check and standardize systems if necessary. The goal isn't to substitute humans; it's to minimize human error. Mitigating waste and guaranteeing superior precision are on every medical professional's to-do list. Now, dosing medications more efficiently will allow pharmacists and doctors to think more about their top priority: what their patients need [21]. A tablet counter has become a standard in more than 30,000 sites in 35 countries (as of 2010) including many non-pharmacy sites, such as manufacturing facilities that use a counting machine as a check for small items [22]. Waterford Health Park Pharmacy has installed in Ireland in one of its community pharmacy a Robotic Dispensing unit called the ARX VMAX Duplo, which dramatically increases the speed in which prescriptions are dispensed [23].

Overview of robotic integration in the hospitality sector and its emulation in the pharmaceutical sector for medical dispensing jobs: According to a recent study released by PMMI, The Association for Packaging and Processing Technologies, 75 percent of manufacturers use robots at some point along their manufacturing line, including processing operations involving direct food contact. The report indicates that use of robotics has more than tripled in a number of industries in the past five years [24]. Micah Solomon, writes in his article that Hilton Hotels has launched a customer care robot named Connie and is currently being tested at the Hilton McLean Virginia, in the heart of the Washington, DC,

sprawlospere. Similarly, in a West Coast nod to Rosie, Aloft Cupertino Hotel, in the heart of Silicon Valley, recently deployed a personable little robot dubbed Botlr that can come to your floor, summoning the elevator for himself, to assist you with items you've forgotten and such. Domino's Pizza is now introducing DRU, a robot, uh, "autonomous delivery vehicle" for pizzas in Australia [25]. The concept of booking into a hotel and being confronted with nothing but robots may be a surreal and slightly unpleasant one. But a Japanese hotel, Nagasaki's Henn-na Hotel, is already offering this particular experience, ensuring that guests have a particularly memorable experience [26]. Robot butlers and bartenders could be staffing hotels by 2020 as consumers become increasingly open to the idea, according to new research. Robot butlers and bartenders could be staffing hotels by 2020 as consumers become increasingly open to the idea, according to new research [27]. A new hotel in Dubai will feature an artificial rainforest and robotic hosts [28]. Chihira Aico can smile, she can sing and this robot receptionist ever gets bored with welcoming customers to her upmarket shop. The humanoid is not the first robot to begin customer service in Japan - the wisecracking Pepper, a 4-foot-tall (120 cm) machine with a plastic body perched on rollers, sells coffee machines and mobile phones [29]. The robot -- Nadine, to give its full name -- works as a receptionist at Singapore's Nanyang Technological University. It looks, and acts, just like a human receptionist would and unlike many conventional robots exhibits personality, moods and emotions. It's also humanoid; with long dark hair, Nadine looks just like a normal receptionist, only slightly less human. Robots like Nadine could also be used to "address the shrinking workforce, become personal companions for children and the elderly and even serve as a platform for healthcare services," Thalmann said [30].

A robot's predictability can have its benefits on medication administration. Since the new millennium, health care staff has had to increase their service hours within inpatient and outpatient care. As a result of increased hours along with prescriptions, a prescription-filling robot has been utilized in more than one thousand pharmacies for the year 2007 alone [31]. The device's robotic arm will attain the appropriate vial, collect the medication, and label each vial, in addition to scanning and using bar codes to verify medication; these robots also package, store, and dispense filled prescriptions to patients [32]. St Thomas's hospital, London, has linked automation and pharmacy in the dispensary with the use of a robotic picking device. The pharmacy department at St Thomas's hospital has been both redesigned and extended. The front of the dispensary now has a "sound and vision" queuing system for managing patients collecting prescriptions. The system both displays and announces patients' numbers in the queue when their medication is ready for collection and also visually gives waiting instructions to patients [20].

Results

From the foregoing study, researchers unveiled that thus far no significant study has been done to emulate the successful robotic integration of the hospitality sector with the

healthcare industry especially the pharmaceutical sector. Inevitably productivity and proficiency advancements by the implementation of automation will become more evident which in turn would result in the integration of robotics gaining thrust and shall play an ever increasing role in helping the pharmacists at the medical stores i.e., pharmacies, to complete their day to day duties, subsequently assisting in providing improved customer services.

The pharmaceutical industry like any other industry has been affected by economic conditions, which has in turn raised the stakes and boosted competition and thus, it is notable to mention here that the study found that emulating robotic technology of the hospitality sector especially customer care robots will have a profound effect in selling pharmaceutical products to patients at medical stores and at the same time these robots could also be useful in helping pharmacies and drug companies in the identification of counterfeit medications or drugs that have been produced fraudulently. The pharmaceutical industry lays utmost importance on being able to trace drugs from manufacturing all the way to the point of sale or dispensing and robots at the point of sales end or at dispensing can help the pharmaceutical companies in making it a fool proof system by scanning the barcodes before selling the drug to the customer or the patient and thus, in quickly determining the legitimacy of the procurement and subsequent selling of the product. If a medication at the drug store was intended for Mayfair but ends up in Old Kent Road, the robotic system can quickly flag the product and identify it as a potential counterfeit drug.

In addition to this, the study is applicative for the pharmaceutical sector, to draw the most significant areas of concern with regard to the economic viability and gaining competitive advantage, by introducing robotics in medical stores. And the areas of interest can appropriately be on additional advancement of practical, profitable and employment friendly robots for the sector. Despite the fact robots are capable of doing some tasks better, economical, and faster than people in the healthcare sector and are in great demand at different levels, which is invariably expected to gain momentum in the times to come, care should be taken when it comes to ethical concerns like affordability of the technology, privacy concerns of the patients, and assuring the patients/attendants that not much of healing human touch is acceptable from health care professionals as the health benefits for the patients and employees appear to overshadow the ethical apprehensions of implementing robot technology.

The researchers assertively conclude that this research has pragmatic and administrative significance for the organizations in the health care industry, especially in the pharmaceutical sector.

Discussion and Conclusion

Practical implications for pharmaceutical sector

The pharmaceutical sector is growing at an ever increasing rate and is showing a futuristic advancement by introducing robots in the everyday engagements but concurrently the study suggests that the sector lacks the same futuristic vision when it comes to automating the customer and/or patient services at the medical stores i.e., the pharmacies, with the integration of humanoid robots.

The sector should invest in new generation of beautiful and intelligent humanoid robots as humans around the world have started demonstrating acceptance of them in the hospitality sector. Research shows that companies in the hospitality sector use humanoid robots as a tool to get competitive advantage. This approach is important, as history teaches us that organizations which introduced futuristic but affordable technology became profitable and in turn, led their sectors to the next level of development.

Practical implications for government

Government establishments should start collaboration with the pharmaceutical sector so that trade specific and innovative humanoid robots are developed. This should facilitate pharmacists to allocate more time counselling the patients and/or customers and discuss their medication. Thus helping improve patient safety and care, which in turn will help improve the quality of life of the pharmacists.

Limitation of the study

The research is based on data derived from secondary sources only and thus, has a scope for further research based on primary resource. Furthermore there is scope for establishing a relation between hiring and the implementation of robotics in the pharmaceutical sector.

Conflict of Interest

All the authors declare to have no monetary or personal relationships that could unfavourably impact the research described.

Acknowledgments

We would like to thank the whole management and administrative policy of King Abdulaziz University in motivating and boosting research activities. Furthermore, we would like to extend our gratitude to the Deanship of Scientific Research for their constant advice and help in making this research possible.

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