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# SYSTEMATIC LITERATURE REVIEW OF INDUSTRY 4.0 IMPLEMENTATION OF PRODUCTIVITY

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**ABSTRACT**

Industrial Technology 4.0 is designed to provide many conveniences from a transactional persepective, to be able to increase work productivity. This disruptive digital-based technology is crushing old methods and replacing them with new ones. However, the presence of this era of disruption is both an opportunity and a challenge for people's lives. This research aims to provide information about the role of using Industry 4.0. in increasing productivity, as a transformation effort towards improvement and creating opportunities to support business development. This study uses the Systematic Literature Review (SLR) method for journal papers published from 2016-2021. Data collection techniques with the methode of observation, interviews, and documentation. This study's results conclude that the industrial sector's most widely implemented Industri 4.0 innovation y is Artificial Intelligence (AI). This innovation is able to increase productivity, especially in the factors of improving production processes and improving customer service.

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## 1. INTRODUCTION

The word Industrial Revolution 4.0 is currently starting to be talked about a lot. The mention of the Industrial Revolution 4.0 or also known as *four point zero* (FPZ) was initiated by the presence of the internet revolution. Professor Klaus Scwab, is a German economist and the initiator of the *World Economic Forum* (WEF) who first introduced the concept ofIndustry 4.0 R e volusion. In short, industry players let computers connect and communicate with an intelligent and automated system through *machine learning* technology and cyber technology to collaborate so that able to analyze and determine industry decisions without human involvement[1]. The period of the Industri Revolution is also called the era of disruption. According to the definition of the World Economic Forum, the industrial revolution 4.0 is the disruption of internet technology to *performance*, in the production process so that the process of processing goods and services can be more efficient, fast, and bulk[2]. There is a major change caused by innovations that change the system and order of business to a newer level. The nature of this disruption grinds old methods and replaces them with new methods.

Disruption means disorder, in this context the disorder in question is the use of old methods or ordinances. But the disorder is not necessarily destructive, but it can also be a supporter, and provide an advantage for those who understand and carry it out. Disruption not only means changing one or two specific things, but broadly means leading to dramatic innovations that change the course of the game with new infrastructure and actors, signaling the development of time and technology and offering work efficiency and effectiveness. [3]The presence of this era of disruption is not a threat, but an opportunity and challenge for people's lives. With the above basis, this research is carried out with the aim of providing information by reviewing research that has been carried out previously about the impact of the application of industryi 4.0 technology on increasing work productivity.

In a study conducted by Ignat Kulkov entitled "*The role of artificial intelligence in business transformation: A case of* pharmaceutical companies" with a *qualitative interview* approach method, data were taken by observing 15 pharmaceutical and biotech companies which applies AI technology to its business[4]. The results obtained in the study explained that the use of AI technology in the prorduction process has a major impact on improving the production process and sales process, while the application of AI technology in the *support business* process has a major influence on the analysis and reporting process. The conclusion that can be drawn from the research above is that the implementation of industrial technology 4.0 has a major influence on increasing the productivityof work. This research is expected to

add insight, especially for business people in capturing the opportunities that come from the use of industri 4.0 technology.

## 2. METHOD

The research method used in this article uses a research methodology with a systematic literature review or *Systematic Literature Rreview* (SLR), which is a review of the previous article in a structured and planned manner. Thepurpose of *systematic review* is to answer questions in a specific, relevant, and focused manner, synthesize results, lower bias from reviews, and identify gaps in research. [5] The SLR method performs processing to identify, assess and interpret a fact and evidence obtained from previously conducted research.

The SLR method in this research process consists of:

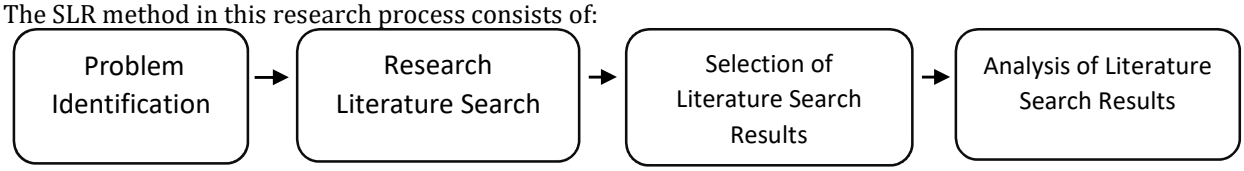


Figure 1. Stages of SLR Research

This research was conducted with the aim of determining the impact of the application of technological innovations on increasing work productivity. The object of this study was taken becausetoday's technology applicationy is closely related to the era of disruption and is very significant with the development of innovation in the industrial revolution i 4.0.

This research uses research articles that have been done before and then the results of the research are *reviewed*. The articles used arefrom various sources, national journals, and international journals that have been published with the keywords industry and productivity.

### Selection of Literature Search Results

This selection is carried out based on predetermined *Quality Assessment* criteria, namely:

1. QA 1: Is the journal Paper published in the time span of 201 6-2021?
   The limitations of this publication year are based on the development of the industrial revolution 4.0 or also known as*cyber-physicall systems* which began in 2016, marked by the existence of a digital economy, big data, the use of robotic technology, engineering intellectuals, the Internet of Things (IoT), nano-technology, to systems called cloud *computing* systems whose activities are all technology-based.[2]
2. QA 2: Does the journal paper discuss work productivity and technological innovation?
   The paper under *review* can answer the formulation of the problem in this study.
3. QA 3: Does the journal paper discuss the industry 4.0 technology used?
   Based on these criteria, 9 journal paper articles were obtained that discussed the implementation of industry 4.0 in work productivity.

### Analysis of Literature Search Results

This stage is to analyze the results of a literature search that has been selected based on predetermined criteria. The analysis is carried out by summarizing the results of a literature search that has a relationship with the influence of the application of industrial technology 4.0 on increasing work productivity. Articles that fit the goals that have been set out are grouped for *review*. The last step is to conclude the results of the grouping of reviews that have previously been carried out. The results of previous research that have been synthesized are then concluded as answers to research questions that have been asked previously.

## 3. RESULTS AND DISCUSSION

### Search Process Results and Inclusion and Exclusion Criteria

The results of the *search process* and *inclusion and exclusion* criteria are only taken 9 journal papers that have met the criteria, namely journal papers published in the 2016-2021 time range and have discussions related to "productivity" and "application of industr i 4.0 technology". The following are the types of journals that have been successfully obtained:

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Table 1 Grouping by Journal Type

| No | Journal Type | Year | Sum |
|---|---|---|---|
| 1 | Journal of Social and Technology | 2020 | 1 |
| 2 | Journal of Environmental Sciences | 2020 | 1 |
| | | 2021 | 1 |
| 3 | Journal of Tourism | 2021 | 1 |
| | | 2022 | 1 |
| 4 | Journal of Education | 2018 | 1 |
| 5 | HR Journal | 2021 | 2 |
| | | 2022 | 1 |

**Quality Assessment Results**

The following are the results of the *quality assessment* written into a table:

Table 2 *Quality Assessment* Results

| No | Writer | Year | QA1 | QA2 | QA3 | Result |
|---|---|---|---|---|---|---|
| 1 | Nanda Tommy Wirawan, Defnizal, Risa Nadia Ernes | 2020 | Yes | Yes | Yes | Accepted |
| 2 | Zhaoyu Zhai, José Fernán Martínez, Victoria Beltran, Néstor Lucas Martínez | 2020 | Yes | Yes | Yes | Accepted |
| 3 | Kumar Raja Vanapalli, Hari Bhakta Sharma, Ved Prakash Ranjan, Biswajit Samal, Jayanta Bhattacharya, Brajesh K. Dubey, Sudha Goel | 2021 | Yes | Yes | Yes | Accepted |
| 4 | Hana Mohelska, Marcela Sokolova | 2018 | Yes | Yes | Yes | Accepted |
| 5 | Almir Pestek and Maida Sarvan | 2021 | Yes | Yes | Yes | Accepted |
| 6 | Shafiq Khaqiqi, Lizar Alfansi | 2022 | Yes | Yes | Yes | Accepted |
| 7 | Charis M. Galanakis, Myrto Rizou, Turkey M.S. Aldawoud, Ilknur Ucak, Neil J. Rowan | 2021 | Yes | Yes | Yes | Accepted |
| 8 | Aarni Tuomi, Iis P. Tussyadiah, and Jason Stienmetz | 2020 | Yes | Yes | Yes | Accepted |
| 9 | Ignat Kulkov | 2021 | Yes | Yes | Yes | Accepted |

**Analytics Data**

At this stage, the analysis data and the results will answer the predetermined *Research Question (RQ)* and will discuss the factors that affect work productivity that often arise from year 2016-2021.

**A. RQ1 Result: The Name of Technology Innovation**

Based on Research Question 1 about the name of the 4.0 technology innovation used, a paper category was generated based on the name of the application studied. From the results seen in table 3, it shows that the trend of the industrial business world, especially in the field of tourism, is currently choosing to apply technological innovation 4.0 using AI and VR technology.

Table 3 Categories of Technology Innovation Names

| No | Name of Technology Innovation | Research Papers | Sum |
|---|---|---|---|
| 1 | *Artificial Intelligence* (AI) | [1], [3], [4], [6]–[9] | 7 |
| 2 | *Virtual Reality (*VR) | [3], [7], [10], [11] | 4 |
| 3 | Robot | [6], [12] | 2 |

**B. Results from RQ2: Data Collection Techniques**

Based on *Research Question* 2 about data collection techniques, results were obtained with paper categories based on data collection techniques. From the results seen from table 4, it shows that of the 9 papers, 3 research papers use a case study approach of the research object with 15 respondents to the research object, and 2 papers The study used a field survey approach with 21 respondents to the research object.

Table 4 Categories of Data Collection Techniques

| No | Data Collection Techniques | Number of Respondents | Research Papers | Sum |
|---|---|---|---|---|
| 1 | Bibliography Review | - | [1], [2] | 2 |
| 2 | Literature Review ( Research Statistical Data) | 2 | [6], [7] | 1 |
| 3 | Case Study (Object of Research) | 15 | [6], [8], [9] | 3 |
| 4 | Field Survey (Observation, Interview and Documentation) | 21 | [10], [11] | 2 |

### C. RQ3 Results: Industri 4.0 Technology Factors to Productivity

Based on *Research Question* 3 about the role of the application of industrial technology 4.0 as one of the important factors in increasing productivity, the results of the category of factors driving industrial activity to measure productivity were obtained. From the results seen in table 5, it shows that the factors of the production process and consumer services are the most dominant factors in experiencing an increase in productivity. Furthermore, time efficiency related to *machine-to-machine* automation factors and analytical capabilities and business intelligence are the second highest factors. Then the factors of data volume, computing power and connectivity as well as purchasing power factors and market expansion are the third highest factors.

Table of 5 Categories of Productivity Factors

| No | Factor | Research Papers | Sum |
|---|---|---|---|
| 1 | *Machine-to-machine* automation | [3], [4], [6], [9]–[12] | 7 |
| 2 | Data Volume, Compute Power and Connectivity | [4], [6], [9]–[12] | 6 |
| 3 | Analytics and Business Intelligence Capabilities | [3], [4], [6], [9]–[12] | 7 |
| 4 | Production Quality | [4], [6], [9], [10], [12] | 5 |
| 5 | Production Process | [3], [4], [6], [8]–[12] | 8 |
| 6 | Production Costs | [2], [13] | 2 |
| 7 | Purchasing Power and Market Expansion | [3], [4], [8], [10]–[12] | 6 |
| 8 | Customer Service | [3], [4], [6], [7], [9]–[12] | 8 |
| 9 | *Human-to-machine* communication | [3], [4], [10]–[12] | 5 |

**Summary of Data Analysis Results**

From the results of each *Research Question*, information has been obtained about the application, data collection techniques and factors for implementing industrytechnology 4.0 on productivity that have emerged and been researched from 2016 to 2021.

Table 6 Most RQ Frequency Categories

| RQ | Aspects | Most frequency categories |
|---|---|---|
| 1 | Name of Technology Innovation | *Artificial Intelligence* (AI) |
| 2 | Data Collection Techniques | Field Survey with observation and interview |
| 3 | Productivity Factors | Production Process and Customer Service |

## 4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that based on the results of the *Systematic Literature Review* (*SLR),* the most widely applied technological innovation in the industrial sector today is *Artificial Intelligence* (AI). The field survey approach is the most widely practiced data collection technique by conducting observations and interviews. It was found that the productivity factor that experienced the greatest increase due to the implementation of industri 4.0 innovation was an increase in the production process and an improvement in consumer services. In addition, 7 other factors were found that alsoled to an increase in productivity.

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