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The influence of the Internet of things on pharmaceutical inventory management

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A B S T R A C T

The primary goal of this research is to examine the influence of the Internet of Things on Pharmaceutical Inventory Management in Jordan. The employees of the pharmaceutical companies in Jordan represent the population of the study. Accordingly, the study instrument was distributed to an appropriate sample of 620 employees of pharmaceutical companies in Jordan; the questionnaires used in the analysis were 432. Structural equation modeling (SEM) was used to test the study hypotheses. The study results indicated that all dimensions of the Internet of Things had an influence on inventory management. The greatest influence was for cloud computing. Based to the study findings, pharmaceutical companies in Jordan should provide high-quality Internet coverage in their offices and stores, as well as to invest in Internet of things technologies that allow the company to remotely monitor and control the physical components of the stores, attract employees with knowledge of modern Internet technologies, and provide the necessary training and development for their employees.

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1. Introduction

The Internet of Things (IoT) has recently become a hot topic in a variety of businesses. For businesses, the Internet of Things is more than just a phrase; it's also a developing trend, a tried-and-true strategy, and cutting-edge technology. Companies operating on the Internet of Things are reaching a tipping point, but may also face various challenges related to technical or management aspects (AL-Zyadat et al., 2022; Tang, Huang & Wang, 2018). IoT has been identified as one of the most crucial areas of future technology, with a wide range of companies paying close attention to it. The actual potential of the enterprise IoT may be achieved when connected devices can speak with one another and combine with supplier inventory systems, customer support networks, analytics tools, and business analytics (Lee & Lee, 2015).

The Internet of Things is a developing technology that has the potential to revolutionize businesses, but it also necessitates considerable policy reforms (for example, in terms of data privacy and security) as well as enormous resources (Alwan et al., 2022; Khalayleh & Al-Hawary, 2022; Espinoza et al., 2020). Because electronics must be compatible with objects rather than the other way around, the Internet of Things scenario is forcing a paradigm shift in product design and execution. Electronics are becoming more common in a growing variety of gadgets because of rising Internet of Things applications. Some of these technologies are designed to improve human existence by enhancing production processes, improving health care, and resulting in more efficient energy use, transforming our daily objects into intelligent, collaborative beings (Mezzanotte et al., 2021; Mohammad et al., 2022).

Ding (2013) introduced a new type of intelligent warehouse management system—the IOT-based intelligent warehouse management system—due to the heavy workload and low efficiency, explaining its principles and structure (Yassine, 2014). This system offers a number of advantages over the old manner, and we believe it has a bright future (Ait-Yassine, 2012). Mostafa,

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Hamdy, and Alawady (2019) also used one of Industry 4.0's core pillars, the Internet of Things, to present a novel method to warehouse management. Through real-time data collecting and sharing, this innovative technology allows many things to be connected. The information gathered can subsequently be used to aid automated decision-making. The architecture of this application is described, as well as its potential benefits, and a methodology for implementing this technique in warehouse management is proposed. This approach can assist provide real-time visibility into everything in the warehouse, improving speed and efficiency. This proposal provides an effective route for enterprises to improve their warehouses utilizing the Internet of Things, preventing inventory shortages and counterfeiting. As a result, the goal of this research is to see how the Internet of Things affects inventory management.

2. Theoretical framework and building hypotheses

2.1 Internet of Things

The Internet has developed over time. In the past, the network was limited only to military uses; then it was made available for civilian use, and in a short period, it spread very quickly, serving everyone all over the world. The Internet did not stop at reaching all people, but it continued to evolve to include the use of its applications in all aspects of life, and this is what was called the Internet of Things. The proliferation of geographically distributed devices with built-in identification, sensing, and actuation capabilities is at the heart of the rapidly increasing Internet of Things (IOT), which is used to extend the Internet and the Web to the physical environment. The Internet of Things envisions a future in which physical and digital things can be connected together with the help of suitable communication and information technology to allow a new category of apps and services (Liu & Wang, 2017).

The Internet of Things (IoT), also known as the Smart Manufacturing, according to (Lee & Lee, 2015) is “a new technology paradigm envisioned as a global network of machines and gadgets capable of communicating with one another”. According to Bari et al. (2013) “the Internet of things' information and related to it is to say that the information of the thing flows rationally and orderly on the Internet, in order to share it on a global scale”. Also, according to Dankan et al. (2020), Internet of Things is defined as “the upcoming and newer IoT technologies, the Internet of Things, just about every area, every device, every sensor, and every piece of software connected to each other and those devices that we can access remotely through a Smartphone or through a computer”. Others defined The Internet of Things (IoT) as “a set of physical and virtual things that are connected to each other across a network to communicate and perceive or interact with the micro and macro environment” (Espinoza et al., 2020; Abdel-Basset et al., 2018).

The methodologies used to implement the Internet of Things are utilized to measure the Internet of Things in this study. Wireless Sensor Networks (WSN), Cloud Computing, Radio Frequency Identification (RFID), Middleware, and Internet of Things Application Software are the five core technologies used in the Internet of Things (Lee & Lee, 2015).

Radio Frequency Identification (RFID) is a word that refers to technologies that employ radio waves to identify people or objects automatically. There are numerous techniques of identification, the most popular of which is identifying an object or person with the unique identifier of an RFID tag. RFID systems typically include an RFID device (mark), a card reader with an antenna and transmitter, a host system, or connection with a business system (Roberts, 2006). In Wireless Sensor Networks (WSN), the sensor node senses data from the sensor and collects it into end tags, which send their data to the router, who then transmits it to the coordinator, and the router delivers services. The base station will hold several clients, including data display. The data will be transferred to the cloud (through Ethernet), and the customer will be able to access the base station remotely (website). Such a sensor measures temperature, vibration, pressure, humidity, light, and pollution (Jaladi et al., 2017). Middleware connects disparate computing and communication devices, enabling interoperability across a wide range of applications and services. Middleware is a software layer that sits between applications, operating systems, and network communication layers, allowing for the coordination and facilitation of some aspects of collaborative processing. It's important in both communication and system-level technologies, and middleware should support both as needed (Razzaque et al., 2015). The Internet Service Provider uses Cloud Computing in order to accommodate the greatest number of customers and provide the most flexible service with the least number of resources. Cloud computing is a form of computing in which information technology services are delivered via huge, low-cost processing units connected to Internet Protocol (IP) networks (Qian et al., 2009). Cloud computing is the use of the Internet to deliver computation, storage, services, and applications (Stergiou et al., 2016). The integration of IoT and cloud computing is referred to as the “Cloud of Things” (Aazam et al., 2014). IoT Application Software is a set of computer programs that display data from physical objects (which are captured using specific techniques) via mobile devices to enable the human element to support physical activities by following up on physical objects and controlling them remotely without having to be present.

2.2 Inventory management

In any production system, inventory management is a critical aspect of customer service and cost reductions. Inventory has become a headache as firms become more global, with dozens of parts and hundreds of warehouses, and a lot of effort is spent tracking inventory and assuring right shipments (Paul et al., 2019). Warehouse operations must evolve in response to the rising complexity and diversity of customer orders. Due to highly personalized orders, which tend to be small batch sizes but with a lot of variability because orders vary regularly based on customer requirements, demand for real-time data and contextual information is increasing. It is critical to synchronize purchase orders with manufacturing to guarantee that purchases are completed on schedule. The ineffective and erroneous order selection procedure, on the other hand, has negative consequences for order execution (Lee et al., 2017). A good warehouse management system can help you save money while also enhancing customer satisfaction (Hamdy et al., 2020). Greater rates of inventory management practice, according to Atnafu and Balda (2018), can lead to increased competitive advantage and greater organizational performance. Organizational performance is directly impacted by competitive advantage. Inventory control policies have been recommended (Leung, Chen, Yadav & Gallien, 2016) on a large scale as they are used for drug distribution in sub-Saharan Africa and are directly responsible for a significant portion of the stock outs observed in common situations involving seasonality of demand and interrupted access to facilities. Developing central capabilities in ocean demand forecasting and inventory control is critical, providing inventory management insights (Paam et al., 2019) to apple industry stakeholders who simultaneously contribute to economic and environmental sustainability. Manufacturing companies apply different techniques in managing their inventories. The practices followed have a significant impact on returns, profitability, and sales volume. Manufacturing companies that efficiently implement these practices enjoy excellent financial performance. The results of the study (Lwiki et al., 2013) indicate that there is a positive relationship between inventory management and return on sales, as well as return on equity. It was found (Masudin et al., 2018) that inventory management enhances organizational performance. According to Panigrahi (2013), the inventory conversion period (ICP) has a negative correlation with a company's financial performance; that is, as the ICP days grow, the company's profitability drops, and vice versa.

2.3 Internet of things and inventory management

According to Yerpude and Singhal (2018), the Internet of Things has the ability to transform a warehouse into a SMART warehouse when it is incorporated into warehouse inventory management. The current status of technologies, logistics operations, inventory management system, and other factors were studied, and the technology roadmap was validated by its potential application to warehouse and warehouse management systems that will transform the warehouse into a SMART warehouse, as well as solutions that will support real-time data collection from the warehouse and its consumption in various data models for efficient inventory management. In this article, the researchers also explain how to apply service-oriented architecture to a business IoT application, which connects the three layers of the IoT landscape. The current and future business environments are also discussed, as well as the vital need for an IoT-enabled inventory management system to transform the warehouse into a SMART warehouse. For incoming and departing activities, inventory location suggestions, and issue handling, Zhang et al. (2016) proposed an inventory management system for a warehouse organization that RFID technology is integrated, as well as a self-adaptive distributed decision support approach. Environmental recognition, knowledge integration, and decision-making are the three key components of the approach. Furthermore, the “self-adaptation” feature has been implemented to change the knowledge that is employed in decision-making operations.

Internet of Things (IoT) technology, Radio Frequency Identification (RFID), and Web 2.0 technologies were employed by Mathaba et al. (2017) to improve inventory control (phones). Propose a software architecture that combines the benefits of RFID and Web 2.0 and use the proposed architecture to develop a prototype inventory management software aimed at companies in developing African countries, particularly South Africa, using PDAs, computers, and other devices to transmit data contents over the Internet. He then created an inventory management prototype that could detect misplaced products and low inventory levels, as well as send a message to inventory managers on mobile via Twitter.

Because it keeps specific product information and tells us which storage room the product is in, the Warehouse Inventory Management System is quite valuable. The Warehouse Inventory Management System plays an important aspect in many production and merchandise methodologies. RFID technology uses the Internet to send tag data from the transmitter section to open-source devices via a wireless link. To track products linked to tags with their corresponding product information and timestamps for further verification, a warehouse inventory management system based on IoT architecture has been built. The Raspberry Pi serves as a central server that keeps track of everything. The total system generates an archetype that matches to data and material flows. A Web page is created to give a user-friendly interface for tracking products. When compared to conventional warehouse inventory management systems, the created system produces a highly low-cost and dynamically running system (Tejesh & Neeraja, 2018). Airlines must manage their aircraft spare parts inventory carefully since it has a direct impact on fleets availability and customer satisfaction. Sensors in Iot network can send actual information to the data analytical unit to update the estimate of the lifetime of the parts and send the required notifications to the maintenance department to take the necessary actions, and the Internet of Things (IoT) and big data analytics can help airlines reduce unavailability risks and inventory costs (Keivanpour & Ait Kadi, 2019). Based on the above, the research hypothesis may be as:

H_1: *Internet of Things has an influence on inventory management.*

2.4 Study model

Fig. 1 presents the summary of the proposed study.

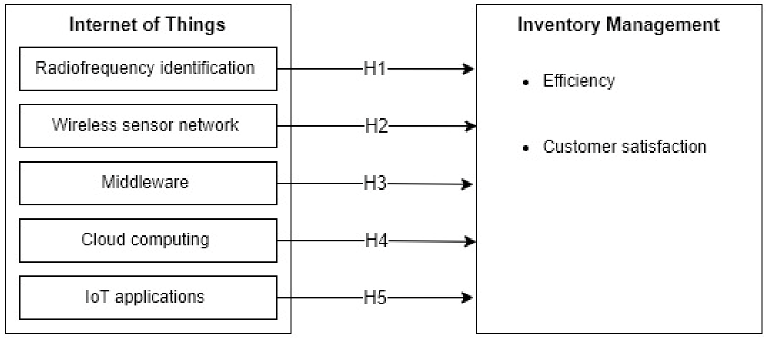

Fig. 1. Research Model

3. Methodology

3.1 Population and data collection

To test the supposed impact of the internet of things on inventory management, two main data collection sources were used. First, secondary sources by reviewing the literature published in scientific books and research papers, Second, the primary sources that were based on the data collected from the study population represented by employees in pharmaceutical companies in Jordan. Accordingly, the study instrument was distributed to an appropriate sample of 620 employees of pharmaceutical companies in Jordan, where the sample size was determined according to Sekaran& Bougie (2016) in unlimited populations. The retrieved questionnaires were 467, while it was found that they include 35 questionnaires with missing data and patterned answers, thus they were excluded from the total retrieved questionnaires. Therefore, the questionnaires used in the analysis were 432, these questionnaires constitute a response rate of 69.67% of the total questionnaires distributed to the study population.

The frequencies and percentages used in analyzing the demographic data of the respondents indicated that most of them were males 73.14% compared to 26.86% of females. The educational level of the sample members indicated that 67.59% of them hold a bachelor's degree, 28.25% hold a postgraduate degree, and 4.16% hold a diploma or less. Moreover, 66.66% of the respondents were within the age group "less than 40 years", which was the majority of the sample, followed by 18.07% of their age within the category "From 40 to less than 50 years", and finally 15.27% of those whose age is within the category "50 years and older".

3.2 Research instrument

Google Forms were utilized in the design of the current search instrument, as the main instrument was a self-report survey sent to the study sample via e-mail. The survey consisted of an introduction and two main sections. The first section was to collect demographic data (gender, educational level, and age), which are ordinal variables. The second section included the paragraphs used in the measurement of the Internet of things and inventory management. Response alternatives were determined by a five-point Likert scale with a lower bound of "strongly disagree" and a higher bound of "strongly agree".

Internet of things was the independent variable whose paragraphs were formulated relying on the study (Lee & Lee, 2015). This variable was a second-order construct containing 15 items distributed into five first-order constructs. Radiofrequency identification was measured by three items. The wireless sensor network was measured through three items. Middleware was measured using three items. Cloud computing was measured by three items. Finally, IoT applications were measured through three items. Inventory management was the dependent variable in the research that its paragraphs were developed according to Hamdy et al. (2020). This variable was a second-order construct containing eight items distributed into two first-order constructs. Efficiency was measured by four items. Customer satisfaction was measured through three items.

4. Research Results

4.1 Measurement model evaluation

The validity and reliability of the measurement model were verified by applying the confirmatory factor analysis (CFA). Table 1 shows the loadings and average variance extracted (AVE) to assess convergent validity. Furthermore, it demonstrates the maximum shared variance (MSV) and the square root of average variance extracted (√AVE) that were used to judge discriminant validity. While McDonald's Omega coefficients were calculated to evaluate the composite reliability (CR) of the measurement model.

Table 1
Results of measurement model evaluation

Constructs	Items	Loadings	AVE	MSV	√AVE	CR
Radiofrequency identification (RFID)	RFID1	0.715	0.576	0.415	0.759	0.802
	RFID2	0.833				
	RFID3	0.724				
Wireless sensor network (WSN)	WSN1	0.846	0.608	0.331	0.780	0.823
	WSN2	0.734				
	WSN3	0.755				
Middleware (MW)	MW1	0.684	0.585	0.402	0.765	0.808
	MW2	0.811				
	MW3	0.794				
Cloud computing (CC)	CC1	0.739	0.542	0.316	0.736	0.780
	CC2	0.702				
	CC3	0.766				
IoT applications (IoTA)	IoTA1	0.785	0.615	0.422	0.784	0.827
	IoTA2	0.803				
	IoTA2	0.764				
Efficiency (EF)	EF1	0.771	0.656	0.501	0.810	0.884
	EF2	0.816				
	EF3	0.809				
	EF4	0.842				
Customer satisfaction (CS)	CS1	0.721	0.625	0.498	0.791	0.869
	CS2	0.782				
	CS3	0.837				
	CS4	0.818				

The results reported in Table 1 indicate that the values of factor loadings on their latent constructs were within the range (0.684-0.846), thus all factors were kept as being above 0.50 the minimum value to maintain factors (Gana & Broc, 2019). The values of AVE were greater than the minimum threshold of 0.50 adopted for this indicator (Alolayyan et al., 2022; Cheah et al., 2018). Accordingly, the measurement model can be considered to have convergent validity. As for the discriminant validity, the results showed that AVE exceeded MSV for all latent constructs, as well as √AVE for each construct skipped the values of the correlation coefficients among the rest of the constructs. Therefore, the measurement model satisfies the two discriminant validity conditions (Franke & Sarstedt, 2019). Besides, the composite reliability of all constructs was greater than the lower limit of 0.70 according to McDonald's omega coefficients (Hayes& Coutts, 2020). Relying on results listed in Table.1, it is found that the measurement model for this research has appropriate validity and reliability and is within the permissible limits.

4.2 Descriptive statistics

Table 2 lists the values of descriptive statistics used in this research to identify the respondents' perspectives on the study variables and to verify that the dimensions of the internet of things were free from the multicollinearity issue.

Table 2
Means, standard division, and correlation

Constructs*	Mean	SD	1	2	3	4	5	6	7
1. Radiofrequency identification	3.48	0.715	1						
2. Wireless sensor network	3.62	0.822	0.415	1					
3. Middleware	3.51	0.834	0.528	0.438	1				
4. Cloud computing	3.66	0.961	0.435	0.482	0.492	1			
5. IoT applications	3.59	0.728	0.446	0.405	0.467	0.458	1		
6. Efficiency	3.71	0.902	0.625	0.514	0.612	0.647	0.584	1	
7. Customer satisfaction	3.75	0.871	0.578	0.559	0.673	0.665	0.671	0.605	1

Note: * All correlation coefficients had a significant level less of 0.05.

The results in Table 2 confirm that all dimensions of the internet of things were of moderate relative importance, where cloud computing (M= 3.66, SD= 0.961) ranked first, while radiofrequency identification (M= 3.48, SD= 0.715) ranked last. Otherwise, the dimensions of inventory management were of high relative importance, where customer satisfaction (M= 3.75, SD= 0.871) got the first rank and efficiency (M= 3.71, SD= 0.902) got the second rank. Furthermore, the correlation coefficients between the internet of things dimensions and inventory management dimensions within the range (0.514-0.673), as well as the values of the Pearson correlation coefficients between the dimensions of the internet of things were within the range (0.405-0.528). Hair et al. (2019) argued that the study data are free from the multicollinearity issue between the dimensions of the independent variable if the correlation coefficients do not exceed 0.80. Hence, the data of the current research was free from the multicollinearity issue.

4.3 Structural model evaluation

Structural equation modeling (SEM) was used to test the impact of the internet of things dimensions on inventory management. Fig. 2 illustrates the structural model used in the current research.

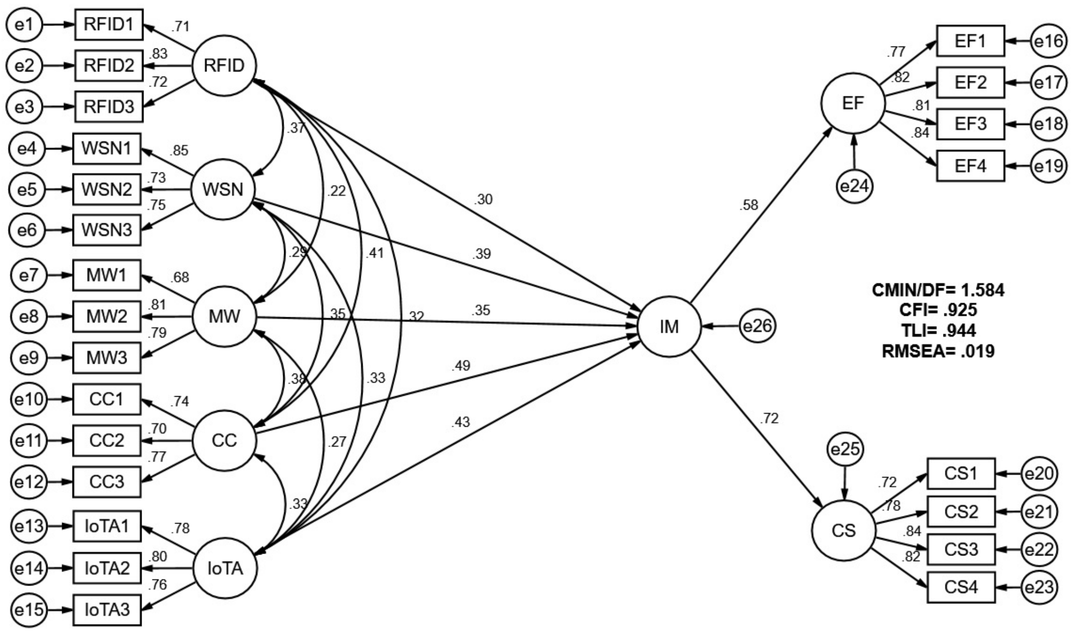

Fig. 2. SEM to test the impact of internet of thing on inventory management

It is evident from Fig. 2 that the ratio of chi-squared to the degrees of freedom (CMIN/DF) was 1.584, which is less than the maximum permissible limit of 3. The values of the comparative fit index (CFI) and the Tucker-Lewis index (TLI) were above the 0.90 minimum threshold for these indicators. For root mean square error of approximation (RMSEA), its value was 0.019 which is lower than the upper limit of 0.08 for this indicator. Therefore, the structural model was characterized by construct validity (Xia& Yang, 2019). Accordingly, the results of standardized and unstandardized coefficients listed in Table.3 can be relied on to test the impact of the internet of things dimensions on inventory management.

Table 3
Standardized and unstandardized path coefficients

Constructs	B	SE	β	t-value	p-value
Radiofrequency identification→ Inventory Management	0.477	0.041	0.303	11.634*	0.02
Wireless sensor network→Inventory Management	0.543	0.044	0.386	12.341**	0.005
Middleware→Inventory Management	0.505	0.042	0.353	12.024**	0.008
Cloud computing→Inventory Management	0.622	0.044	0.487	14.136***	0.000
IoT applications→Inventory Management	0.597	0.045	0.432	13.266***	0.000
Note: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.					

The results presented in Table.3 indicated that all dimensions of the internet of things had an impact on inventory management. The greatest impact was for cloud computing (β= 0.487, t= 14.136, p= 0.000), followed by IoT applications (β= 0.432, t= 13.266, p= 0.000) in the second rank, wireless sensor network (β= 0.386, t= 13.341, p= 0.005) in the third, then middleware (β= 0.353, t= 12.024, p= 0.008) in the fourth, and the fifth rank was for radiofrequency identification (β= 0.303, t= 11.634, p= 0.02), which had the least impact on inventory management.

5. Conclusion and Discussion

Based on the results of the study, it was found that there is an adoption of the Internet of things in pharmaceutical companies in Jordan due to their possession of advanced and diverse technologies that provide links to their devices, machines, and elements available to them on the Internet, and they seek to attract modern IoT technologies on an ongoing basis, as they write down their information via the Internet, and use the Internet to reduce the time it waits for its customers, invest in online connectivity tools to reduce costs, seek to achieve efficiency through Internet-based means of communication, and employ the Internet at various stages of the product lifecycle. In addition, it adopts inventory management due to the fact that it has large-sized stores as a result of its interaction with a large-sized community, and it also employs qualified people to work on inventory effectively and tries to provide data and information related to inventory in the shortest possible time. It seeks to meet the increasing demands of customers in a short period of time, which in turn leads to improved customer satisfaction, and also contributes to reducing the cost resulting from poor inventory management and it seeks to enhance competitive advantage and improve organizational performance through the application of high levels of inventory management practices. The study concluded that there is an influence of the Internet of Things with its techniques on inventory management, due to the Internet has developed significantly and rapidly from a network to connect the electronic world to a much wider network, and it includes even the physical elements that exist in the physical world. Companies are also helped in managing stores through the Internet using various Internet of Things technologies. Radio Frequency Identification (RFID) technology automatically identifies things using radio waves, through an RFID device (tag) that is linked to the thing where it contains It contains all the information related to it, and the tag reader, which reads the tag attached to the thing and sends it through the Internet to the host system, the enterprise system, or the Internet of Things application programs. The tasks in the stores and the company as a whole also contribute to the speed of providing service to customers and maintaining customer satisfaction. The Wireless Sensor Networks (WSN) technology, which is linked to devices and machines, senses data and information about the machine through the sensor node, then the end tags collect them and send them to the router, which in turn sends them to the coordinator, who in turn provides the employees with this data, and they vary. This data, such as temperature, vibration, pressure, humidity, light, pollution, etc., makes the employee aware of all the conditions in the store and gives him the ability to be aware of the possibility of a specific malfunction, giving him the opportunity to fix it before it gets worse. Middleware facilitates and coordinates some aspects of collaborative processing between the technologies used in the warehouse, which ensures that there is no conflict in the systems used within the warehouse, and this ensures the continuity of the work of the store without any problems that may cause a sudden stop. Cloud Computing provides services, applications, and huge data storage spaces on the Internet and allows the employee to access them at anytime and anywhere, which maintains the detailed product information, tells us about the storage room in which the product is located, and contributes to managing the stores and facilitating his affairs in the shortest possible period and at a low cost. Employees can utilize IoT Application Software to support physical tasks in warehouses, such as following up on and controlling physical objects without having to be there. This study supports the findings of a previous study (Yerpude & Singhal, 2018), which highlighted the Internet of Things' potential when integrated into warehouse inventory management and the transformation of a warehouse into a SMART warehouse. In addition, a study (Zhang, Alharbe, & Atkins, 2016) presented an inventory control system for a warehouse organization that included RFID system and a self-adaptive distributed decision - making support model for incoming and outgoing operations, inventory location suggestions, and incident management, as well as a study (Mathaba, Adigun, Oladosu & Oki, 2017) that Uses Internet of Things (IoT) technology and Web 2.0 tools as a synergy to enhance inventory control, proposes a software architecture that combines the advantages of RFID and Web 2.0, uses the proposed architecture to develop a prototype inventory management software, then develops the inventory management prototype and detects misplaced products and low stock levels, send a notification on Twitter to update inventory managers on mobile. The study (Tejesh & Neeraja, 2018) created an IoT-based warehouse inventory management system to track products linked to tags with product information and timestamps for subsequent verification. In comparison to conventional warehouse inventory management systems, the created system produces a low-cost, dynamically running system. According to the study (Keivanpour & Ait Kadi, 2019), the Internet of Things and big data analytics can reduce the risks of unavailability and inventory costs for airlines, and sensors can be used in IoT systems to send actual information to the data analytical unit to update the estimate of the life span of the components and submit the required notifications to the maintenance department to take the necessary actions.

6. Recommendations, study limitations and future research directions

The study concluded that there is an impact of the Internet of Things on inventory management. According to the findings, pharmaceutical companies in Jordan should provide high-quality Internet coverage in their offices and stores, as well as invest in Internet of things technologies that allow the company to remotely monitor and control the physical components of the stores, attract employees with knowledge of modern Internet technologies, and provide the necessary training and development for their employees. Keep pace with the developments of the times and to provide them with the necessary knowledge to constantly use advanced Internet technologies and to exploit the capabilities offered by Internet of Things systems in the best way.

The study dealt with the impact of the Internet of things on inventory management, and it is possible for another study to address the impact of the Internet of things on risk management, logistics, or the performance of the organization. Another study can deal with an intermediary variable such as the amount of capital invested in the company's development or the quality of the materials used. The study also measured the Internet of Things with its technologies, another study to address the same title with other technologies represented by social media, cloud manufacturing, and other technologies related to the Internet. Because the study focused on pharmaceutical companies in Jordan as a community of study, another study may focus on the health sector, educational sector, banking sector, or other Jordanian governmental sectors.

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