

## **Industrial Revolution: A History of Industrial Revolution and Its Influence in Manufacturing Companies**

Nurdiana, Moses Glorino Rumambo Pandin  
Faculty of Humanities, Universitas Airlangga  
nurdiana-2020@fib.unair.ac.id

### **Abstract**

*Before the existence of industrial technology, people in doing their job used their power. People were able to produce goods and sell services with their power. These activities are ineffective because they are constrained and take a long time, so the discovery of industrial technology is today. This study aims to determine the meaning of the industrial revolution, the history and development of the industrial revolution 1.0 to 4.0, the relationship between the industrial revolution and Indonesian history, and the influence of the industrial revolution in Indonesian manufacturing. Indonesian people do not understand what revolution means and how it relates to Indonesian history, where the current and former situation is very different because of a revolution, especially the industrial revolution. The discovery of industrial technology or industrial revolution makes human development become advanced and rapidly growing. In this study, the author uses a method in the form of a Literature Review (LR) or a literature review and data obtained from several articles that have been published and registered online. Technology is believed by many people to make their work easier and takes a short time. The development of technology became necessary because of the emergence of the industrial revolution 4.0 that changed human life. This article tries to review the understanding of the industrial revolution, its development history, and its influence on Indonesian manufacturing companies. The limitation or weakness of this research lies in the research process, namely the author's weakness in collecting the reference sources used.*

**Keywords:** *Industry, Revolution, Technology*

### **Introduction**

The development of the times is undoubtedly faster and faster after developing industrial technology known as the industrial revolution. The history of the first industrial revolution emerged in 1750 because of an assessment of only one type and sort. Therefore there must be a change in

the processing<sup>1</sup>. Revolution is interpreted as a change in socio-cultural patterns or habits carried out in people's lives, while industry can be interpreted as activities related to the processing of raw goods into finished goods that have a high selling value and quality<sup>2</sup>. So it can be concluded that the industrial revolution is a fundamental and significant change in world industry because it gives birth to new things that are needed and help human life. This change is in the form of how humans process resources and produce large quantities of goods in a relatively short time.

The history of the world's industrial revolution ranges from industrial revolution 1.0 to industrial revolution 4.0. In the industrial revolution 1.0 people still use muscle power, water, wind, and steam power to discover steam engines. The production of electric power marked the industrial revolution 2.0 for transportation use. The industrial revolution 3.0 machine is transformed into a moving machine such as computers, robots, and electric power. Industrial revolution 4.0 is characterized by the number of machines created by no longer using human power, but with advanced technology as a human liaison with machines, this causes the development of technology to be faster<sup>3</sup>.

The history of the industrial revolution occurred because of significant events in Europe that affected the lives of Indonesians. Notable events include church reform, mercantilism, the French revolution, and the industrial revolution. The industrial revolution was initially made using manual power then developed using engine power by the British of the 18th century. With the industrial revolution, the country became a superior country rich in natural resources. The industrial revolution in Europe succeeded in making people's lives in various parts of the world changed, including with the country of Indonesia.

The existence of an industrial revolution in Indonesia affects the lives of Indonesians, of course. The industrial revolution has a tremendous impact on Indonesia, especially in the social field is the change of the use of human

---

<sup>1</sup> Irman Maulana, "Sejarah Revolusi Industri," *Program Studi Sistem Telekomunikasi*, 2021, 1–2 <<https://doi.org/10.13140/RG.2.2.30091.52006>>.

<sup>2</sup> Amalia Annisa, "Sejarah Revolusi Industri dari 1.0 sampai 4.0," *Artikel Mahasiswa Sistem Telekomunikasi*, 1 January (2021), 2–3 <<https://doi.org/10.13140/RG.2.2.20215.24488>>.

<sup>3</sup> Makna A Kautsar dan Universitas Pendidikan Indonesia, "Sejarah Peralihan Revolusi Industri," January, 2021, 10–12 <<https://doi.org/10.13140/RG.2.2.18956.95364>>.

power into mechanical power so that jobs in the industrial field are reduced, which causes many workers affected by layoffs<sup>4</sup>, and the economic field is the change of business capital system and the number of companies that invest in adding sophisticated technological tools. Industrial revolution 4.0 is known as the era of disruption where the scope of production and competition are not balanced<sup>5</sup>. In addition, there are also advantages and disadvantages of the industrial revolution. A slight advantage of the industrial revolution for Indonesia is a large number of industries in cities, facilitating relations and accelerating the dissemination of information between people far away and even abroad. The disadvantages are the onset of social discrimination in society, the emergence of capitalism in the economic field, the emergence of hoax news, etc. Nowadays, many Indonesians use technology, let alone the covid 19 virus that plagues the world, which makes human activities limited for example, in terms of education is learning online or online, working from home, etc. That is a small example of the industrial revolution 4.0.

Based on the context of the above problem, the questions that arise in this study are: What is the meaning of the industrial revolution? What are the history of the industrial revolution and the development of the industrial revolution from 1.0 to industrial revolution 4.0? How does the industrial revolution relate to Indonesia's history? What is the influence of the industrial revolution in the field of Indonesian manufacturing companies?. This research aims to find out the understanding of the industrial revolution, the history and development of the industrial revolution 1.0 to 4.0, the relationship of the industrial revolution with the history of Indonesia, and the influence of the industrial revolution in the field of Indonesian manufacturing.

## **Research Method**

In this study, the authors used a method in the form of Literature Review (LR) or a review of the library of several articles that have been

---

<sup>4</sup> D. Anisa Sunija et al., "Pekerja Sosial Industri Dalam Menangani Permasalahan Phk Di Dunia Industri Indonesia," *Prosiding Penelitian dan Pengabdian kepada Masyarakat*, 6.3 (2020), 181 <<https://doi.org/10.24198/jppm.v6i3.26206>>.

<sup>5</sup> Vina Fujiyanti, "Sejarah Peralihan Revolusi Industri," January, 2021, 6 <<https://doi.org/10.13140/RG.2.2.11983.92328>>.

published and registered online. A literature review is a theory, findings, and research material obtained from the reference material that it serves as the basis of research activities for a clear frame of mind of the formulation of the problem studied. In addition, the author also uses descriptive data analysis, which describes in detail the data obtained, then given understanding and explanation or some images to make it easier for the reader to understand them.

The choice of theme for this research is a problem that is being felt by the people of Indonesia or even the whole world in facing the era of the industrial revolution. The data collection technique is done by using literature study. This method is often used by authors to find reliable sources from books, journals, articles, and websites. References in this paper use the latest sources, in the sense of using sources published in 2019, 2020 and 2021.

This writing is adapted to the themes and references which are arranged in a systematic and structured manner. Readers are expected to provide criticism and suggestions in improving this article for the common good. This method also uses historical methods which include data collection and interpretation of the symptoms of events that occurred in the past.

## **Result and Discussion**

Articles created by authors use library reviews from the last three years, some articles that have been registered and published online, and several reliable websites. The author takes reliable sources published in 2019, 2020, and 2021. The journals taken and used in the making of this article are closely related to the topics that have been taken, namely the industrial revolution.

The journal reference in making this article has a very broad content, including 1) the understanding of the industrial revolution, 2) the history of the development of the industrial revolution from 1.0 to 4.0, 3) the relationship between the industrial revolution and the history of Indonesia, 4) the influence of the industrial revolution in the manufacturing sector. So the result of making this paper article hopefully can help readers understand the history of the development of the industrial revolution 1.0 to 4.0 and its influence on Indonesian manufacturing companies.

## 1. Understanding the Industrial Revolution

The industrial revolution comes from two words: revolution and industry. Revolution is a rapid social and cultural change concerning the primary points of people's lives. The industry is an economic activity that processes raw or raw materials, semi-finished goods or finished goods, into quality goods with high selling value. The more advanced the level of industrial development in a country, the more there will also be the number of industries that develop with the complex nature of its activities<sup>6</sup>.

So from the understanding of revolution and industry from the explanation above can be concluded that the industrial revolution is a rapid change in the field of economics especially, which initially economic activities centered on agriculture turned into an economy centered on the industrial sector by using machines in processing raw materials into mass-produced goods with high selling value in society. The industrial revolution originated in the United Kingdom; Friedrich Engels and Louis Auguste Blanqui introduced the Industrial Revolution in the mid-19th century. Around the 16th-17th century, Europeans began exploring new areas that led to capitalism controlling various areas of its conquered regions<sup>7</sup>. The industrial revolution then developed throughout Western Europe, North America, Japan and spread throughout the world. So, in short, the sense of the industrial revolution was a change in the way to produce goods that initially used human power turned into engine power<sup>8</sup>.

## 2. History of The Development of the Industrial Revolution 1.0 - 4.0

### a. History of the Industrial Revolution

Every event must have a history, such as the industrial revolution, to multiply today. The industrial revolution occurred because of an

---

<sup>6</sup> Afifah Cinthia Pasha, "Industri adalah Kegiatan Manufaktur, Ini Pengertian Menurut Para Ahli dan Jenisnya," 2019 <<https://m.liputan6.com/bisnis/read/3872902/industri-adalah-kegiatan-manufaktur-ini-pengertian-menurut-para-ahli-dan-jenisnya#>>.

<sup>7</sup> Widias Tuti, "Perkembangan Revolusi Industri 1," January, 2021, 2–5 <[https://doi.org/10.13140/RG.2.2.32765.38886](https://doi.org/10.13140/RG.2.2.32765.38886>)>.

<sup>8</sup> Listhari Baenanda, "Sejarah dan Perkembangan Revolusi Industri," *Binus university*, January, 2019 <[https://doi.org/10.13140/RG.2.2.22941.54243](https://doi.org/10.13140/RG.2.2.22941.54243>)>.

important European event that affected the lives of Indonesian people, namely the existence of colonialism and imperialism that is significantly related to the history of Indonesia<sup>9</sup>. Colonialism and Imperialism have similarities in that both colonize a nation or another country, while the differences between colonialism and Imperialism lie in their purpose. Colonialism aimed to control and take over various fields, such as politics and economics, while Imperialism aimed to form a new system of government by expanding its colonies. European nations make the eastern nation the object of its target to gather natural resources and instill its influence in all areas of the country's life it colonized. The events that took place across Europe resulted in the development of colonialism and Imperialism. Notable events that occur in Europe include:

**Reformation of the church:** reform comes from Latin, meaning *Re* means (back) and *Formare* means (form), so general reform is to restructure people's lives. The reformation of the church began in 1517, which transformed beliefs across western Europe from Catholic to Protestant. Martin Luther, a German monk, criticized the Catholic Church for its abuse of Christian teachings such as the sale of indulgences, deviations of the sacred sacrament, mythology and superstitions, and many corrupt practices in the form of taxes that burdened society. This was the forerunner of the church reform movement across Europe that expanded throughout the world and gave birth to a new belief in Protestantism.

**Mercantilism:** mercantilism is a 16th-17th century economic stem that aims to obtain as much precious metal wealth as possible to measure wealth, prosperity, and power. The mercantilism movement encouraged the birth of the exploration of Samudra and encouraged the birth of ancient imperialism in search of its colonies to monopolize trade. Thus, European countries developed a trade organization in their colonial countries, such as the VOC by the Netherlands, the EIC by the British, and the West Indies Trade Company by France.

---

<sup>9</sup> Murti Ningsih, "PENGARUH PERKEMBANGAN REVOLUSI INDUSTRI 4.0 DALAM DUNIA TEKNOLOGI DI INDONESIA UAS Murti Ningsih," 2019, 1–12 <<https://doi.org/10.31219/osf.io/pswmu>>.

**French Revolution:** The French revolution is an excellent chance of the world to change the order of people's lives. Before the French revolution, the system of government was flawed in various fields, such as politics, social, and economic, in an unstable and chaotic situation. The French revolution resulted in the change of the French government system, which was initially an absolute monarchy, into a democratic system of government.

**Industrial Revolution:** The industrial revolution was a massive change in the processing of resources and producing goods, which occurred between 1750-1850 which impacted the social, economic, and cultural changes of the world. These changes include agriculture, manufacturing, mining, transportation, and technology that impact the world's changing social, economic, and cultural conditions.

b. The Development of the Industrial Revolution from 1.0 to 4.0

Technology is an essential tool for humans who can make the most of nature. At the same time, this technology aims to facilitate human work in their daily lives<sup>10</sup>. The development of technology has been fundamentally changing in various fields, such as politics, economics, society, education, and many more, so that this technology serves as the basis for success in the era of globalization<sup>11</sup>.

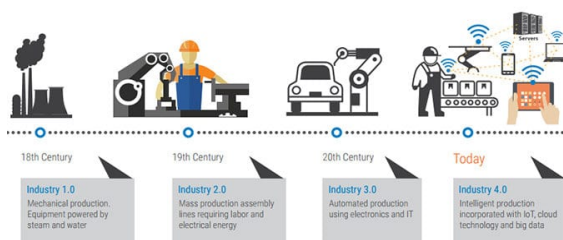
In this day and age, human life is easy because of the industrial revolution 4.0 as it is today, because it changes the way of life, the way of working and communicating with others<sup>12</sup>. The industrial revolution has developed, starting from the industrial revolution of the 1.0 century, the industrial revolution of the 2.0 century, the industrial revolution 3.0, and the industrial revolution of the 4.0 century. Here is an explanation of the development of the industrial revolution from the 1.0 century to the 4.0 century as it is today.

---

<sup>10</sup> Djoys Anneke Rantung F.M, "TEKNOLOGI DALAM PEMBELAJARAN PENDIDIKAN AGAMA KRISTEN YANG ANTISIPATIF DI ERA REVOLUSI INDUSTRI 4.0," Shanana, 2020, 96.

<sup>11</sup> I Nyoman Andy Putra Bali, "Menguji Kesiapan Pengelolaan Desa Berbasis Manajemen Modern Guna Menghadapi Era Revolusi Industri 4.0," Manajemen dan Bisnis, 2019, 6.

<sup>12</sup> A.S. Marsudi and Y.Widjaja, "INDUSTRI 4.0 DAN DAMPAKNYA TERHADAP FINANCIAL TECHNOLOGY SERTA KESIAPAN TENAGA KERJA DI INDONESIA," 2.2 (2019), 10.



*Image of development of industrial revolution 1.0 – 4.0*

[https://otomasi.sv.ugm.ac.id/wp-](https://otomasi.sv.ugm.ac.id/wp-content/uploads/sites/361/2018/10/revolusi-industri-4.0.jpg)

[content/uploads/sites/361/2018/10/revolusi-industri-4.0.jpg](https://otomasi.sv.ugm.ac.id/wp-content/uploads/sites/361/2018/10/revolusi-industri-4.0.jpg)

a. Industrial revolution era 1.0

The revolution took place around 1800-1900; the country that pioneered the industrial revolution was the United Kingdom (United Kingdom). The industrial revolution was influenced by changes and developments in science in the 16th century. The industrial sector that started the industrial revolution 1.0 was the textile industry with the discovery of spinners, the steel industry with product innovations and cheaper manufacturing processes, the transportation industry to discover steam engines or steamers invented by James Watt. Work equipment that initially relied on human resources and animals was eventually replaced with such machines. The industrial revolution era 1.0 is environmental pollution due to steam engines and factory waste<sup>13</sup>.

b. Industrial revolution era 2.0

This industrial revolution took place in the early 20th century, marked by the invention of electric power. Human power that steam engines had replaced was slowly replaced by electric power. In late 1800, cars began to be mass-produced with the help of much cheaper and easier electric power than steam engines. The impact of the industrial revolution era 2.0 was the military conditions in World

---

<sup>13</sup> Adit Kusnandar, “Revolusi Industri 1.0 HINGGA 4.0,” *Forkomsi FEB UGM*, 2019, 305.



War II, where many aircraft and weapons were mass-produced, and the change from an agrarian society to an industrial society<sup>14</sup>.

c. Industrial revolution era 3.0

In the industrial revolution 3.0 people no longer produced various types of goods, the industry slowly ended, and the information century had begun. This revolution is produced by machines that can move and think automatically, namely the discovery of computers and robots. The first computer of world war II was colossus which was used to decode nazi Germany. Technological advances are overgrowing where computers are produced with small sizes, do not require much electricity, and are increasingly sophisticated when computers are paired on machines that operate production lines to replace humans as labor<sup>15</sup>.

d. Industrial revolution era 4.0

Human connectivity, data characterize the current industrial revolution 4.0, and machines in virtual (cyber-physical) to create a better quality of life. This industrial revolution began to occur because of the shift of innovation trends to digital technology. One of the highlights of this industrial revolution 4.0 is applying artificial intelligence in all areas of industry. This industrial revolution 4.0 marked the emergence of advanced computers, intelligent robots, rudderless vehicles that optimize the functioning of the human brain. In short, industrial revolution 4.0 instilled intelligent technology that can connect with various areas of human life<sup>16</sup>. President Joko Widodo inaugurated Making Indonesia 4.0 as a roadmap for Industry 4.0 to increase the added value of the domestic manufacturing industry to compete globally. The roadmap will focus on five manufacturing sectors for its initial implementation: the food and beverage industry, textiles and clothing, automotive, chemical, and

---

<sup>14</sup> Benny Agus Setiono, "Peningkatan Daya Saing Sumber Daya Manusia Dalam Menghadapi Revolusi Industri 4.0," *Jurnal Aplikasi Pelayaran dan Kepelabuhanan*, 9.2 (2019), 179 <<https://doi.org/10.30649/jurapk.v9i2.67>>.

<sup>15</sup> Dwi Wahyu Riani, "Sejarah dan Perkembangan Revolusi Industri 1.0 - 4.0," 2021, 1–3 <<https://doi.org/10.13140/RG.2.2.22941.54243>>.

<sup>16</sup> Kelas pintar, "Mengungkap Sejarah Revolusi Industri, dari 1.0 Sampai 4.0," 2019 <<https://www.kelaspintar.id/blog/edutech/sejarah-revolusi-industri-dari-1-0-sampai-4-0-1088/>>.

electronics<sup>17</sup>.

e. Industrial Revolution 5.0 Emerges?

The industrial revolution 5.0 mulai was slowly introduced by the Japanese state, which focuses on society with a combination of human empowerment, technology, and data. In Indonesia, there are already companies that implement the industrial revolution 5.0, including online motorcycle taxi companies (grab, uber, go car) and fundraising<sup>18</sup>.

**3. The Relationship of the Industrial Revolution with The History of Indonesia**

The industrial revolution across Europe made a difference in various areas of people's lives worldwide, especially in Indonesia. The change in the philosophy paradigm was carried out by European Imperialism, making Europe colonial to produce raw materials and invest capital. The Dutch forced planting system against Indonesia received criticism from humanists and democrats so that in 1870 the forced planting system was abolished and replaced with an open economic system. An open economic system implemented in Indonesia makes foreign countries invest a lot in Indonesia; the goal is to obtain maximum profit. Investment in Indonesia is used to make plantations that produce raw materials for their industry; for example, java and Sumatra plantations are built. The capitalists' exploitation was very burdensome for the Indonesian people, where the Indonesian people were given a minimum wage with a heavy burden of work.

The government also built infrastructure, such as irrigation, reservoirs, highways, railways, and ports, to send plantation materials to various regions more quickly. The construction of these means can cause influence the mobility of population growth. Humanists in the Netherlands encouraged the Dutch to return to Indonesia by educating and prospering the Indonesian people. The idea was

---

<sup>17</sup> Yantina Debora, "Perbedaan Revolusi Industri 1.0 yang dimulai abad ke-18 hingga Industri 4.0," 2019 <<https://tirto.id/sejarah-revolusi-industri-dari-10-hingga-40-dhhu>>.

<sup>18</sup> Cohive. space, "Berkenalan Dengan Sejarah Revolusi Industri," 2020 <<https://cohive.space/blogs/revolusi-industri/>>.

invented by van Deventer known for ethical politics or return, which contains three points, namely education, irrigation, and transmigration. Educational education programs are not intended to educate Indonesia but are directed to meet the administrative personnel placed in the plantation industry. Irrigation programs are not used to improve Indonesian agriculture but rather for the growth of capitalist plantations that invest in Indonesia. The transmigration program is not done to equalize the population but rather to meet the dutch plantation workforce. Western education was generally given only to the nobility, which greatly influenced the abolition of the feudalism system in public relations patterns.

#### **4. Influence of Industrial Revolution 4.0 in Indonesian Manufacturing**

Industrial Revolution 4.0 influences industry, especially in manufacturing, as Indonesia's strategy to enter the industrial revolution or Making Indonesia 4.0<sup>19</sup>. Today there are many digital and internet technologies in the manufacturing industry, where all jobs can be automated without the intervention of many people. The industrial revolution 4.0 as it is today is more focused on developing its technology software but rather open on its machines<sup>20</sup>. Here are some of the influences of the industrial revolution in manufacturing, as follows:

##### **1. Artificial Intelligence (AI)**

Artificial Intelligence is an innovation of the industrial revolution era 4.0 in digital computers that have intelligence like humans. An example is a chatbot that can be found on the website. This chatbot can automatically respond to chats based on specific keywords and provide relevant answers, so there is no need to wait too long for answers. In the manufacturing industry, Artificial Intelligence can help companies to predict when machines are repaired, how logistics processes run, estimate

---

<sup>19</sup> Hafidh, "Mengenal Revolusi Industri dan Pengaruhnya pada SDM Industri Manufaktur," 2020 <<https://www.talenta.co/blog/hr-manufaktur/mengenal-revolusi-industri-manufaktur/>>.

<sup>20</sup> Sasana Digital, "Aspek Revolusi Industri 4.0 Pada Perusahaan Manufaktur," 2020 <<https://sasanadigital.com/aspek-revolusi-industri-4-0-pada-perusahaan-manufaktur/>>.

goods arrive or run out, and set production schedules automatically.

2. Software-based Activities

Nowadays, all human activities can be done through applications, such as online shopping, meetings, transportation needs, etc. In the industry, software was created to facilitate the performance and relationships of corporate divisions, such as CRM software, ERP systems, HR, etc. In that case, the software has its functions, such as arranging relationships with clients, controlling production systems, and monitoring logistics.

3. Complex and barrier-free communication system

In ancient times people communicated using telephone and SMS, but nowadays communication is getting more sophisticated. In manufacturing companies appeared a variety of communication applications used for business and productivity, such as Trello, Jira, Slack, and various online document applications such as Google Docs office applications with communication features and Figma, a collaborative graphic design application.

4. The beginning of the Robot era

Robots began to replace some of the roles of humans in this industrial revolution 4.0, in the robot manufacturing industry is indispensable in producing an item. Several multinational companies such as Sony and Mitsubishi have used robot systems that work automatically within their company, replacing some human roles. This robot is believed to be more efficient.

5. Internet of Thing (IoT)

Internet of Things is a technology that can connect all kinds of technological devices to connect virtually. With this Internet of Things, company owners can control factory production activities through smartphones.

Every country must feel the benefits of the industrial revolution. This industrial revolution also provides advantages and disadvantages lack for connoisseurs of the good industrial revolution in the fields of education, economy, technology, manufacturing, and human resources, therefore it is necessary to prepare a strategy to face these challenges. The industrial

revolution also gave there are many opportunities for humans but also not spared from challenge. In the face of all the challenges that exist very much needed skills in the current era of the industrial revolution.

## **Conclusion**

The industrial revolution in Indonesia affected people's lives, where initially, human activities using manual power turned into mechanical power. The discovery of steam engines marked the change in the development of the industrial revolution starting from the industrial revolution 1.0, the discovery of electric power marked the industrial revolution 2.0, the industrial revolution 3.0 was marked by the emergence of the era of computers and robots, the emergence of digitalization marked the industrial revolution 4.0. The relationship of the industrial revolution with the history of Indonesia is a paradigm change of philosophy carried out by European Imperialism, making Europe colonial to produce raw materials and invest investment capital. Industrial revolution 4.0 had an impact on the industry, especially in manufacturing, where all jobs can be automated without the intervention of many people. Slowly, the industrial revolution 5.0 is developing in Indonesia that focuses on the field of society with a combination of human empowerment, technology, and data. In Indonesia, there are already companies that implement the industrial revolution 5.0, including online motorcycle taxi companies (grab, uber, go car) and fundraising. The limitation or weakness of this research lies in the research process, namely the author's weakness in collecting the reference sources used. Based on the conclusions described above, several recommendations related to the history of the development of the industrial revolution 1.0 to 4.0 and their influence in the field of Indonesian manufacturing companies can be submitted. This suggestion is addressed to further researchers or the Indonesian people to be ready to face the industrial revolution that will occur.

## Reference

### Journals

- A.S. Marsudi and Y.Widjaja, "INDUSTRI 4.0 DAN DAMPAKNYA TERHADAP FINANCIAL TECHNOLOGY SERTA KESIAPAN TENAGA KERJA DI INDONESIA," 2.2 (2019), 10
- Annisa, Amalia, "Sejarah Revolusi Industri dari 1.0 sampai 4.0," *Artikel Mahasiswa Sistem Telekomunikasi*, 1.January (2021), 2–3 <<https://doi.org/10.13140/RG.2.2.20215.24488>>
- Baenanda, Listhari, "Sejarah dan Perkembangan Revolusi Industri," *Binus university*, January, 2019 <<https://doi.org/10.13140/RG.2.2.22941.54243>>
- Djoys Anneke Rantung F.M, "TEKNOLOGI DALAM PEMBELAJARAN PENDIDIKAN AGAMA KRISTEN YANG ANTISIPATIF DI ERA REVOLUSI INDUSTRI 4.0," Shanana, 2020, 96
- Dwi Wahyu Riani, "Sejarah dan Perkembangan Revolusi Industri 1.0 - 4.0," 2021, 1–3 <<https://doi.org/10.13140/RG.2.2.22941.54243>>
- I Nyoman Andy Putra Bali, "Menguji Kesiapan Pengelolaan Desa Berbasis Manajemen Modern Guna Menghadapi Era Revolusi Industri 4.0," *Manajemen dan Bisnis*, 2019, 6
- Irman Maulana, "Sejarah Revolusi Industri," *Program Studi Sistem Telekomunikasi*, 2021, 1–2 <<https://doi.org/10.13140/RG.2.2.30091.52006>>
- Kautsar, Makna A, dan Universitas Pendidikan Indonesia, "Sejarah Peralihan Revolusi Industri," January, 2021, 10–12 <<https://doi.org/10.13140/RG.2.2.18956.95364>>
- Kusnandar, Adit, "Revolusi Industri 1.0 HINGGA 4.0," *Forkomsi FEB UGM*, 2019, 305
- Ningsih, Murti, "PENGARUH PERKEMBANGAN REVOLUSI INDUSTRI 4.0 DALAM DUNIA TEKNOLOGI DI INDONESIA UAS Murti Ningsih," 2019, 1–12 <<https://doi.org/10.31219/osf.io/pswmu>>
- Setiono, Benny Agus, "Peningkatan Daya Saing Sumber Daya Manusia Dalam Menghadapi Revolusi Industri 4.0," *Jurnal Aplikasi Pelayaran dan Kepelabuhanan*, 9.2 (2019), 179 <<https://doi.org/10.30649/jurapk.v9i2.67>>
- Sunija, D. Anisa, Septia Febriani, Santoso Tri Raharjo, dan Sahadi Humaedi,

- “Pekerja Sosial Industri Dalam Menangani Permasalahan Phk Di Dunia Industri Indonesia,” *Prosiding Penelitian dan Pengabdian kepada Masyarakat*, 6.3 (2020), 181  
<<https://doi.org/10.24198/jppm.v6i3.26206>>
- Tuti, Widias, “Perkembangan Revolusi Industri 1,” January, 2021, 2–5  
<<https://doi.org/10.13140/RG.2.2.32765.38886>>
- Vina Fujiyanti, “Sejarah Peralihan Revolusi Industri,” January, 2021, 6  
<<https://doi.org/10.13140/RG.2.2.11983.92328>>

### **Website**

- Afifah Cinthia Pasha, “Industri adalah Kegiatan Manufaktur, Ini Pengertian Menurut Para Ahli dan Jenisnya,” 2019  
<<https://m.liputan6.com/bisnis/read/3872902/industri-adalah-kegiatan-manufaktur-ini-pengertian-menurut-para-ahli-dan-jenisnya#>>
- Cohive. space, “Berkenalan Dengan Sejarah Revolusi Industri,” 2020  
<<https://cohive.space/blogs/revolusi-industri/>>
- Hafidh, “Mengenal Revolusi Industri dan Pengaruhnya pada SDM Industri Manufaktur,” 2020 <<https://www.talenta.co/blog/hr-manufaktur/mengenal-revolusi-industri-manufaktur/>>
- Kelas pintar, “Mengungkap Sejarah Revolusi Industri, dari 1.0 Sampai 4.0,” 2019 <<https://www.kelaspintar.id/blog/edutech/sejarah-revolusi-industri-dari-1-0-sampai-4-0-1088/>>
- Sasana Digital, “Aspek Revolusi Industri 4.0 Pada Perusahaan Manufaktur,” 2020 <<https://sasanadigital.com/aspek-revolusi-industri-4-0-pada-perusahaan-manufaktur/>>
- Yantina Debora, “Perbedaan Revolusi Industri 1.0 yang dimulai abad ke-18 hingga Industri 4.0,” 2019 <<https://tirto.id/sejarah-revolusi-industri-dari-10-hingga-40-dhhu>>