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The Internet of Things and Its Impact on The Productivity And Economic Growth of The Manufacturing Industry

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KEYWORDS

Internet of Things; Productivity; Economy.

ABSTRACT

At a practical level, IoT is a network in which all physical objects connect to the internet via network devices or routers and transfer data. IoT allows objects to be controlled remotely through the existing network infrastructure. The existence of IoT is considered to make it easier for humans to do their work. One of the factors affected by IoT is productivity. Productivity referred to here is work productivity, and its impact on increasing sales, which is related to the economic growth of the manufacturing industry. The influence of IoT, whether we like it or not, will impact all sectors of life. The Internet of Things is slowly turning from a vision to a reality. The IoT platform plays a central role in evolution by providing many architectural blocks. IoT also has the potential to increase the availability of information and is likely to transform companies and organizations in almost every industry in the world. Thus, in the future, economic developments will be able to be monitored and predicted based on an IoT platform that is tailored to the needs of each industry, as well as the goals of the company.

1. Introduction

Indonesia's vision in 2045 is to become a golden Indonesia so that Indonesia will carry out a modern economy with a quality level of welfare. Quality human resources will be the key to achieving this Indonesian vision, and therefore there will be significant changes in the need for employment and human resource management. So that in the current era of globalization, companies are expected to be able to achieve quality human resources, both in terms of managerial competence, socio-cultural, technical, and training management in organizational development.(Global, 2015) At this time more and more things are connected to the internet this situation is known as the Internet of Things / IoT. IoT does not yet reach every region, especially remote areas far from the internet, which is why most poor countries are not familiar with IoT. But thanks to the rapid development of IoT technology, shortly, IoT will become very common and commonly used in the future. Because currently there are many requests for Internet application development which are very high and IoT is the main technology used to be able to make these various applications. IoT is a network where all physical objects are connected to the

internet through network devices or routers and transfer data. IoT allows objects to be controlled remotely through the existing network infrastructure. IoT is a very smart technique, good, and can reduce human energy and provide easy access to physical devices. IoT also has features that can be controlled by any device without human interaction (Nahdi & Dhika, 2021).

The Internet has long been known as a communication interaction technology between people and personal computers. However, over time, internet communication has turned into interaction between people, the environment, and objects(Bagheri & Movahed, 2016). The internet is growing with connectivity on a device. This is associated with technological developments using Radio Frequency Identification (RFID), and sensors called the Internet of Things (IoT). In this case, the Internet of Things (IoT) is a development in the technological revolution in the industrial sector (Mattern & Floerkemeier, 2010). The existence of IoT can make a major contribution to development such as smart cities, smart environments, smart governance, smart branding, smart living, and smart education. The use of IoT can be built on complex architectures, and various devices, which are integrated into communication systems(Zanella, Bui, Castellani, Vangelista, & Zorzi, 2014).

The fourth-generation industrial era has entered Indonesia. This new chapter synergizes physical, digital, and biological aspects, such as the utilization of artificial intelligence (artificial intelligence), robotics, and the ability of computers to learn from data (machine learning), in manufacturing. It includes the use of large-scale data (big data), engineering data storage in the cloud (cloud computing), as well as Internet connectivity (Internet of things). The Indonesian government launched a road map and strategy towards the fourth industrial revolution era on April 4 2018 on the sidelines of the 2018 Indonesia Industrial Summit(Adha, 2020).

The concept of productivity can be seen from two dimensions, namely the individual dimension and the organizational dimension. The study of productivity problems from the individual dimension looks at productivity, especially concerning individual personality characteristics. In this context, the essence of the notion of productivity is a mental attitude that always has the view that the quality of life today must be better than yesterday, and tomorrow must be better than today.(Arrohman & Andriani, 2022)

According to the formulation of the National Productivity Board (Sedarmayanti, 2009), work productivity is a mental attitude (attitude of mind) that has the enthusiasm to make improvements. As described by Sutrisno (2012) that mental attitude is making improvements to what already exists. A belief that an employee can do a better job today than yesterday and tomorrow better than today. [8]

Work productivity must be a concern of management as the leader of the organization because high or low work productivity can affect the achievement of overall school organizational goals. Leaders must continue to increase productivity that can be in line with the use of technology, especially the existence of IoT so that they can move in tune with increasing work productivity of employees in the manufacturing industry. Previous studies reported that work productivity can increase between 35-40% through the influence or encouragement of university leaders, and around 60-65% is determined by personal abilities supported by technological devices. [8]

To identify work productivity can be seen from the following aspects: [9]

a. The quantity of work, is a result achieved by employees in a certain amount by comparison with existing or established standards by the company.
b. Quality of work, is a result standard related to the quality of a product produced by employees in this case is an employee's ability to complete work technically with a comparison of the standards set by the company.
c. Timeliness, the level of an activity completed at the beginning of the specified time, seen from the point of coordination with the output results and maximizing the time available

for other activities. Timeliness is measured from the employee's perception of an activity provided at the beginning of time until it becomes output.

In the era of the industrial revolution 4.0, there has been a big change in the industrial sector. This is because in this digital era production can be increased due to public demand and supply due to technological developments. Apart from the production process, the industrial revolution also had an impact on the entire industrial value chain. This ultimately has an impact on changing digital-based business models to obtain good quality products effectively and efficiently(Amalia, 2019).

The results of previous research suggest that previous theoretical studies have shown that internet use can increase economic growth by accelerating the development and adoption of innovation processes and thereby encouraging competition that results in the development of new products, processes, and business models. In addition, the results of this study stated that they were by most of the previous empirical studies which showed a positive and significant effect of the Internet on economic growth in developing countries(Bahrini & Qaffas, 2019).

Based on the research background, the formulation of the problem that must be answered in this study is to test whether the Internet of Things Has a Significant Influence on the Productivity and Economic Growth of the Manufacturing Industry?

Literature Review

According to the formulation of the National Productivity Board (Sedarmayanti, 2009), work productivity is a mental attitude (attitude of mind) that has the enthusiasm to make improvements. As explained by Sutrisno that mental attitude is to make improvements to what already exists. A belief that an employee can do a better job today than yesterday and tomorrow better than today. (Azara, 2020)

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Muchdarsyah[14] also suggests two sets of conditions for high individual productivity:

1) First group
    a) Level of education and expertise;
    b) Types of technology and production results;
    c) Working conditions;
    d) Health, physical and mental abilities;
2) Second group
    a) Mental attitude (to the task), colleagues, and supervisors;
    b) Variety of tasks;
    c) Incentive system (wages and bonuses system);
    d) Job satisfaction;

Meanwhile, in terms of the organizational dimension, the concept of productivity as a whole is another dimension than efforts to achieve the quality and quantity of an activation process related to the discussion of economics. Therefore, it is always oriented to how to think and act to utilize input sources to get optimum output. Thus the concept of productivity in this view is always placed in the framework of technical relations between inputs and outputs.[7]

From the various opinions of the experts above, it can be concluded that work productivity is the orientation of thinking and mental attitude on how to make today better than yesterday or the utilization of resources to get optimum output (target achievement).

The Internet of Things or IoT is a concept/idea whose goal is to expand the benefits of internet

network connectivity that is fully connected and can be connected to devices, machines, and other physical objects by using networks, sensors, and actuators to acquire data and manage it so that machines can collaborate and act according to the new information they get independently.

The Internet of Things or IoT is an idea where objects in the real world can communicate with one another as an integrated system that uses the internet as a connecting medium. For example, on CCTV installed along the road, the technology is connected to the internet network and then reunited in the control room, which can be very far away. or a smart home / smart home can be controlled via a smartphone with the help of an internet network. IoT consists of various sensors as data collection media, internet networks as connecting media, and servers as devices that collect information results obtained from sensors that will be used for analysis.[2]

2. Materials and Methods

In fulfilling the objectives of the research, namely, to test whether the Internet of Things Has a Significant Influence on the Productivity and Economic Growth of the Manufacturing Industry, this research is included in the type of explanatory research. The technique of collecting data and information itself is in the form of field research (Field Research). The data obtained will be analyzed using the SPSS 21 application.

Suharyadi and Purwanto [15] stated that the population is a collection of all possible people, objects, and other sizes that are objects of concern or a collection of all objects of concern. In this study, the focus was on the number of 42 respondents in the Manufacturing Industry Employees.

The sample is part of the population or part of the number and characteristics of the population. (Sugiyono, 2018) stated that the sample is part of the number and characteristics possessed by the population. To determine the number of samples, the authors use the Solving formula in (Umar, 2013), namely determining the number of samples needed for a population as follows:

n = N
1+N e 2
Information :
n = number of sample members
N = number of members of the population
e = percentage error rate of the sampling
acceptable, in this study determined 5% (0.05)
So with a known number of population (respondents), then:
n = 42
1 + 42 (5%) 2
n = 42
1.105
n = 38.00 sample/person.
The hypothesis in this study is as follows:
H_0 : It is suspected that the Internet of Things Has a Significant Influence on Productivity.
H_a : Allegedly Internet of Things Has No Significant Effect on Productivity.
H_0 : It is suspected that the Internet of Things Has a Significant Influence on the Economic Growth of the Manufacturing Industry.
Ha : It is suspected that the Internet of Things has no significant effect on the economic growth of the manufacturing industry.

3. Results and Discussions

1. Description of the object of study

Candisari Village is one of the villages located in Candisari District, Ungaran Regency. Most of the population make a living as farmers, factory workers and carry out entrepreneurial activities. The location of Candisari village is under the slopes of Mount Ungaran which makes its location very strategic as a tourist area, so many surrounding communities take advantage of the layout of the village as culinary tourism.

Human resource management has developed far from the previous era, carrying out more administrative functions to become more strategic. One of the strategic functions of human resources in an organization is to prepare human resources within an organization that has the capability and potential to support the achievement of current and future organizational strategies. The implementation of this strategic function can be supported and developed using IoT.

Validity Test.

The purpose of this test is to find out whether the measurement tools that have been compiled have validity or not. Operational validity or not. Operationally validity can be defined as whether the questionnaire reveals the level of validity of the population and research.

Validity test decision-making:

- If the value of r count > r table, then the question item is valid.
- If the value of r count > r table, then the question item is invalid (fails).

Table 2. Validity Test

No	Variable and Item	R Table	R Count	Information
	Internet of Things			
	X1.1	0,2404	0,689	Valid
	X1.2	0,2404	0,849	Valid
	X1.3	0,2404	0,860	Valid
	X1.4	0,2404	0,681	Valid
	X1.5	0,2404	0,689	Valid
	X1.6	0,2404	0,704	Valid
	X1.7	0,2404	0,773	Valid
	X1.8	0,2404	0,695	Valid
	Work productivity			
	Y1.1	0,2404	1,000	Valid
	Y1.2	0,2404	0,827	Valid
	Y1.3	0,2404	0,737	Valid
	Y 1.4	0,2404	0,310	Valid
	Y 1.5	0,2404	0,487	Valid
	Manufacturing Economic Growth	0,2404	0,310	Valid
	Y2.1	0,2404	0,400	Valid
	Y2.2	0,2404	0,310	Valid
	Y2.3	0,2404	0,270	Valid
	Y 2.4	0,2404	0,762	Valid
	Y 2.5	0,2404	0,915	Valid

The results of the validity test for all variables in this study indicate that the value of r count > r table is 0.2404. This shows that the questions on all the research variables are valid.

Reliability Test.

This test is conducted to determine the extent to which a variable or construct is said to be reliable (fit) to be used for research.(Ghozali, 2018) The result is an index that shows how far a measuring device can be trusted or relied on. Reliability test decision-making:

- If a variable has a reliability value (Cronbach's Alpha) > 0.6 it is said to be reliable
- If a variable has a reliability value (Cronbach's Alpha) > 0.6 it is said to be unreliable.

Table 2. Validity Test

No	Variable	Cronbach alpha	Information
1	Internet of Things	0,858	Reliable
2	Work productivity	0,793	Reliable
3	Manufacturing Economic Growth	0,814	Reliable

The variables in this study based on the reliability test showed a Cronbach alpha value above 0.60 so it could be concluded that everything was reliable.

Hypothesis Test.

Table 3. Hypothesis Test

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std Error	Beta	T	Sig.
Internet of Things --> Productivities	0.357	0.304	0.261	4.351	.013
Internet of Things --> Manufacturing Economic Growth	0.248	0.220	0.316	5.100	.000

1. Hypothesis Testing 1.

The results of testing the effect of the Internet of Things on Work Productivity obtained a significance value of 0.013 <0.05, so it was obtained that Hypothesis 1 was accepted. This means that the Internet of Things has a significant effect on the level of work productivity.

In building an effective management process, it is important not only to have all the relevant components but also to ensure that these activities are integrated with the Internet of Things provided by the HR unit. If not, then the company will face the risk of many projects or work programs that have the potential to become stalled or stagnant and are not by the goals and productivity work targets that are implemented. To be effective, management needs work application programs that are integrated with the Internet of Things, in this case, the human resource management process is a talent management framework so that work productivity can be maximized.

Based on the extensive review of the literature presented, we found a positive impact of IoT on productivity, which however was relatively small at an early stage of development. Other studies also present projections about the impact of IoT under several scenarios and conclude that this research approach can serve as a starting point for assessing the impact of other new technologies on work productivity.(Beck, Mahdad, Beukel, & Poetz, 2019)

2. Hypothesis Testing 2.

The results of testing the effect of the Internet of Things on the Economic Growth of the

Manufacturing Industry obtained a significance value of 0.000 <0.05, it was obtained that Hypothesis 2 was accepted. This means that the Internet of Things has a significant effect on the economic growth rate of the Manufacturing Industry.

Since IoT is a relatively new phenomenon, researchers are mostly trying to evaluate how they expect the value of IoT to develop shortly.(Espinoza, Kling, McGroarty, O'MAHONY, & Ziouvelou, 2020) The financial impact of IoT on the global economy may be as much as $3.9 to $11.1 trillion by 2025, the largest of which will be felt in the manufacturing and healthcare industries.[21] Additionally, it is also estimated that the economic impact by examining Apps that are currently in existence, are developing, or are likely to have significant adoption by 2025, in nine different settings. They measure both the direct financial impact, such as potential savings from increased machine utilization, and non-financial factors.(McKinsey Global Institute, 2015)

4. Conclusion

Based on the results, hypothesis testing, and discussion, it can be concluded that there is a significant relationship between the influence of the Internet of Things on Work Productivity and Economic Growth in the Manufacturing Industry. Programs to increase Work Productivity can have good quality if you pay attention to an effective approach to motivating employees through the innovative application of the Internet of Things because motivation has several objectives including encouraging employee passion and enthusiasm, increasing employee morale and job satisfaction, as well as able to increase work productivity. Since IoT is a relatively new phenomenon, researchers are mostly trying to evaluate how they expect the value of IoT to develop soon. The financial impact of IoT on the global economy may be as much as $3.9 to $11.1 trillion by 2025, the largest of which will be felt in the manufacturing and healthcare industries. In addition, it is also estimated that the economic impact of examining existing applications is developing, or tends to have significant adoption in 2025, and has direct financial impacts, such as potential savings from increased machine utilization, and non-financial factors.

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