The Industrial Internet of Things as one of the main drivers of Industry 4.0

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Abstract. The Industrial Internet of Things (IIoT) is one of the most important technologies offered by the fourth industrial revolution. This phenomenon is a promising technology which is able to transform industrial segments in a major way. Therefore, this paper is focused on this aspect of the fourth industrial revolution and attempts to explain what it is and how it is used by companies. The paper also explains how the IIoT is different from the Internet of Things as these two areas have a lot in common but there are also some major differences. Furthermore, it is explained in this paper what kind of challenges this technology has to face in the process of its development and integration. For example, such challenging aspects of this technology as scalability and security are discussed.

1. Introduction
The widespread use of the latest technologies has led to a lot of opportunities for the improvement of our day-to-day lives. Various devices that are based on wireless connectivity are becoming more and more commonplace in our homes. Nowadays, on average, people’s homes are equipped with at least one device which is wirelessly connected. The term Internet of Things (IoT) was coined to describe these interrelated computing gadgets. This, in turn, has led to another closely related phenomenon known as the industrial IoT.

The IIoT is an IoT extension which is used by industrial sectors. It is concentrated on artificial intelligence, big data and machine-to-machine interaction. Industrial applications and medical devices are great examples of the technologies that the IIoT is comprised of.

The purpose of IIoT is to change industries by means of interrelated computing appliances and sensors. This makes it possible to incorporate predictive analytics and AI into manufacturing.

Manufacturing is going through unparalleled disruption due to the development of this technology. The industry has been going through some difficult challenges lately but its future does not look so bleak thanks to the IIoT. Old-fashioned, linear manufacturing can be changed into a system that is dynamic and interrelated. This system is referred to as a digital supply network (DSN). As the main facilitator of DNSs, the IIoT might be able to revolutionize the creation and distribution of products by making factories more effective, providing a safer working environment for human workers and cutting costs significantly.

The IIoT is vital when it comes to the fourth industrial revolution (Industry 4.0), that is, it plays an important role in the transformation of manufacturing processes and cyber-physical systems. Sensors that provide real-time data and other data sources are of great value for industrial infrastructures and...
tools because they make the decision-making process faster and more efficient. It was not possible to automate the workflow in the past the way it is possible now with this current industrial revolution. Figure 1 shows what the infrastructure of the IIoT looks like.

**Figure 1.** The infrastructure of the IIoT.

1.1. *Difference between the IoT and the IIoT*
There are many technologies the IoT and the IIoT have in common. These technologies include data analytics, cloud technologies, sensors and machine-to-machine interactions but the IoT and the IIoT have different uses for these technologies.

The purpose of IoT applications is to make devices interact with one another in many different areas of our lives such as healthcare, enterprise, cities, government, etc. Such devices as fitness bands and smart appliances are great examples of IoT applications. These applications usually do not run the risk of emergency if something goes wrong with them.

The purpose of the IIoT, however, is the interaction of devices and machines in such industrial sectors as manufacturing, gas and oil, and utilities. In the case of IIoT applications, the stakes are very high if something goes wrong. A failure in an IIoT application can potentially lead to life-threatening situations. While IoT applications are all about making the life of its users more comfortable, IIoT applications revolve around making any industrial operations more efficient while ensuring the health and safety of the people involved.

2. *Prediction capabilities*
The main advantage of the IIoT is that it makes manufacturing operations more efficient. For instance, if some piece of equipment is suddenly out of order, the sensors are able to locate where exactly this issue has occurred and automatically send a service request. Most importantly, however, thanks to its capabilities to carry out predictive analysis, the IIoT is able to tell when the equipment will likely have
an issue before it takes place. This allows performing predictive maintenance that leads to less downtime and a lot quicker troubleshooting which, in turn, results in the improvement of safety.

In order to find out whether the equipment is in order or not, the sensors analyse the temperature, sound frequencies and vibrations of that equipment. This procedure consumes a lot of time and effort when carried out manually by human workers. The sensors make predictive analysis much easier by collecting and analysing data in the cloud.

It is important to point out that other than cutting costs and saving time, the IIoT also ensures the safety of workers. For example, if there is an oil well the pressure of which is about to reach a dangerous level, the workers will be notified before an explosion takes place thanks to the prediction capabilities of the IIoT. The sensors provided by the IIoT can also be used for tracking the location of workers so that they are able to evacuate easily if there is an emergency.

3. Challenges
The IIoT is a technology that can change industries in many ways and hopefully for the better. However, it is important to keep in mind that any technology that is introduced usually have serious challenges to overcome. Security and connectivity are some of the most difficult challenges for the IIoT and it is of paramount importance to have strategies to maintain these two areas in the process of developing the IIoT.

Companies that are involved in the development of the IIoT are expected to be familiar with the safety and quality issues associated with this technology. Nevertheless, due to the fact that operational technologies (OT) are being incorporated into the Internet and more automated and intelligent machines are being introduced, there are going to be many challenges that are unprecedented. Thus, it is crucial to gain an extensive understanding of the IIoT.

When implementing the IIoT, it is important to make sure that it is scalable, secure and available. The scalability and availability of industrial processes may not be such a big issue because they might have been in use for a long time. On the other hand, security will most likely be the most challenging of the three in the process of incorporating the IIoT into industrial operations. One major issue associated with security is that legacy systems are still very much in use by manufacturing companies. Many of these legacy systems have been in use for decades without being altered and this makes it even more difficult to introduce new technologies.

In addition, the widespread use of smart devices has led to an increase in security breaches. Companies, which are adopting IIoT technologies, are responsible for making the setup secure but at the same time, the manufacturers of these technologies are obligated to ensure the protection of their customers when they create and distribute a product.

Cybersecurity is becoming increasingly important because security threats never go away, particularly, when it comes to connected systems. If a connected system is hacked, the business is exposed to a serious security breach and it is often forced to shut down its operations. In many ways, companies in industrial sectors that are incorporating the IIoT have to act like IT companies to sort out physical and digital aspects of their business in a secure fashion. This unit will be able to prioritize threats and give businesses the opportunity to securely handle their OT and IT.

3.1. Dealing with security issues
While it is important to strive for a better performance in industrial processes, security issues must always be a top priority. Combining operational technologies with the Internet can make industries more efficient but if there are no proper security strategies in place, any advantages of the IIoT will be undermined.

One major step towards improving the security of operations may be establishing a security operations centre (SOC) the purpose of which is to actively watch for and protect from various kinds of security threats. This unit allows responding quickly to incoming security threats and taking the necessary preventative measures. This technique is particularly valuable when it comes to slow response time, low system visibility and legacy systems.
In addition, when industries are dealing with this type of technological shift, they have to be prepared for security risks which will be unprecedented. This is why it is crucial to have a dedicated team that specifically deals with these issues.

4. Conclusion
In conclusion, the Internet of Things has had a significant effect on many aspects of our lives and it will most like have even more influence in the future. It will be increasingly important in such areas of our lives as healthcare, traffic management, entertainment and many more. It is believed that the Industrial Internet of things will have the same impact on industrial sectors.

Even companies that are already successful can significantly improve their performance by integrating the IIoT into their operations. Provided that the barriers that exist at present are overcome, industries and society can greatly benefit from the development of this technology. Many experts in this area believe that the IIoT will certainly increase production levels as time goes and the IIoT reaches its full potential.

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