Case Study

INTERNET OF THINGS IN INDUSTRY 4.0 – A CASE OF GERMANY

Keywords: *Internet of Things, Interconnectivity, Industry 4.0, Wire manufacturing, Delivery and stock monitoring.*

Background to Case Study

The Internet of Things (IoT) has become an important part of our daily lives. It surrounds us wherever we go: connected cars, home automation, smart office sensors and fitness trackers. But the world was not always like that. There have been visions of machines communicating with one another since the early 1800s. Machines have been providing direct communications since the telegraph (the first landline) was developed in the 1830s and 1840s. However, until 1999, the term "Internet of Things" did not even exist.

The first connected device was a Coca-Cola vending machine that used an early form of the Internet to see if the cooler kept drinks cool enough and if coke cans were available. This invention was a decisive factor for the development of interconnected machines all over the world. A decade later interconnectivity started to rise tremendously.

In 1990, John Romkey was the first to connect a toaster to the internet using a TCP / IP protocol. In 1991, at the University of Cambridge, scientists came up with the idea of using the first prototype webcam to track the amount of coffee available in their lab's coffee pot. 1999 was easily one of the most important years in the history of the IoT, as Kevin Ashton coined the term "Internet of Things". In 2000, LG Electronics introduced an Internet-connected refrigerator, which allowed its users to shop online and make video calls. All these important developments fostered the evolution of the IoT. (Khvoynitskaya, 2019)

Introduction to the Case Study and it's growth within Industry 4.0

IoT-enabled management systems can be extremely beneficial for small business owners. With many small and medium-sized enterprises (SMEs) struggling to stay afloat, those who have integrated advanced IoT systems into their day-to-day operations have seen great benefits.

The Internet of Things will play a key role in the development of Industry 4.0 with its ability to connect physical devices to digital platforms creating a more conducive environment for manufacturing and management.

IoT systems consist of a set of sensors and "smart" devices that, in a sense, communicate with each other via the cloud. The sensors and devices detect changes in the state of their environment or collect the requested data from their designated target for the software to process and then decide on an automated response, such as issuing a notification to responsible parties.

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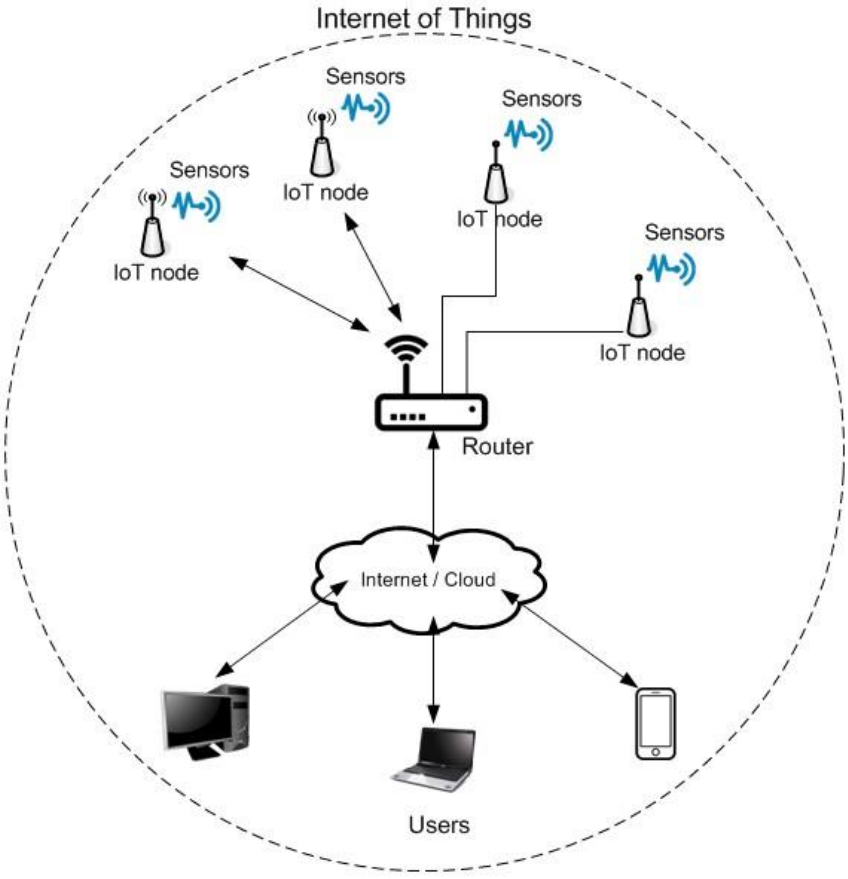
In short, IoT is about gathering information and using accumulative data to improve existing business practices and promote communication between devices. (Saribardak, 2020).

This connectivity of devices (smartphones and automobiles) is crucial for the mobility sector, which is one of the main problems of large cities. The application of Internet of Things and Big Data to the world of carsharing *offers us a way to improve urban traffic. Together with the massive data processing, connectivity allows users to be in contact with companies and calculate the most efficient routes to minimize the travel time.*

The Case Study and Industry 4.0 Elements: A Pictorial Overview

In the following graph we can see the monitoring and control system model of IoT. IoT devices are pieces of hardware, such as actuators, gadgets, appliances, sensors, or machines, that are programmed for certain applications and can transmit data over the internet or other networks. IoT devices connect to the network through the router and have the ability to send data to the remote server over the Internet or to the Cloud services. Sensor data collected by IoT devices is stored in the Cloud database in order to be available to users. This information is accessed by users from any location using desktops, tablets, or smartphones.



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IoT Technology has led to a disruptive evolution of the rent a car model towards carsharing. The concept refers to the loan or temporary use of vehicles made available to users in exchange for a specific tariff, generally for short periods of time and in limited geographical areas.

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The Element Explored within Industry 4.0 Application.	*Schwering & Hasse Elektrodraht, also known as SHWIRE or S&H, is an industry situated in Luegde, Germany that manufactures wires of coated copper and aluminium, which are used in a variety of industrial fields (Schwering & Hasse Electrical Wire, 2013).* *The company started to utilize IoT, using the Software AG's streaming analytics platform for this purpose, in order to produce 32 million miles of copper wire, which high quality is checked in terms of temperature, conductivity, tension, and thickness for each different wire type and can be precisely monitored and controlled in real time. Consequently, the analysis of the gathered data is conducted also in real-time and filed in case of a need for performance check or warranty.* *Schwering & Hasse's production numbers are rather high, as the company operates all-day long and has 400 production lines. It manages to apply 20 different digital sensor types to monitor 50,000 production events per second that are delivered to 20,000 delivery pallet slots that are fully automated. Therefore, the company's IoT services regard storing and delivery, along with an eService and revenue generator that allows S&H to make demand projections and to monitor onsite stock on behalf of its customers. Thus, it saves up to 40% of the delivery process costs.*

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	As Dirk Jäger, CIO at Schwering & Hasse, states: "We have the ability to manage quality consistently as we juggle multiple changing specifications and customer requirements". Consequently, IoT use renders S&H a fully digitalized SME, ready to address any future challenge (Sigg, 2019).
Application Target Audience	*The results of the case-study are intended for use by SMEs, Enterprises and Entrepreneurs.*
Resources Used:	*- "The history and future of the internet of things", by S. Khvoynitskaya. (2019) Available here.* *- "How IoT Reshapes Industry 4.0 and the Effects of IoT on SMEs", by E. Saribardak. (2020) Available here.* *-"Application of IoT in monitoring and controlling agricultural production." By Markovic, D., Koprivica, R., Pesovic, U., & Randic, S (2015). Available here.* *-"A Brief History Of the Internet of Things", by Keith D.Foote (2016). Available here.* *- "Schwering & Hasse Electrical Wire", (2013). Available here.* *- "Germany Turns Manufacturing into an IoT Art Form", by S. Sigg (2019). Available here.*
Further Reading:	*- "Guide to IoT Innovation (SME focus)", by IoT Analytics Available here.*

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