INTELLECTUAL CAPITAL, INNOVATION, AND CURRICULUM OF ACCOUNTING STUDY PROGRAM BASED ON THE INDUSTRIAL REVOLUTION 4.0

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FOREWORD

Praise be to God Almighty, so that the Research Book with the title "*Intellectual Capital*, Innovation and Curriculum of the Accounting Study Program in the Era of the Industrial Revolution 4.0" can be published. This book is a research book with the title "Challenges and Threats of the Industrial Revolution 4.0 on Accounting and the Contribution of *Intellectual Capital"* which is financed by the Ministry of Education and Culture Research in 2022.

This book will contain four chapters, namely about Intellectual Capital, Innovation, the Curriculum of the Industrial Revolution 4.0-Based Accounting Study Program, and Concluding. With the completion of the writing of this research book, the author would like to thank all parties who have provided writing materials both directly and indirectly. The author also expresses his special thanks to:

1. Ministry of Education and Culture Ristek which has financed PTUPT research in 2021-2022
2. Dr. Hidayatullah, M.Si the highest leader, namely the Rector of the University of Muhammadiyah Sidoarjo who has provided and facilitated in the research and writing of this research book.
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4. A team of researchers who have helped a lot with the completion of this research book.
5. Umsida Press who has published this book.

Finally, criticisms and suggestions are desirable for the refinement of this research book. We hope that this book can be used as additional useful information and references for other IC researchers.

Sidoarjo, 20 Mei 2023

Researchers

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CHAPTER I

INTELLECTUAL CAPITAL

1.1. Definition of Intellectual Capital

Intellectual Capital (IC) is defined as a combination of intangible resources and activities in an organization that transforms material, financial and human resources into a reliable system to create stakeholders value. IC also means as one of the intangible assets because it meets the criteria of intangible fixed assets which are assets for business units in helping to achieve competitive business unit advantages.(Boekestein, 2006; Hussi, 2004) (Wachyu et al., 2020) The definition of IC which is based on the conclusions made by (Gunawan, 2012) are all assets owned by the company and can contribute to efforts to create wealth in the company. Intellectual Capital is seen as knowledge that has potential value thus revealing the transformation of knowledge as something valuable within the company (Kucharska, 2021; Liu et al., 2021) (Bintang & Yudhanti, 2010). IC is knowledge or an intangible asset that develops the value of a product or service, thereby contributing to the innovation and creativity of a company's resources (Baregheh et al., 2009; Mejia et al., 2019) (Sari, 2020). IC has needs and benefits for knowledge-intensive companies in the high-tech sector and the service industry, so companies tend to invest substantially in IC (Dewi et al., 2020) (Matisone & Lace, 2019) (Jian Xu & Li, 2019).

IC is one of the company's intangible assets over time it becomes a very valuable asset (Aulia & Haryono, 2021) (Boj et al., 2014) (Zivile, 2013). IC itself is a knowledge, information and intellectual property that is able to find opportunities and manage threats in the life of a company, so that it can affect resilience and competitive advantage in various ways (Nugroho, 2012) (Lu et al., 2009) (Aisyah, 2021). IC includes all employee knowledge and company capabilities to create added value and competitive advantage (Dewi et al., 2020) (Lee, 2016) (Bhatti & Zaheer, 2008). The role of IC is proven to influence business performance, increase company value, increase organizational effectiveness, competitive advantage, and also create prosperity for the company (S. Hermawan, 2013) (Hejazi et al., 2016) (Jian Xu & Liu, 2020). Although intellectual capital is important for achieving competitive advantage, many companies do not understand the concept

and value of intellectual capital, especially how to manage intellectual capital so that it can increase competitive advantage and improve company performance (Cahyati, 2011).

In research conducted by (Rahayu, 2016) stated that often the term IC is replaced by the term intangible asset, especially in studies in the United States, so the following is the definition of IC from several studies:

Table 1.1. Definition of *IC* According to Experts

Expert	IC Definition
CIMA (2005)	The difference between the market value of a business and *tangible assets*.
Choo dan Bontis, (2002)	*Intellectual capital* contains different capital rooted in employees, organizational routines, intellectual property rights, and relationships with customers, suppliers, distributors, and co-workers.
Marr dan Schiuma (2001)	The group of knowledge assets is associated with the organization and significantly contributes to the competitive position of the organization by adding key factors that *stakeholders have*.
Caddy (2000)	The difference between intangible assets and *intangible liabilities* .
Harrison dan Sullivan (2000)	Knowledge that can be converted into profit.
Sveiby (1997)	With regard to the experience of knowledge, the brain power of employees is like the resources of knowledge, which are stored within the processes of *database* systems, cultures, and philosophies.
Brooking (1997)	*Intellectual capital* operationally as an intellectual material that is formalized, acquired, and managed to produce high-value assets.
Stewart (1997)	Intellectual aterial – knowledge, information, intellectual rights, experience that can be used to create property.
Roos *et al,* (1997)	The amount of knowledge possessed by the company's members and their practical translations such as trademarks, patents, and *brands.*
Bontis (1996)	*Intellectual capital* is elusive, but once discovered and explored, it will provide organizations with a new resource to compete and win.

Source : (S. Hermawan, 2013)

1.2. Components of Intellectual Capital

Based on a lot of research that has been done, IC consists of three main elements, namely human capital, structural capital, relational capital related to knowledge and technology to improve company performance towards competitive advantage and prosperity in an organization. (Bontis, 2001; Bontis et al., 2000; S. Hermawan et al., 2022. (S. Hermawan et al., 2021). The three components of the IC can be explained as follows, namely:

1. *Human Capital* is an individual knowledge stock that includes a combination of genetic inheritance, education, experience, and attitudes about life and business.
2. Structural Capital includes non-human storehouses of knowledge such as databases, organisational charts, process manuals, strategies and everything that makes a company's value outweigh the material value.
3. Relational Capital is an inherent knowledge in marketing channels and customer relationships in the company's business development.

In the research conducted by (Sari, 2020) there are 3 IC components, namely

1. Human capital is the main component that must be owned by every type of business because there is innovation, knowledge, skills, and expertise in every individual who enters the company.
2. Customer capital, The assessment of the company by the customer, automatically opens up a wider network as a measure of the reputation owned by the company, so that it will have an impact on relationships with suppliers, governments, and other industry associations related to the company.
3. Structural capital, to support other IC components in generating value and company performance.

The components in IC are very important considering that IC is related to multidisciplinary concepts, so certain criteria are needed to classify IC (Rahayu, 2016). The following is an example of IC grouping from several researchers and practitioners:

Table 1.2. IC Grouping

IC Expert	Country	Classification
Saint-Onge (1996)	Canada	*Human Capital, Structural Capital, Relational Capital*
Edvinsson and Malone (1997)	Swedia	*Human Capital. Structural Capital*
Stewart (1997)	Amerika Serikat	*Human Capital, Structural Capital, Customer Capital*
Sveiby (1997) dan Guthrie and Petty (2000)	Australia	*Employe Competence, Internal structure, External structure*

Bontis (1998)	Canada	*Human Capital, Structural capital, Customer capital*
Roos, *et al* (1998)	Inggris	*Human Capital,, Structural capital Relational capital*
Van Buren (1999)	Amerika Serikat	*Human capital, Innovation capital, Process capital Customer capital*
O'Donnell and O'Regan (2000)	Irlandia	*People, Internal Structure, External structure*
Hermawan (2013, 2022)	Indonesia	*Human Capital, Structural Capital, Relational Capital*

Source : Adapted by the Author

The following is described per component of the IC:

1.2.1. Human Capital

Human Capital is the value of employees determined by their ability to apply their skills and expertise. Human capital is also a source of very useful knowledge, skills, and competencies in an organization or company (Kucharčíková, 2011) (Nugroho, 2012). Human capital is referred to as an intangible asset that is not easy to measure considering that humans have dynamic and relatively changing characteristics along with changing situations and conditions (Alika & Aibieyi, 2014) (Novandalina & Budiyono, 2021). Human capital reflects the company's collective ability to produce the best solutions based on the knowledge possessed by the people in the company (Kusuma, 2015) (Lengnick et al., 2011) (Rajindra, 2021). Based on research conducted (Susanti et al., 2018) (Muazza, 2021) (Ybnu Taufan & Basalamah, 2021) said human capital includes professional competence, social competence, and motivation.

The importance of human capital is because there is a source of innovation and strategic renewal that comes from each individual in it (Sari, 2020) (Vandaie, 2020) (Obaid et al., 2023). Human capital reflects the company's ability to come up with the best solutions based on the knowledge that employees have within the company (M. R. Hermawan et al., n.d.) (Ali et al., 2020). In simple terms, human capital is an individual knowledge stock that includes a combination of genetic inheritance, education, experience, and attitudes about life and business (Dewi et al., 2020) (Afiouni, 2007) (Dawson, 2016). Superior human capital does not necessarily produce optimal performance if it is not managed effectively. The development of human capital is a very important part because the education, training, and health of workers / employees will

create forward thinking, in order to advance and create new strategies for the company (Pertiwi et al., 2013a) (Tondi et al., 2015).

The three types of human capital are (Bontis, 2001; Bontis et al., 2000) :

a. Competence based on skills and knowledge
b. Behavior that reflects the level of motivation in the company's leadership quality of management
c. Intellectual agility as the ability of company employees to innovate and adapt.

1.2.2. Structural Capital

Structural Capital or Organizational Capital is the ability of an organization or company to fulfill the company's routine processes and structures that support employee efforts to produce optimal intellectual performance and overall business performance, for example: company operational systems, manufacturing processes, organizational culture, management philosophy and all forms intellectual property owned by the company (Garcia-Alvarez et al., 2011) (Nugroho, 2012) (Almaududi et al., 2022).

Structural capital or organizational capital is the ability of organization or company in fulfilling the routine processes of the company and its structure that supports the efforts of employees to produce optimal intellectual performance and overall business performance, for example: company operational systems, manufacturing processes, culture organization, management philosophy and all forms of intellectual property owned by the company (Nourani et al., 2018) (Nugroho, 2012) (Hsu & Fang, 2009). Structural capital is defined as a general system and framework for problem solving and innovation, strategic capital that represents a strategic and strategic framework that leads to the design, development and dissemination of knowledge (Murtadlo, 2021) (Wang et al., 2014) (Alipour, 2012). Structure Capital, referred to as the ability of an organization or company to fulfill the company's routine processes and structures that support employee efforts to produce optimal intellectual performance and overall business performance (Cahyati, 2011) (Choudhury, 2010) (Bollen et al., 2005).

Structural capital includes non-human storehouses of knowledge such as databases, organizational charts, process manuals, strategies and everything that makes a company's value

greater than material value (Dewi et al., 2020) (Kianto et al., 2017). Structural capital includes every element of the organizational structure that facilitates the ability of employees to create wealth for the company and stakeholders (Novandalina & Budiyono, 2021) (Komnenic & Pokrajčić, 2012) (Azzahra, 2018). Without structural capital, it will only become human capital which if it fails will have an impact on the success that will be achieved by the company (Sari, 2020) (Chowdhury et al., 2019).

In research conducted by (Sari, 2020) explains that an individual can have a high intellectual level, but if the company has bad systems and procedures, IC cannot achieve optimal performance and the existing potential cannot be optimally utilized, so that structural capital much needed to support other IC components in generating value and company performance.

1.2.3. Relational Capital

Relational capital is a harmonious relationship that a company has with its partners, both from reliable and quality suppliers, from loyal customers who are satisfied with the company's services, from corporate relations, as well as with the surrounding community (Zahoor & Gerged). , 2021; Zhang & Wang, 2018) (Daat, 2019). The main goal of Relational Capital is the level of trust, respect and friendship arising from close interactions between internal and external partners (Kale Et Al, 2000 in (Firmansyah & Sukarno, 2021).

Relational capital refers to a series of economic, political, and institutional relationships that are developed and enforced between universities and non-academic partners (companies, non-profit organizations, local governments, and society in general) (RS Wardhani et al., 2019) (Veltri et al., 2014) (Wijayanti et al., 2022). Relational capital includes relations with consumers, relations with colleagues and relations with the public (Susanti et al., 2018) (Ahmed Shah et al., 2020) (Kim & Swink, 2021). Relational capital can emerge from various parts outside the company environment that can add value to the company (Kusuma, 2015) (de Castro et al., 2004) (Jiawei Xu et al., 2022).

1.3. Indicator of Human Capital, Structural Capital, and Relational Capital

Indicators or characteristics of human capital, structural capital and relational capital need to be known by the management of the company or organization. The goal is to be able to manage these indicators to become an important asset for the organization which is then expected to be

able to improve performance, competitiveness and welfare. Several HC, SC, and RC indicators have been formulated by many experts, including :(Garcia-Alvarez et al., 2011; Hosseini & Owlia, 2016; Kale et al., 2000; Katona, 2021; Manzari et al., 2012; Molodchik et al., 2018; Namvar et al., 2010; Russell et al., 2015; Sharpe, 2001). The following is an explanation of the HC, SC, and RC indicators

Table 1.3. Indicator of *Human Capital, Structural Capital,* and *Relational Capital*

IC	The Key of Indicator
Human Capital (HC)	Innovation capacity, creativity, "know how" or know how, previous experience, work team capacity, employee flexibility, tolerance for differences, motivation, employee satisfaction, learning capacity, loyalty, education, formal training, capabilities, employee sustainability, vocational qualifications, job assessment, psychometric assessment, innovative, have proactive and reactive abilities, ability to change, knowledge and skills, employee involvement, emotional intelligence, entrepreneurial spirit, flexibility, employee creativity
Structural Capital (SC)	Organizational routines, management processes, procedures, systems, culture, database systems, organizational flexibility, documentation services, existence of knowledge centers, general use of information technology, organizational learning capacity, organizational culture, intellectual property, management philosophy, information systems, networking systems
Relational Capital (RC)	Customer loyalty, goodwill, supplier relations, public relations, image, customer satisfaction, supplier relations, shareholder relations, commercial strength, negotiating capacity with financial entities, environmental activities, brands, company names, distribution channels, business collaborations, agreements licenses, lucrative contracts, franchise agreements, basic marketing capabilities, market intensity.

Source: (S. Hermawan, 2013)

1.4. The Relationship between Intellectual Capital and Innovation

IC is closely related to innovations carried out by organizations or companies. In the IC component, there is human capital that is able to make very significant changes, including in innovating. HC is able to create and compile structural capital such as operational procedure systems, information communication technology systems, database systems, corporate culture, network systems, and other SC indicators. HC is also able to create and compile relational capital such as making loyal consumers, consumer satisfaction, good relations with the community around the company, business collaboration, product brands, activities with the environment, and other indicators. HC itself is also able to form HCs that exist in organizations or companies. HC is able

to form creativity, innovation capacity, form a good work team, form employee competence, employee satisfaction, employee achievement, knowledge, skills and attitude. Thus the IC owned by the organization will be very capable of creating innovations to improve performance and competitiveness.

In addition, through innovation, the companycan improve the company's global position and achieve the status of a world-class producer of goods (world class manufacturing). The more management supports new innovations that emerge, the more the company increases the value of its innovation capital.(Anatan & Ellita, 2005) (Pertiwi et al., 2013b). Innovation is an attempt to exploit change into an opportunity for an organization, or how to exploit a new idea successfully. Building company excellence through the process of innovation to the organization's products and services becomes inevitable because Innovation has a very large correlation between the success of the company in this case good performance. (Pertiwi et al., 2013b)(Pertiwi et al., 2013b)

Business actors in order to survive, grow in such fierce competition determined by small and medium-sized businesses in the management of their intellectual capital so as to cultivate creative ideas to create a product innovation (Humairoh & Budi, n.d.). The main key to innovation lies in the intellectual capital of the organization, namely humans and their ural struct capital, so that anoptimal innovation must be supported by good human capital and supported by structural capital, namely organizational culture. (Pertiwi et al., 2013b) So in this case the management of intellectual capital as a foundation to produce innovation. In this case, it can be concluded that intellectual capital is closely related to innovation.

1.3. Intellectual Capital and Innovation

Several studies have been conducted by experts to make the link between intellectual capital and innovation. Research results from (Ur Rehman et al., 2022) said the study explores the central question regarding the relationship between intellectual capital (IC) and innovative performance of organizations through the mediating role of management control systems (MCS) and business strategy, as well as the moderating role of innovation capabilities. Data was collected from managers of small and medium enterprises (SMEs) through a structured questionnaire. Of the 1,152 questionnaires distributed, only 415 were used for analysis purposes. Structural equation

modeling (SEM) is used to test the research hypothesis.Intellectual capital significantly influences MCS, business strategy and innovative performance. In addition, MCS, business strategy and innovative capabilities significantly improve innovative performance. MCS and business strategy significantly mediate the relationship between intellectual capital and innovative performance. Finally, innovative capabilities significantly moderate between intellectual capital and innovative performance.

Current research examines how management should use MCS, business strategy, and innovative capabilities to take maximum advantage of intellectual capital in order to enhance innovative performance. This is pioneering research developing a theoretical model to combine intellectual capital, MCS, business strategy, innovative capability and innovative performance. Although the influence of various types of intangible assets/resources on innovative performance has been extensively studied in the literature, little attention has been paid to the role of MCS, business strategy, and innovative capabilities in leveraging firm intellectual capital.

Meanwhile, research results from (M. A. Ali et al., 2021) said there is a high trend for the conversion from statistical economics based on measurement of tangible assets to investigating the drives of intangible capital in the current state of economies around the world. The implications of intellectual capital for innovation performance have attracted much attention from researchers in the global arena. This study questions the impact of intellectual capital on innovation performance in the banking sector as an influencing non-tangible asset. In addition, the role of dynamic capabilities in moderating the relationship between intellectual capital and innovation performance is examined. The purposive sampling technique was applied to 364 participants from Iraqi commercial banks as a research context. Furthermore, structural equation modeling (SEM) was used to analyze the data collected from the survey questionnaire using SPSS.v25 and AMOS.v24. This study finds that the level of employee intellectual capital increases significantly towards innovation through the moderating role of dynamic capabilities between intellectual capital and innovation performance in the commercial banking sector for better competitive advantage. Consequently, this research provides valuable insights and guidance for academics and practitioners on the impact of developing intellectual capital in enhancing competitive performance, particularly in the context of Iraqi commercial banks.

The next research results from (M. A. Ali et al., 2021) said over the years, several studies have been conducted to identify the impact of various components of intellectual capital on

organizational performance. However, most of this work strongly replicates the application and use of different components of intellectual capital (human, structural, relational, social) without addressing the drawbacks regarding their empowerment of organizational innovation perceptions. Based on this fact, we comprehensively review the existing literature which greatly influences the innovation performance of the financial sector. Standard inclusion and exclusion criteria were used for critical and systematic evaluation of the previous studies. It identifies the main limitations of the efficiency of the intellectual capital component in the financial sector which can greatly affect the desired innovation performance in a dynamic and competitive market scenario. In addition, a correlation was established between the organizational growth of the intellectual capital component and innovation performance, leading to positive implications on the development of the intellectual capital component.

Research results from (Bontis et al., 2020) said the main objective of this research is to investigate the impact of intellectual capital on innovation in pharmaceutical manufacturing SMEs operating in Karachi. This empirical research is based on a survey of 97 pharmaceutical manufacturing SMEs. Purposive sampling technique was used to select targeted respondents. Multiple regression analysis was applied to test the proposed research hypothesis. The findings show that intellectual capital has a positive impact on the innovation of SMEs operating in the pharmaceutical industry in Karachi. This study will help to understand the importance of intellectual capital in innovation in SMEs and provide guidance to use it wisely. This research contributes to the existing literature by investigating the effect of intellectual capital on innovation of pharmaceutical manufacturing SMEs in Karachi. This is the first study in Pakistan and makes a contribution in the existing theory of intellectual capital. This will provide a theoretical basis for future research efforts.

Research results from (Nejjari & Aamoum, 2020) said in this study, a careful summary of all the main investigations in response to the relationship between intellectual capital and innovation is achieved. A meta-analysis technique was applied to set the data in context and to determine the utility of the proposed research, this approach allows a systematic review of the sources of information that are correlated with the two research predictive variables related to intellectual capital and innovation.The results of a systematic review reveal that intellectual capital is a generator of innovation in companies. This paper will provide support to investigators intended to work in this field. This article provides some insight and provides answers for future researchers

to questions such as what markers does the work involve? What theories are established in this field and data selection mechanisms are preferred by scientists in the field?

Research results from (M. A. Ali et al., 2021) said The purpose of this study is to explore the impact of intellectual capital on achieving competitive advantage in organizations. It also aims to explore the impact of innovation mediation on the relationship between intellectual capital and the attainment of competitive advantage. To meet the research objectives, the researchers reviewed the relevant literature. Researchers also provide definitions for intellectual capital and innovation. They also identify dimensions of intellectual capital (ie structural, human and relational capital). This study identifies the types of innovation (incremental and radical innovation) and finds that intellectual capital has a significant effect on achieving competitive advantage. In addition, this research finds that innovation has a mediating influence on the relationship between intellectual capital and the attainment of competitive advantage.

CHAPTER II

INNOVATION

2.1. Definition of Innovation

The word "innovation" is often translated as anything new or renewed.(Haryanto, 2007) (Baregheh et al., 2009; Kogabayev & Maziliauskas, 2017) Innovation is also defined as a new idea that is felt by various parties either individually or in groups. (Rahmi, 2020a) In general, innovation is defined as an idea, practice or object that is perceived as something new by an individual or another unit of adoption (Nisrokha, 2020) (Yan et al., 2011) (Amabile & Pratt, 2016). Meanwhile, inovation can refer to something new or a change made to an existing product, idea, or field. Innovation is everything (in the form of ideas, practices, goods or objects) of changes made with systematic planning to bring about positive change and be considered new to a person or group of people who use it (Haryanto, 2007) (Quattrone & Hopper, 2001). The understanding of innovation eventually becomes broad but basically innovation is a process that is not only limited to creating new ideas or thoughts which ide must be implemented through a process of adoption, and adoption is the decision to use innovation as a whole as the best way of action (Fatimah et al., 2021).

Innovation is also an effort of research, development, engineering carried out to obtain the practical application of a new science or a new procedure in the application of previously existing science and technology into a new process or new product (Wijaya et al., 2019) Innovation is also often used to refer to changes that are perceived as new by a society that experiences (Soraya, n.d.). Innovation requires the courage to be ready to leave the old way to a new, more effective and more quality way (Setiawan & Sukatin, 2020). Creating innovations must be able to determine what kind of innovation should be done in improving services so that these innovations can be useful and last a long time (Febrian, 2018) (Bitner et al., 2007) (De Jong & Den Hartog, 2007) (Ville, 2008).

Innovation can be positive or negative (Suyatno, 2010) (King et al., 2007) (Leydesdorff & Ivanova, 2016). Positive innovation is defined as the process of making changes to something that is already established by introducing something new that provides added value to customers whereas negative innovation causes customers to be reluctant to use the product because it has no

added value, damaging the taste and trust of customers is lost. Thewhole innovation includes all forms of new information, thoughts, ideas, practices, and values previously unknown to society that are then accepted and can be used by the wider community to change something that already exists or create something new for performance improvement or improvement efforts.(Wijaya et al., 2019)

2.2. Innovation Objectives

The purpose of innovation is to develop or improve things to create new ideas or thoughts. Innovation is also often used to refer to changes that are perceived as new by the society that is experiencing . Innovation is used to create a product that was previously in order to add value to a product. Innovation is referred to as a tool for organizations to exploit ideas, produce something new, a tool of change in the organization, to make the organization better, faster, more productive, more efficient and even higher performing. (Soraya, n.d.)(Siringoringo & Madya, n.d.)

Based on the research conducted by (Nisrokha, 2020) the objectives of the innovation as follows:

a. achieving dynamic equilibrium in social systems
b. improving and developing quality
c. Generating new markets
d. Improving the production process reduces costs
e. Reducing waste
f. Changing services.

2.3. Benefits of Innovation

Innovation is expected to provide benefits and can bring change. So here are some of the benefits of innovation (Everett, 2003 in (Wijaya et al., 2019) , among others :

a. Individual point of view

   An innovation provides a platform for a person to express and distribute his creativity in creating something useful.

b. The point of view of the company

   Innovation provides benefits in increasing sales figures and profits that will be of great value to the survival of the company.

c. Market point of view

The diversity and quality of new products that increase due to innovation, resulting in the market becoming increasingly competitive.

d. People's point of view

Innovation can improve the quality of life because it can answer many problems and needs that were previously lacking or unable to be met.

2.4. Characteristics of Innovation

Innovation has the following characteristics: (Rahmi, 2020b; Suntari et al., 2022)

a. the existence of relative profit, meaning that something is said to be innovation if it can be profitable for the person who receives it, the more profitable the innovation, the faster it will spread in society.
b. compatible is the suitability of innovation with value, this is related to the experience and also the needs of the person who accepts the innovation.
c. complexity, that is, the degree of difficulty in understanding and using innovations.
d. triability, existing innovations are acceptable or not by the recipient.
e. observability, these existing innovations can really know the advantages

Meanwhile, ada 5 new product categories, including:

a. A completely new product, that is, a new product as a result of innovations that create a new market.
b. New product lines, that is, new products that allow the company to enter a previously existing market for the first time.
c. Additions from existing product lines, for example, can add to the size of the shape, different contents and so on.
d. Improvements as revisions to existing products. This can be done by adding new traits or models, changing processing requirements/needs, and changing product elements.
e. Repositioning costs. New products that produce the same performance at a lower cost level.

Innovation itself has four main characteristics, namely having peculiarities or uniqueness that can be in the form of ideas, ideas, systems or stages, having a new nature, implemented through a planned program, and must have the desired end goal.(Wirapraja, 2018)

Based on the research conducted by the following the characteristics of innovation are as follows:(Wijaya et al., 2019)

a. Compatibility

   These characteristics describe the suitability of an innovation to the needs, values, and previous experience of the recipient. Innovations that do not match the recipient's conditions will cause innovations to be difficult to accept or accept slowly compared to innovations that have conformity with society.

b. Complexity

   This characteristic is the level of difficulty to understand and use an innovation by the user or receiver. The easier the innovation is to be used and accepted by users, the faster the dissemination of information will be understood by the wider community and vice versa.

c. Relative advantage

   This characteristic relates to the measure of the benefits of innovation to the user or the receiving society. The size of these benefits can be based on social, economic, satisfaction, or other components that the user finds particularly necessary or important. The greater the benefits received and felt by users, it will be able to speed up the process of disseminating innovation information to the public.

d. Observability

   This parameter relates to the ease with which an innovation shows its results or how easily the results of an innovation can be observed by users. When the results of an innovation that is considered useful can be easily observed by users, then the innovation will be more quickly accepted by users. On the other hand, if the results of the innovation are difficult to observe, it will further slow down the process of disseminating innovation information.

e. Triability

   This includes whether or not an innovation can be tried by the recipient before the application of the innovation. If an innovation can be tried and show its benefits and advantages in the experiment activity, then the innovation will be easier and faster to accept.

Basically, every change must have obstacles that deny the existence of renewal in a process. Most individuals must have mechanisms of resisting and accepting change. So that the following are obstacles to innovation (Nisrokha, 2020) , including:

a. Geographical Barriers. This happens because Indonesia consists of various islands that are very difficult to innovate in education on their own. Whether it's in distribution or the introduction of innovation itself.
b. Economic Barriers. There are economic differences from each individual or related agency in terms of developing innovations in education
c. Procedural Barriers. Namely obstacles in terms of implementing innovations in the field of education, this includes the technical implementation of the innovation itself.
d. Personal Barriers. Personal barriers include things: lack of reinforcement (gifts). For recipients and users of innovation, people who play an important role in society are not open to accepting and implementing innovation, rigid attitudes and narrow knowledge of individuals who actually have an important role in the project, as well as personal conflicts.
e. Social Barriers - Culture. The socio-cultural obstacle that is taken most seriously is the existence of ideological conflicts about change (innovation). Other things related to social culture that hinder innovation are the lack of an atmosphere of open exchange of ideas, differences in cultural values, and the lack of harmonious relationships between members of the innovation project team..
f. Political Barriers. As for what includes political obstacles, there is a good relationship with political leaders, the change of government will make it difficult to continuously develop the implementation of planned programs, education that handles innovation projects does not know political realities, there are objections to innovation projects based on golonagan interests, lack of understanding and lack of attention from political leadership
g. Psychological Barriers. Psychological barriers are obstacles caused by factors that exist in a person. Included in these obstacles or obstacles include the placement of teacher lifters, costs and facilities, communication systems, Coordination systems between consumers and procedures and Traditional Attitudes (primitive ways of thinking).

2.4.Stages of Innovation

Innovation arises because there are several processes called stages of innovation. The following are the stages of innovation (Wijaya et al., 2019) , including:

a. Necessity recognition

The first stage in innovating is to identify the needs and problems that occur in society. These needs and problems can be observed through phenomena that occur in the community environment or through some in-depth previous research.

b. Basic research and applicative research

Basic research is carried out to explain a phenomenon that is scientific in nature, while applicative research is carried out with the aim of providing solutions to practical problems that exist in society. From the basic research and applicative research carried out, an idea or ideas will be produced that can meet the needs or solve problems that exist in society.

c. Development

In the development process, determination and passing on new ideas generated from the previous stage are carried out, which are believed to be solutions to problems that exist in society. At this stage, the formulation of an innovation is made to be offered as a solution to community problems.

d. Commercialization

This stage is carried out after the innovation has been developed and is ready to be distributed, deployed, and marketed to its users. At this stage, an innovation first contacts / interacts with users through socialization activities or marketing innovation products.

e. Diffusion and Adoption

It is the last stage and determines whether an innovation can be accepted or rejected by the community.

2.5. Innovation Continuum

According to the Continuum Innovation is the basis of all efforts to rationalize material creativity into a scientific platform for future design. This continuum allows us to trace the fundamental basis of all intelligent design. Simplicity is taken from natural events and interpreted into scientific laws (Hitcher, 2006) (Kalantzis & Cope, 2010). Akan tetapi, ini bukan sesuatu yang bisa begitu saja didefinisikan dalam beberapa baris kalimat. The law is so abstract when compared to everyday necessities that it really takes the intellectual leap of a genius to bridge the gap. The difficulty in innovation is twofold. The number of possibilities for combining the laws that govern the universe, with the strangeness of the demand of six billion people, is statistically very

numerous. Second, produce successful product designs out of thin air without design patterns (Fu et al., 2015).

2.6. Higher Education Innovation in the Era of Disruption

Innovation is a complex social process, and not something we should take for granted (Johnson et al., 2006) (Schwarzmann, 2010). Therefore, although this section has highlighted diverse technological advances with the power to change the world, it is important that we pay attention to how we can ensure those advances continue to be made and directed towards the best results. Several concepts about higher education in response to the era of disruption were formulated by a number of researchers (Pearlin et al., 2005) (Harimurti, 2022). Two of the various concepts offered are *entrepreneurial universities* and academic firms. Meanwhile, Indonesia massively uses the concept of an independent campus as a motor for higher education reform to adapt to the demands of the industrial and business world (Marginson, 2007).

2.7. University of Entrepreneurship and Academic Firms

Academic institutions are often considered one of the leading places to pursue forward-thinking ideas (Hitcher, 2006). The current kari e r and funding conditions at the university support additional research and conservancyrather than bold and innovative programs. This is likely to be advantageous because tertiary institutions have high expectations of being at the forefront of innovation. Meanwhile, on the other hand, universities are also required to produce graduates who have qualified capabilities and competencies when they graduate. The future of graduate employment, in the context of the global labor market, characterized by frequent changes in employment, employment, and location, also potentially involves periods of independent or involuntary contract work (Rajan et al., 1997)

One of the concepts that is said to be able to make a university into an institution that can be at the forefront of innovation as well as a place to learn that students can rely on is the concept of *an entrepreneurial-based university (entrepreneurial university*). This concept is considered by (Gibb et al., 2013) research centers as well as places for students to develop themselves to become graduates who are ready to enter the world of business and industry. Globalization demands the capacity of graduates to think and act both locally and globally in an entrepreneurial way. Burton

Clark, in ((Gibb et al., 2013), argues that based on a number of case studies (including two British universities) there are five main components of the organization of the university of entrepreneurship:

a. There is a strong central direction to embrace management groups and academia;
b. Expanded development boundaries involving the growth of units reaching beyond traditional areas of the university;
c. diversity in funding base, not only by using third-stream government funding but from a variety of sources;
d. a stimulated academic center with academics committed to the concept of entrepreneurship;
e. an integrated entrepreneurial culture defined in terms of shared commitment

Strong management with a steady network is necessary for universities / colleges, but they also need to determine the right educational direction in order to be able to produce graduates who are truly expected by the community. There are many opinions about the expected graduate figures. One of the influential detractors is that the new 'DNA' of knowledge is 'polyvalentsi' and intellectual which involves the merging of interdisciplinary elements of itas, teori, and practical an (Viale & Etzkowitz, 2005)(Viale & Etzkowitz, 2005) Meanwhile, Etzkowitz (in (Gibb et al., 2013) argues that current attention to the cultivation of broader knowledge brings the university back to its original purpose. Meanwhile Michael Crow, president of Arizona State University, a major US research university, argued the case for a 'New American Research University' with academic firms as an 'organizing principle'. Its targets for such organizations are:

a. academic excellence focused on maximizing social impact while relying on social support;
b. Competitiveness;
c. Agility;
d. adaptability;
e. inclusivity;
f. focus globally but also locally;
g. responsive to changing needs;
h. and quick decision-making ability.

Universitas is seen as a 'force to carry out transformations in society' with a culture of academic institutions that aim at relevance based on users and can break through discipline-based boundaries. The concept of '*citizen scholar*', is also increasingly debated in the US (Cherwitz,

2005) However, in line with this, the focus is on individual empowerment. These concepts have primary organizational and physical designs, as well as intellectual implications.

Meanwhile, (Carayannis & Formica, 2013) presents the concept of "academic firm" as a reaction and adaptation of universities to the increasingly severe challenges of increasing knowledge and innovation. Knowledge groups and innovation networks of entrepreneurial universities and academic enterprises (academic and commercial enterprises) generate synergies and 'creative environments' to trigger and advance performance in a knowledge-based economy and society. "Hibridization" is an important thing to add diversity and pluralism, and it is not just simple conversion of fusion from universities and companies because gratuitously fusing the concepts of college and company will have a negative effect. Academic firms will demonstrate the expansion of academia into the business world (e.g., 'academic culture and values', high-quality publishing and *life-long learning*).

Entrepreneurial University also shows the expansion of some elements of business into academia. The implication of academic firms is that some concepts or strategies (such as publishing versus patents) can be discussed in parallel for academia and business. 'Academic entrepreneurship' is given with extended meaning. Hybrid configurations of knowledge clusters and innovation networks can be approached from an organizational perspective (universities and companies) or from an individual perspective (individual entrepreneurs). Academic entrepreneurship ties those features together, creating an entrepreneur of academic knowledge.

2.8. Innovation and University Performance

Innovation is needed by any organization including universities. Much research has been done to analyze the importance of innovation for university performance. The first research from (Fan et al., 2019), said the nature of funding sources for university-industry collaboration (UIC) has changed gradually, which may motivate universities to pursue different goals. Therefore, the question arises whether and how funding sources affect higher education innovation performance. This study explains this relationship using organizational control theory. The results of structural equation modeling using partial least squares based on a sample of 146 Taiwanese universities reveal that government and industry funding facilitate UIC management mechanisms and regulatory implementation, which in turn influences university innovation performance. In addition, government funding has a greater impact on implementing UIC regulations and industry

funding has a greater impact on establishing UIC management mechanisms. The results also reveal that only industry funding has a positive influence on a university's innovation climate. The policy implications are discussed at the end of this paper.

The second research from (Abdulai et al., 2020), said this paper examines the relationship between university-industry collaboration and firm innovation performance, and the influence of informal mechanisms of knowledge transfer on such associations, using data from a survey of 245 firms in Ghana and using partial least squares structural equation modeling. The results are highly relevant to the business community and policy makers in Ghana and West Africa. We find that while university-industry collaboration is positively related to innovation performance in firms, informal mechanisms of university knowledge transfer are not and negatively moderate the positive relationship between university-industry collaboration and innovation performance in firms. It was also found that in order to facilitate the outcome of innovation, a legally binding formal contract is required. This study recommends that university knowledge generation and innovation policies in Ghana encourage formal collaboration between knowledge exchange actors. It is also suggested that improvements need to be made to the effectiveness of intellectual property laws in Ghana.

The third research from (Maulani et al., 2021), said information technology encourages various forms of organizations to always adapt to changes so that they can maintain their business for a long time. Higher education is an organizational entity that is required to use information technology to support existing business processes. This study aims to examine the extent to which information technology resources have an influence on innovation performance in tertiary institutions. Quantitative research methods were used to determine this effect by involving 97 respondents who work in tertiary institutions in Garut, Indonesia, in addition to processing and modeling research using SmartPLS. The results of the analysis show that information technology resources have an important role in creating increased innovation performance in higher education, especially in terms of product innovation. The research was only conducted at private universities in Garut Regency. Therefore, further research involving universities within the national scope is recommended. The results of this study indicate that universities which are expected to be ready to face change need to involve information technology in creating innovations in order to survive. The influence of information technology resources on the innovation performance of private

tertiary institutions in Garut Regency has never been studied before; therefore, we consider that our research makes a new contribution to the field.

The fourth research from (Chen & Shu, 2021), said this paper explores the scientific & technological innovation performance of world-class universities in China from 2014 to 2019, based on the super-efficiency DEA model and the Malmquist index. Then we provide a new five-dimensional analysis framework to examine the factors that influence the efficiency of their science and technology innovation with the Tobit-DEA model. The results show that 36.6% of the sample universities are efficient DEAs, and the efficiency varies according to type and location. In addition, the technical efficiency index of higher education institutions is relatively high and the total factor productivity fluctuates, which is reflected in the ability to transform scientific research results into practical productivity. From the perspective of dynamic analysis, the sample university is developing slowly at the forefront of science and technology innovation efficiency. In addition, the performance of science and technology innovation is closely related to the quality of inputs and the structure of matching scientific research elements, government relevance, and the level of industry-academic-research collaboration. Among these main factors, the high proportion of permanent teachers with senior degrees, reasonable resource allocation structures, and government support had a significant positive impact, while the number of international academic participants had a negative impact.

The fifth research from (Costa et al., 2021) said open innovation has proven to be decisive in the rationalization of sustainable innovation ecosystems. Companies, universities, governments, user communities and the environment as a whole are called upon to contribute to this dynamic process. This study aims to contribute to a better understanding of the impact of open innovation on firm performance and to empirically assess whether university-industry collaboration complements or replaces these activities. Primary data was collected from a survey covering 908 companies, and then combined with performance indicators from SABI (Spanish and Portuguese business information). Econometric estimates were run to evaluate the role of open innovation and university-industry collaboration in firms' innovative tendencies and performance. The results highlight the importance of diversity in collaboration with academia and open innovation strategies as enhancers of corporate performance. The two activities reinforce each other. By examining the impact of open innovation practices on firm performance, the need for heterogeneity in terms of contact type and university is also demonstrated. The findings highlight the need to reformulate

existing policy packages, strengthen links with academia as well as promote open innovation strategies. Linkages with innovation ecosystems need to be further encouraged as well as the ongoing promotion of linkages with knowledge sources within an open and multilateral framework.

The sixth research from (Wibowo et al., 2020) said the purpose of this study was to measure the effect of hard skills, soft skills, organizational learning, and innovation capabilities on the performance of lecturers at Islamic Universities in Indonesia. Data collection was carried out by simple random sampling on 261 populations of Islamic Universities in Indonesia. The results of the returned and valid questionnaires were 244 samples. The SEM method with SmartPLS 3.0 software is used for data processing. The research findings reveal that hard skills, soft skills, organizational learning, and innovation capabilities have a direct positive and significant effect on lecturer performance. In addition, soft skills have the greatest influence on lecturer performance among other variables. This study proposes a model for fostering the performance of lecturers at Islamic Universities in Indonesia through increasing hard skills, soft skills, organizational learning, and innovation capabilities. This research can pave the way for increasing lecturer readiness in facing the education era 4.0.

CHAPTER III
INDUSTRIAL REVOLUTION 4.0 AND CURRICULUM FOR ACCOUNTING STUDY PROGRAM

3.1. The Journey of the Industrial Revolution

Etymologically, the industrial revolution in modern history refers to changes related to the industrial sphere. Referring to the Encyclopedia Britannica (Gaur et al., 2022) this term is then synonymous with the change from an agrarian-based economy and handicrafts to an economy that is supported by the majority of industries with machinery manufacturing.

These rapid changes are most obvious in the field of technology, which then "forces" changes in fundamentally new ways of working and lifestyles. This process began in England in the 18th century and from there spread to other parts of the world. Although used previously by French writers, the term Industrial Revolution was first popularized by the British economic historian Arnold Toynbee (1852–83) to describe the development of the British economy from 1760 to 1840. Meanwhile, (Mokyr, 1999) argues that in fact the indusri revolution was a series of events referring to a number of major changes in Britain (which later spread to various European countries) at that time. The term revolution is underlined because it describes the rapidity of the changes taking place. This revolution in industry certainly cannot be juxtaposed with a revolution in the political sphere that refers to actions or an atmosphere of chaos.

Since the time of Toynbee, the industrial revolution has been applied more widely, especially in the process of economic transformation, especially in western countries. Meanwhile, some Asian regions that tend to be targeted by colonialism and imperialism did not start an industrial revolution until the beginning of the 20th century. Written by (Gaur et al., 2022)some of the main characteristics in this first stage of the industrial revolution include technological, social and economic, and cultural aspects. A shift in behavioral tendencies in technology is seen in the use of basic materials for industry. At this time, iron and steel became the main raw materials in the industry. Related to the invention of the steam engine, the effect that arises is the transition of energy source preferences. Coal is the most favorite source of energy, followed by the increasing frequency of use of steam engines. In the next phase, tools appeared that began to be based on electricity and petroleum. Engines with an internal combustion type are also widely used by the community.

Innovation is also another major feature of this revolution. At this time, several new machines were invented, such as spinning devices and electric weaving which made the industrial sector more free to increase production capacity without spending much wages to pay human workers. It was also this period that later made significant changes in people's lives, especially in urban and urban areas. Cities in England gave rise to organisations with a new iystem known as the factory work system. This system of work gave rise to a firm division in divisions within the industry, such as production-specific sections, managerial-only sections, and so on. In addition, the rise of manufacturing-based industries has also triggered a number of phenomena such as the transition of professions from farmers to manufacturing workers, the emergence of labor groups, and the phenomenon of urbanization.

As a result of innovation in mechanics, the transportation sector has also had a very significant impact. Human mobilization was carried out by new types of vehicles such as locomotives and steamships, cars, and airplanes. Meanwhile, developments in the field of communication were supported by telegraphs and radio. Finally, the escalation of various kinds of innovations has boosted the rapid development of science in the industrial field due to the need for mass production from business actors.

3.2. Industrial Revolution 1.0

The first period of the industrial revolution took place in England in the period from about 1760 to 1830. At that time, the British realized that the beginning of the change occurred in their country, so they took a number of policies such as the ban on export activities for important commodities, namely skilled workers, machinery, and manufacturing techniques. However, theBritish economy turned out to be unable to proceed as expected, because their citizens actually saw a good business opportunity abroad. Meanwhile, entrepreneurs from other countries in Europe smelled the opportunity to attract experts to develop industries in their own countries. Eventually two Englishmen, William and John Cockerill, brought changes in this industrial field to the Belgian state through the development of engines in Liège around 1807(Gaur et al., 2022) Finally, Belgium came to the fore as the first country outside the UK to undergo significant changes in the economic sphere.

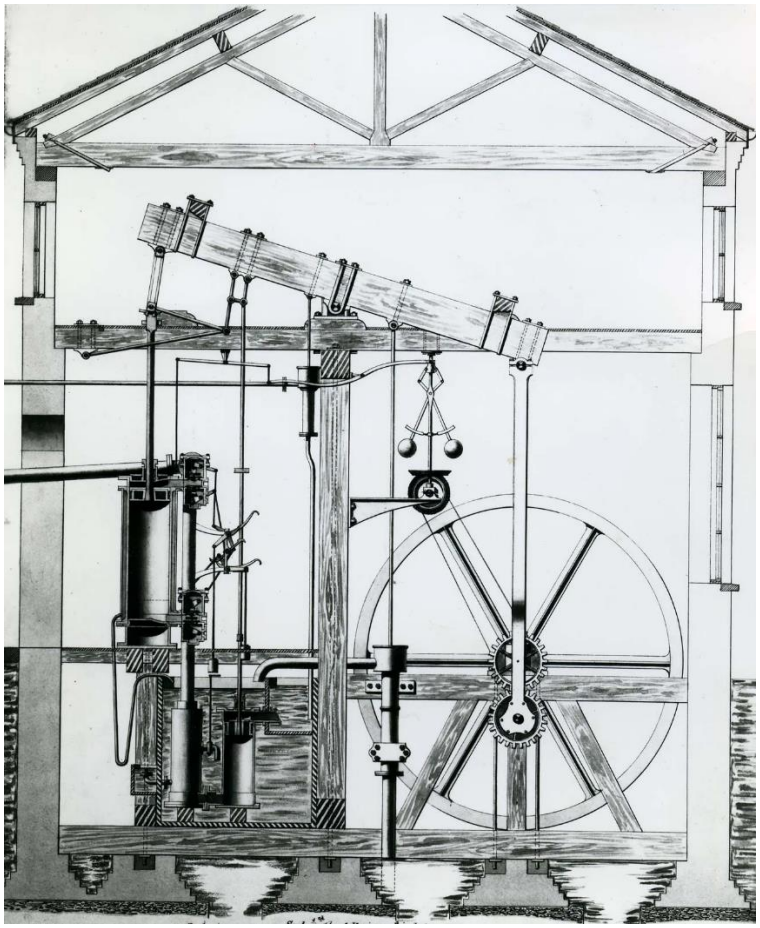


Figure 3.1. James Watt Steam Engine Design Illustration

Source: https://cdn.britannica.com/35/60535-050-167C3CCD/James-Watt-steam-engine-gear-drawing-Science-1788.jpg

The main features involved in the Industrial Revolution are technological, socioeconomic and cultural. These technological changes include:

a. use of new base materials, especially iron and steel
b. the use of new energy sources, including fuel and motive power, such as coal, steam engines, electricity, petroleum, and internal combustion engines,
c. the invention of new machines, such as spinning and electric looms that allowed increased production with a smaller expenditure of human energy,
d. a new work organization known as the factory system, which entails an increase in the division of labor and the specialization of functions,

e. important developments in transport and communication, including steam locomotives, steamships, automobiles, airplanes, telegraphs, and radios,
f. the increasing application of science to industry. This change in technology allowed an increase in the greatly increased use of natural resources and the mass production of manufactured goods.

Apart from the influence on theindustrial sector as written in the paragraph above, many developments within the nonindustrial sector have also emerged. These influences arise in the economic, agricultural, social and cultural spheres, and even in the political sphere. Pertanian became one of the vital buffers in life during the industrial revolution because the non-agricultural population was larger than the agricultural population. Changes in the economic sphere triggered a wider distribution of income and wealth.

Experts think that the revolution in agriculture in England in the period 1700-1860 was triggered by three main things, namely urbanization, increased incomes, and an increase in population (Clark, 1999). There is a shift in the size of wealth that also has an impact on the models of community work. In its early days, land was the main source of wealth . Landowners have a high economic position because the main transaction of trade is agricultural commodities. When industry began to squirm, wealth was no longer sourced from agricultural products but from the results of people working in various industries. In addition, economic activity is increasing rapidly as cross-regional and cross-border trade activities develop rapidly, thanks to the development of transport.

If agriculture and the economy are the most directly affected aspects of the development of the industrial revolution, there are other aspects that have undergone changes but not directly. These aspects include political, social, and cultural. A shift in economic power and new things requires a new set of rules and policies. At this time, various new ideologies also emerged as a result of various new phenomena. Meanwhile, due to various new things that trigger changes in people's lifestyles, social aspects are also affected.

As a result of new jobs absorbing large numbers of workers, a new class in the community emerged, namely the working class, especially in urban and urban areas. The existence of these phenomena in the social sphere also ignited changes in the cultural sphere. Workers acquire new and distinctive skills, and their relationship with their duties shifts. If previously they tended to be

independent workers who worked with ideas and tools, they became machine operators who had to be submissive to factory discipline.

3.3. Industrial Revolution 2.0

The course of the industrial revolution in this second stage may seem "crowded" with the first period because of the very narrow time span. The first Industrial Revolution took place at the end of the 19th century while the 3rd industrial revolution squirmed at the beginning of the 20th century. Periodically, this period is then also characterized by the term periodization of the modern period. The determination that the second stage of the revolution as well as the modern period is in the difference in character of its industrial development. According to (Nurdiana & Pandin, 2021) most significant difference from the first and second waves is the emergence of a new trend of electric power use that is slowly shifting the use of steam-powered engines. In addition, the most obvious difference is that there is a major change in production patterns from manufacturing to mass industries. This blend of mass production uses of electrical energy was prominently demonstrated by the automobile industry in the late 1800s. Electric power has advantages in terms of cost efficiency compared to steam engines.

Developments in the industrial field at this time also exist in the use of resources for industrial raw materials. If the previous period was limited to mining materials such as coal and iron, then at this time innovations began to emerge that allowed the use of other metals, such as light metals, rare earth raw materials, composites, and even other products produced as sitnesis such as plastics. Computers have not played a role at this time, but there are already automated operations that are used as one of the backbones of mass production. In the process of car production for example, from the assembly line made separately with the manufacturing line, it first achieved great significance in the second half of the 20th century.

Another thing that really stood out at this time was the beginning of the tendency of oligarchs and corporations in the system of ownership of sala-means of production. The mass production system raises the possibility of a business / industry expanding in a relatively short time and makes business owners have large capital. The ownership system is also designed to be controlled by small groups for the reason of the ease of management that is carried out. On the other hand, another system has also emerged, namely shareholding. Individuals, banks, or even insurance

companies can buy shares because the mass production system cuts off large injections of funds to grow into large ones as well.

Figure 3.2. Mass production at the Ford car plant

Transforming the World's Automotive Industry

Source:http://news.bbc.co.uk/2/shared/spl/hi/picture_gallery/07/business_rise_and_fall_of_mass_production/html/1.stm

Mass production also played an important role in the outbreak of World War II (Nurdiana & Pandin, 2021) Aircraft and weapons were mass-produced, allowing countries to invade other regions, and improved defense systems for countries that tended not to lust to expand their territories. If at the first stage there has been a shift in livelihood patterns from an agrarian society to an industrial society, this shift is even more extreme in modern times. In fact, this shift in livelihood patterns triggers people's mobility to urban areas massively.

Another thing that is quite prominent in the distinction between the industrial revolution of this time and the previous period is the breadth of the influence of change. If in stage 1.0 the industrial revolution was only visible in Continental Europe, then in stage 2.0, changes also penetrated into a wider area. The expansion of this industrially distorted territory is inseparable from the influence of colonialism and imperialism. One that stands out is the embryo of one of India's automotive giants, Tata Motor Inc. which developed as a result of the development of the second industrial revolution. As noted by (Nomura, 2018)modern business corporations have

existed in India since the mid-19th century, although their scale is still very limited as they developed under the control of the British colonial government. However, this is a very significant evidence that illustrates how this third stage of the industrial revolution also touched countries on the Asian continent which at that time were considered the object of expansion of European countries.

The wide reach in the period of the second industrial revolution was also supported by a number of innovations that had a major impact on people's lives globally. A number of vital discoveries at this time are mentioned in the following table.

Table 3.1. Innovations And Findings Most Influential In The Second Industrial Revolution

Year/ Period of Discovery	Significant Innovations and Inventions
1876	- Alexander Graham Bell invented the phone. This was the most influential invention, since this would later become the forerunner of modern long-distance communication
1880s	- Increased production and manufacturing - Steel replaces iron in construction because it is strong and low price - Steel was also used to build railways at competitive costs, the construction of ships, skyscrapers, and larger bridges.
The 1890s.	- Phonographs and moving images - Electric generators replaced steam-powered objects2. Modern household items such as refrigerators and washing machines began to be made by utilizing electrical power. - The invention of the internal combustion engine allowed the first car and the first aircraft flight of the Wright brothers in 1903. - Innovation in papermaking, through the invention of paper machines by Charles Fenerty and Friedrich Gottlob Keller. This machine makes paper production cheaper so that the distribution of books and newspapers can be wider. - Pens, mass-produced pencils steam-driven rotary printing presses. - Thomas Edison's deposition of light bulbs became one of the most important things in the life of modern man. Faraday did invent the bulb, but the improvements made by Edison and Swan and the establishment of General Electric are very important because of the widespread and continuous use of this innovation. Almost no society in the world that uses electricity does not know about light bulbs

	- In 1886, Karl Benz patented the world's first car. This first car was designed in such a way as to generate its own power, not just a carriage or a horse-drawn carriage. Benz began selling vehicles in 1888. This eventually became the first commercial car in history. - Henry Ford constructed the first car in 1896 and he was finally able to pioneer the world's most prominent automotive giant with its mass production. FordMotor Company pioneered mass production by employing 40,000 workers in a building complex in Michigan.
1901	- Guglielmo Marconi sent radio waves across the Atlantic Ocean for the first time.

Source: (Agarwal & Pandey, 2021)

The influence of the Industrial Revolution 2.0 is so great, that (Agarwal & Pandey, 2021)it is a milestone in the Golden Age of human civilization. This is a very vital period in the course of human transformation towards modern times. Many people have achieved great glory and wealth, but poverty is also widespread. At this time there were also major expansions and also a period called *The Great Depression* (grand depression). The era of depression occurred in the 1870s and 1890s. There are millions of people who are forced to lose their livelihoods or live in terrible conditions because they are forced to work at low wages.

Figure 3.3. People Lined Up For A Bowl Of Soup In The U.S. State Of Illinois Around 1929

Sumber: https://www.britannica.com/event/Great-Depression

People who work in the industrial sector experience very non-ideal working conditions, long working hours, no compensation for work accidents, no pensions. However, for a small percentage of workers, the industrial system is a new form of freedom. Skilled workers receive high wages in industrial work. Economic independence requires technical skills rather than own shops and equipment. His supporters call it "progress", but those who work in the factory know it comes at a price. Nevertheless, it is indisputable that thanks to these new discoveries and ideas, the second industrial revolution must end as a positive and beneficial time for history.

3.4. Industrial Revolution 3.0

Unlike the timeline of transition from the earliest to the second industrial revolution, the distance between the emergence of the third revolution is quite far. Experts consider that the industrial revolution of this stage began to take place in the era of the 1970s. One of the key factors of the industrial revolution 3.0 is the fading use of human labor in industry, and the beginning of the dominant role of computers in all aspects of life. This, according to (Nurdiana & Pandin, 2021)characterized by the emergence of machines that can move and think automatically, that is, the invention of computers and robots. The first computers of World War II were giants used to decode Nazi Germany.

Meanwhile (Mohajan, 2021)thinks that actually the third wave of the industrial revolution has started quite long before the 70s era. He noted that change had actually begun in the 1950s. The wave of change that this revolution brought reached its peak when the internet began to be used by the general public in the second half of the 1990s, also known as the "dot.com" era. Until now, this third phase of the industrial revolution is still ongoing and is expected to end around the 2030s by (Mohajan, 2021), which also highlights that this is (Mohajan, 2021)twilight of conventional machines and fossil fuels. Tmechanical electronic eknology began to be dominant, as analog shifted todigital electrics.

Computers were increasingly used in the cold war era. Starting at the end of the 20th century computers have developed tremendously rapidly. Komputer is produced with a compact size, efficient in electricity consumption, and increasingly sophisticated when paired with machines that run the production process to replace humans as labor. Workers are still employed

in various industrial fields, but many entrepreneurs who use automatic machines as by (Kaplinsky, 1989) are referred to as the transition from *manufacture* to *systemofacture*. Although computers have begun to take over many human jobs, this does not mean that labor jobs are lost. The existence of globalization makes "Third World" countries become new industrial locations because of abundant human resources at relatively low prices when compared to labor costs in "western" countries.

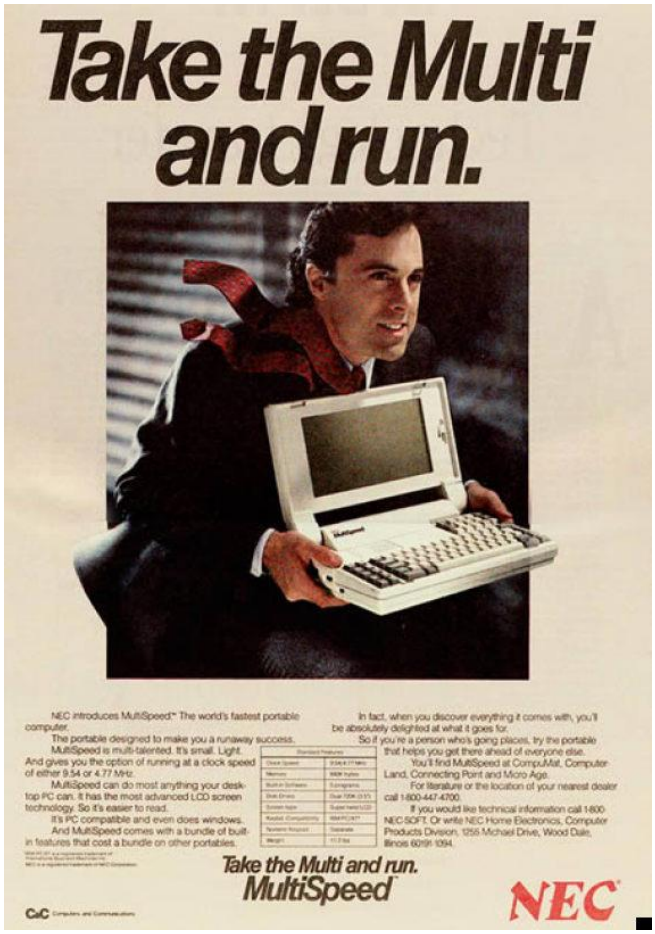
Concepts that are considered friendly to nature, such as green buildings, electric cars, and distributed manufacturing are also dominant at this time. It is based on the transition of energy and digital technologies, and the internet, and is called the "Digital Revolution". The world has recently moved from the information society to the knowledge society and also the ubiquitous knowledge society. Thecorporate industry also brings innovations that take advantage of the findings of nanotechnology, artificial intelligent systems, three-dimensional printing, and robotics. This third wave is also a time full of development and momentum. Not only discoveries that support the industry, several important events also appear and bring enormous influence in the world. Some of the important moments that occurred and were influential in the early stages of the third industrial revolution are shown in the following table.

Table 3.2. Key Moments Rev. Industry 3.0, Adapted From (Mohajan, 2021)

In the 1950s	- American mathematician and computer scientist Richard Hamming discovered Hamming's code at Bell Labs, which is important in *coding* theory; - American electrical engineer Hubert Schlafly (1919-2011) invented the camera teleprompter; - The first credit card (Diners Club) was invented by Frank McNamara, Ralph Schneider and Matty Simmons. - The Korean War (1950–1953) was a battle between the Democratic People's Republic of Korea (North Korea) and the Republic of Korea (South). More than 2.5 million people died including civilian casualties. This became a new round of feuds involving the US with China, after previously the US was hostile to Russia in the cold. - In 1951, American chemist Harry Wesley Coover Jr. invented super glue; - The first video tape recorder (VTR) was invented by American engineer Charles Ginsburg; - Power steering in cars was invented by engineer Francis W. Davis; - The first heart-lung machine was invented, allowing advanced life support during open surgery of the heart

	- In 1951, the famous physicist Albert Einstein warned all countries that nuclear war would lead to a common destruction. - In 1952, the first patent for barcodes was invented by two American inventors Joseph Woodland (1921-2012) and Bernard Silver (1924-1963); - The evolution of digital design and Computer Numerical Controlled (CNC) machines introduced to the market; - The first effective polio vaccine developed by American physician Jonas Salk (1914-1995); - The hydrogen bomb was invented by Edward Teller's team. - In 1955, Tetracycline was discovered that is active against a wide variety of microorganisms. - Optical fiber was discovered by Indian-American physicist Narinder Singh Kapany (1926-2020). - The Vietnam War, also known as, the Second Indochina War; was the conflict in Vietnam, Laos, and Cambodia from 1 November 1955 until the fall of Saigon on 30 April 1975. - In 1956, Hard Disk Drives were invented by IBM; - Southdale Shopping Centre, the world's first closed; - Climate-controlled shopping malls opened in the USA. - The Hungarian Revolution of 1956 was a national revolution against the Hungarian People's Republic and its policies imposed by the Soviets. - In 1957, the first personal computer, the IBM 610, used by one person and controlled by a keyboard, was invented by the International Business Machines Corporation (IBM); - Gamma or sintylation camera, a device used to describe gamma radiation-emitting radioisotopes, was invented by American electrical engineer and biophysicist, Hal Oscar Anger
1960s	- The Organization of the Petroleum Exporting Countries (OPEC) was founded in Baghdad, Iraq, with the signing of an agreement in September 1960 by five countries; Iran - Iraq, Kuwait, Saudi Arabia, and Venezuela. - In 1960, telephone companies began making phone bills out of stacks of punch cards. During the 1960s CNC entered the aircraft, shipbuilding and automotive industries. - In 1960, Theodore H. Maiman, a physicist at Hughes Research Laboratories built the first laser using synthetic ruby cylinders. - TIROS-1, the first weather satellite, was launched by the United States in 1960. - In 1961, two Americans, physicist Robert Noyce (1927-1990), and electrical engineer Jack St. Clair Kilby developed the first prototype of an integrated circuit; - American physicists, engineers and entrepreneurs George Charles Devol Jr. and Joseph Frederick Engelberger invented the first

	industrial robots. This technology was introduced by General Motors in 1961. - In 1961, Russia sent the first human, Yuri Gagarin, into space; - one month after Gagarin, Alan Shepard became the first American astronaut in space. - In 1961, the construction of the Berlin Wall. Barbed wire concrete physically and ideologically divided Berlin from 1961 to 1989. - During the Cuban Missile Crisis, the leaders of the United States and the Soviet Union engaged in 13 days of political and military tensions in October 1962 over the installation of nuclear-armed Soviet missiles in Cuba. America and the Soviet Union almost launched a nuclear strike. - In 1963, British accountant Edward Craven Walker invented the Lava Lamp. - In 1963, U.S. President John F. Kennedy was assassinated by Lee Harvey Oswald. - In 1964, the computer coding language BASIC (Beginner's All-Purpose Symbolic Instruction Code) was introduced designed by John G. Kemeny and Thomas E. Kurtz. - In 1965, chemist G. D. Searle & Company James M. Schlatter created aspartame while synthesizing ingredients for a planned anti-ulcer drug. - In 1965, Soviet Union cosmonaut Aleksei Leonov (1934-2019) became the first person to travel spacewalk out of the capsule during the Voskhod 2 mission for 12 minutes 9 seconds. - In 1966, the Soviet Union's Luna 9 was the first spacecraft to land on the Moon. - All cigarette packs in the U.S. should include a health warning "Watch out! Smoking may be harmful to your health". - In 1968, Civil Rights leader Martin Luther King Jr. (1929-1968), was assassinated in April by James Earl Ray. - Bank statements and insurance policies are immediately printed on a computer; My personal American Express card is still stamped in 1968. - In 1969, Neil Armstrong and Edwin E. Aldrin became the first people to arrive on the Moon during NASA's Apollo 11 mission. - The Advanced Research Projects Agency Network (ARPANET) was the first large-area packet-switched network. - The Advanced Research Projects Agency (ARPA) was established by the U.S. Department of Defense. In 1969, he delivered his first communication between UCLA and Stanford
1970-1989	- In the 1970s, even before personal computers, monotonous retyping became obsolete due to the presence of memory typewriters. - The airline reservation system came in the 1970s

	- In 1980 barcode scanners and ATM machines spread through the retail and banking industries. - Ancient mechanical calculators were quickly rejected because electronic calculators, both miniature and desktop, were introduced around 1970. - In 1970, the first jumbo-jet, the Boeing 747, entered service and made its debut commercial flight from New York to London. - Computer floppies (*floppies*) were introduced. This is a type of disk storage consisting of thin and flexible disks of magnetic storage media in boxes, introduced. - In 1971, the first microprocessor, the 4004, was launched by Intel and the VCR was introduced.  *Figure 3.4. An Advertisement Promoting A Portable Computer Produced By NEC. Portable Computrer Is One Of The Results Of Innovations That Have An Effect On The Industrial Revolution 3.0* Sumber: https://www.huffpost.com/entry/vintage-tech-ads_n_4260926

	- In 1971, the Watergate Scandal began. It was a major political scandal in the US involving the administration of US President Richard Nixon from 1972 to 1974 that led to Nixon's - Resignation. - In 1973, Skylab, America's first space station was launched. It was operated by a crew of three separate astronauts: Skylab 2, Skylab 3, and Skylab 4. - The Vietnam War ended on April 30, 1975. - On April 4, 1975, Bill Gates and Paul Allen created Microsoft that made computer software. - On April 1, 1976, Steve Jobs and Steve Wozniak founded the Apple Computer Company. - In 1977, the Magnetic Resonance Imaging (MRI) scanner, a medical imaging technique used in radiology to form anatomical images and physiological processes of the body was first tested. - On July 25, 1978, Louise Brown, the first IVF, conceived through in vitro fertilization (IVF), was born in Oldham, Manchester, England. - The first personal computers arrived in the early 1980s with word processors, word wraps, and spreadsheets. - "Moore's Law" runs quickly and allows larger document files and spreadsheets to be handled faster. - The power of doubling computer chips is offset by the increasing complexity of the software, which leads to a light decision. - In 1980, 66 countries led by the United States boycotted the 1980 Olympic Games in Moscow because of the Soviet-Afghan War. - In 1980, the AIDS virus was identified by US scientists, and in 1984 researchers finally identified the cause of AIDS - Sony CDP-101, released in 1982, was the first commercially released CD (compact disc) player in the world. - In 1982, Sally Ride (1951-2012) became the first American woman in space. - The Prime Minister of India, Indira Gandhi, was assassinated on October 31, 1984 at her residence on Safdarjung Road, New Delhi by her bodyguards. - Olimpiade 1984 diboikot oleh total 14 negara blok timur, termasuk Uni Soviet dan Jerman Timur, sebagai reaksi atas boikot Moskow 1980.\ - In 1986, Mad Cow Disease which is a fatal disease that slowly damages the brain and spinal cord in cattle was identified in the UK for the first time. - The Chernobyl nuclear reactor consisted of four RBMK-1000 reactors, each capable of producing 1, 000 megawatts (MW) of electrical power, exploding in the Soviet Union in 1986. - The Iran-Iraq War (September 22, 1980-August 20, 1988) ended. - In 1989, the Berlin Wall fell, which was the end of the Cold War.

1990-2005 era (*dot.com* era)	- An investment boom in the late 1990s as every company large and small developed its own website; - Many "dot.com" start-ups give up being too optimistic - Amazon and Google developed a commercial model that rose to dominance in the years after the stock market bubble dot.com peak in early 2000. - In the 1990s architects began using computer-aided design software (CAD). - In 1990, East and West Germany reunited after the collapse of the Soviet Union. - In 1993, the North American Free Trade Agreement (NAFTA) implemented in 1994 encouraged trade between the United States, Mexico, and Canada - In 1993, Intel introduced Pentium, a brand used for a series of microprocessors compatible with the x86 architecture. - May 10, 1994, Nelson Mandela became President of South Africa after being elected in the country's first multiracial election. - In 1995, the online auction site eBay was founded. - On June 3, 1996, the internet search engine "Ask Jeeves" was founded in 1996 by Garrett Gruener and David Warthen. - In 1998, the Google search engine was founded. - On September 11, 2001 (known as 9/11), 19 hijackers simultaneously took over four U.S. domestic commercial aircraft and crashed two planes into the World Trade Center. - In 2002, George Bush created the Department of Homeland Security to combat the threat of terrorism. - Facebook was launched as a social networking site open only to students from Harvard on February 4, 2004, by Mark Zuckerberg with his college roommates and fellow students Eduardo Saverin, Dustin Moskovitz, and Chris Hughes. - In 2005, the video-sharing site "YouTube" was founded by Steve Chen, Chad Hurley, and Jawed Karim in February 2005.

3.5. What's the Matter in Stage 4.0 ?

Echoes about the industrial revolution 4.0 appeared in 2016. In layman's terms, this logic may be difficult to follow because the third stage of the industrial revolution has not even been completed. However, there are different characters that make this change self-classified. As stated by (Nurdiana & Pandin, 2021) computers have indeed become a special character in the third Industrial revolution, but the 4.0 revolution is focused onhuman activities, data, and virtual machines that are used to create a better quality of life. I technological novation is shifting from automation and networking of cyberspace to the digital world. What really stands out in the

industrial revolution of this stage is the rapid discovery and application of artificial intelligence in almost all industrial fields. In addition to advanced computers, this industrial revolution 4.0 marked the emergence of advanced computers, intelligent robots, wheelless vehicles that optimize the functioning of the human brain. In short, the industrial revolution 4.0 embeds intelligent technology that can connect with various areas of human life.

The President of Indonesia, Joko Widodo inaugurated Making Indonesia 4.0 as a roadmap for Industry 4.0. This is done as a means of increasing the added value of the domestic manufacturing industry in order to be able to compete globally. This roadmap willfocus on five (5) manufacturing sectors: namely the food and beverage industry, textiles and clothing, automotive, chemical, and electronics. Indonesia also makes various systematic efforts to align itself with various countries in the world. There are nuances of lagging behind that Indonesia is trying to pursue from other countries as hinted by the Minister of Industry, Airlangga Hartanto. Citing the page (Kemenkominfo, 2019) Airlangga defines the Industrial Revolution 4.0 as an initiative to carry out with the aim of improvement through a combination of the online world and production lines in the industry. According to him, all processes in production today can be rolled out using the foundation of the internet. According to Airlangga, Indonesia is in a position to gain experience and knowledge from foreign countries that have previously implemented it with the aim of developing the fourth stage of the industrial revolution through policies based on the country's own industrial interests.

The main generators in thefourth industrial evolution are robotization and globalization (Schwab, 2016). Robots have indeed appeared in the third wave of the industrial revolution. However, artificial intelligence is a major differentiator if we compare with the existence of robotics among the waves of automated machines in the industrial revolution 3.0 (Brynjolfsson & McAfee, 2014). Robots can be programmed to sense their environment, understand what is happening, adjust their behavior according to this understanding and learn from their actions, without the need for reprogramming.

Innovators proved that intelligence and *the Internet of Things*(IoT) can take over human tasks in various facets of life. Imitation of human capabilities in robotics may be one of the things that will be most often encountered as a result of this technological development. For example, security problems can be solved with IoT-based discovery through the creation of robots that

replace guard duties, as designed by (Chiu & Huang, 2018). This design allows humans to replace security services that are costly and risky. Industrial management can also be done more efficiently and accurately by using a system, as designed (Sugimura, 2018) In the health sector, accuracy of diagnosis is likely to be greatly helped by automation, as proposed by the design ((Wu & Zhong, 2018).

Another aspect that emerged in the fourth industrial evolution was the existence of developments globally, which made the world seem to be without a geographical center (Dickiinson, 2016). If the industrial revolution 2.0 gave rise to the existence of "western" and "eastern" axes of power, then at stage 3.0 appeared "third world countries". However, at stage 4.0, the world no longer seems to have centralization. There are distortions that then result in international attention not being focused solely on some geographical areas. In addition, migration is not something that determines the status of an area due to the disruption of geographical entities due to the development of information technology. In general, (Johannessen, 2018) summarizes the fourth industrial Revolution in six interrelated concepts, namely the rate of spread, driven by tiered innovation; global impact regions, driven by globalization; and systemic links, driven by robotization and informatization.

The other three concepts are related to the three concepts listed above. These concepts are threshold values, feedback and time lag. The threshold value is relevant because some sectors will join the fourth industrial revolution only after a certain threshold value is exceeded, unlike a situation where adam explodes after a certain threshold is exceeded. Feedback can be understood as the meaning that some people understand what will happen before others. The first group reacts and adapts to new developments before others do. Thus, the first group benefits from the others, who will join later. Time lag means that the more a person becomes part of the fourth industrial revolution, the less time lag he is willing to accept.

For example, this time lag might be the time that elapses between sending a message and receiving a response. One consequence is that a relatively long time lag will serve psychologically as an emphasis on information. Brynjolfsson & McAfee, in (Johannessen, 2018)elements that are the key drivers of the industrial revolution 4.0, namely the knowledge society; globalization; robotization; the workplace of the future; and knowledgeable workers. All these elements are based on the existence of rapid changes (revolutions) driven by innovation, which will ultimately

change the basic assumptions of the social system. In general, how these elements support the industrial revolution 4.0 appears in the following scheme.

In the fourth industrial revolution, there was a development of thinking from linear to interactive or even disruptive. The development that occurred in the third industrial revolution was more about digitizing jobs, while in the fourth industrial revolution, a lot of job information would be carried by these systematically connected robots. Robots are assumed, can dig up the latest information and learn by correcting the mistakes of themselves and others.

There is no change in the way a person works, where they works, what they works for andhis relationship with a colleague or boss. Future workplaces are not tied to fixed geographic locations that require physical presence, but can be geographically dispersed and divided by functional aspects. This "functional" aspect means that the workplace will be based on project-based roles while with people performing different functions for different employers. Working hours are no longer bound, but can be flexible according to individual portions. The 8-16 work pattern (8 a.m. to 4 p.m.) will be history and people will work as if they were self-employed, despite the fact that they will work as subcontractors for a variety of clients. Management in this scenario is about coordinating individual, distributed workplaces, and coordinating workers who will largely self-manage within the framework of fixed contract targets.

3.6. Implementation of the Industrial Revolution 4.0 Curriculum in the Accounting Study Program

Based on the results of research by Hermawan et al (2021), two things are recommended, namely 1) stages in implementing the ri 4.0 curriculum, and 2) courses based on the industrial revolution 4.0. Table 2 describes the stages and implementation.

Table 3.5. Stages and Implementation of the RI 4.0 Curriculum

No	Stages	Implementation
1.	Graduate Profile Adjustments	Graduate profiles are roles that are expected to be performed by graduates of study programs in the community orwork unions. This profile is the *educational outcome* to be aimed at. With a graduate profile set, universities can guarantee that prospective students will be able to play any role

		after they have undergone all the learning processes in their study program. The accounting study program can choose various graduate profiles that will be given to prospective graduates. For example, the profile of graduates is directed to be competent in the fields of auditing, taxation, accounting information systems, government accounting and the public sector, management accounting, financial accounting and fields related to accounting. **An example of a graduate profile description is as follows:** **Description of Graduate Profile** Graduates can compile an accounting system, compile financial reports to external parties, compile financial reports to company leaders, prepare budgets, handle tax issues and internal examinations in private companies and government agencies. Regarding the RI 4.0 curriculum, the accounting study program can change or add to the profile of its graduates about information technology competencies. For example, the profile of graduates in the field of auditing who master information technology or the profile of graduates in the field of taxation who master information technology. However, these changes must be made through the right mechanism, namely through curriculum workshops. **The following is given an example of compiling a graduate profile:** The curriculum of the Accounting Study Program in 2019 is a curriculum based on KKNI which has adopted the development of the industrial revolution 4.0 in the field of accounting. The graduate profile set by the Accounting Study Program, Faculty of Business, Law & Law & Science,Universitas Muhammadiyah Sidoarjo is to make accounting graduates become accountants, especially public accountants and public sector accountants. Public accountants are chosen on the grounds that in Indonesia the

		profession of auditor or public accountant is small in number and steps, even though this profession is very necessary in order to check company finances. For public sector accounting was chosen on the grounds of the peculiarities of Sidoarjo Regency. Where in Sidoarjo there are many SMEs, Villages and Districts that also need energy in preparing financial reports.
2.	Curriculum Redesign	Curriculum Redesign must be carried out for accounting study programs that will adopt the RI 4.0 curriculum. This is done so that there is official documentation of the changes. Curriculum redesign must also involve *stakeholders* of the accounting study program. **The following is given an example of curriculum redesign:** Some of the notes that are used as a reference in compiling the curriculum / redesigning the 2019 curriculum are 1. Advice from the assessor at the time of accreditation which states that for the profile of graduates should focus on certain areas and cannot be general 2. Agreement and advice from the Association of Accounting Study Programs of Muhammadiyah & Aisyiyah Higher Education throughout Indonesia which also stated that the lulan profile was made specifically and highlighted the peculiarities of the area where the university is located 3. The development of the industrial revolution 4.0 which has an impact on the accounting profession has resulted in curriculum changes that can be adopted from the development of the industrial revolution 4.0 in the field of accounting Another reference that is the basis for curriculum changes / curriculum redesign of the Accounting Study Program in 2019 is 1. The change of the merger of faculties from the Faculty of Economics & Business to the Faculty of Business, Law and Social Sciences which is a merger of the Faculty of Economics & Business, Faculty of Communication Sciences and Faculty of Law

		2. Changes in Vision, Mission, Goals and Objectives both in Universities, Faculties and Study Programs.
3.	Changes in Learning Methods	The methode of learning must also change. Because RI 4.0 is a fundamental change in the use of information technology. Learning methods that have been still relying on the lecture / TCL method with the development of a curriculum that adopts 4.0, there is a change in learning methods to SCL by utilizing online learning media
4.	Improving The Quality of Human Resources	In terms of improving the quality of human resources related to the development of the KKNI curriculum which adopts the industri 4.0 revolution, the accounting study program can plan and facilitate trainings or certifications for lecturers based on accounting science or accounting information technology. For example, CA, ACPA, CPA, AAP, and other certifications.
5.	Improvement of Facilities, Infrastructure and Labotorium	KKNI-based curriculum which has adopted the development of the industrial revolution 4.0 in the field of accounting requires supporting facilities / laboratories to be able to apply as well as support the theory that has been obtained. **The following are given contoh improvement of facilities, infrastructure and laboratories :** Umsida Accounting Study Program has two computer laboratories to facilitate students in applying theory into several accounting sofwere programs, including: 1. Computer Accounting Laboratory 2. Simulation Laboratory In addition to the 4.0-based computer laboratory facilities, severalother supporting facilities that can be used to realize learning outcomes are the Tax Center and CPA Center rooms..
6.	Establishing Cooperation with Stakeholders	To be able to realize an accounting graduate to become an accountant, especially a public accountant and a public sector accountant, the umsida accounting study program collaborates with several partners in public and public sector institutions and including: Public Accounting Firms, Tax and financial consultants, Schools, Hospitals, District Offices, BUMDes, Villages, MSMEs, Mosques, and Boarding. In addition to cooperation with several partners, the Accounting

		Study Program also collaborates with various universities both in the Muhammadiyah university, national private and state universities in the country as well as several universities abroad.

3.7. Recommendations for Accounting Study Program Subjects Based on the Industrial Revolution 4.0

The recommendations based on the industrial revolution 4.0 are as follows :

a. Accounting System Analysis & Data Base

Attitude :

Demonstrate an attitude of responsibility for work in their field of expertise independently

General Skills :

Able to examine the implications of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their expertise based on scientific rules, procedures, and ethics in order to produce solutions, ideas, designs, or art criticism

Special Skills:

Able to design business processes in an accounting information system that supports the provision of information technology-based information to support management control and organizational decision making

Knowledge :

Mastering techniques, principles, and procedural knowledge about the use of information technology

Study Materials:

The Scientific Core of the Study Program

Learning Materials:

1. Data base planning
2. Data Base Implementation

b. Designing Web And Android Application Accounting Systems

Attitude :

Demonstrate an attitude of responsibility for work in their field of expertise independently

General Skills :

Able to examine the implications of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their expertise based on scientific rules, procedures, and ethics in order to produce solutions, ideas, designs, or art criticism

Special Skills :

Able to design business processes in an accounting information system that supports the provision of information technology-based information to support management control and organizational decision making

Knowledge:

Mastering techniques, principles, and procedural knowledge about the use of information technology

Study Material :

Developed Science & Technology

Learning Materials:

1. System Planning
2. System Applications

c. Computer Financial Accounting

Attitude :

Demonstrate an attitude of responsibility for work in their field of expertise independently

General Skills :

Able to combine technical competence and professional expertise to complete work assignments

Special Skills :

Able to operate software / software in the context of preparing financial statements, auditing, public sector accounting reports and research

Knowledge :

Mastering the Electronic Data Procesing (EDP) procedure in the preparation to inform financial statements, auditing, public sector accounting reports and research

Study Materials:

Supporting Science & Technology

Learning Materials:

1. Sales & Distribution
2. Materials Management
3. Production Planning
4. Financial Accounting
5. Controlling

d. Public Sector Accounting Computer

Attitude :

Demonstrate An Attitude Of Responsibility For Work In Their Field Of Expertise Independently

General Skills :

Able To Combine Technical Competence And Professional Expertise To Complete Work Assignments

Special Skills :

Able To Operate Softwere / Software In The Context Of Preparing Financial Statements, Auditing, Public Sector Accounting Reports And Research

Knowledge :

Mastering The Electronic Data Procesing (Edp) Procedure In The Preparation To Inform Financial Statements, Auditing, Public Sector Accounting Reports And Research

Study Materials:

The Scientific Core Of The Study Program

Learning Materials:

1. Recording Process
2. Public Sector Financial Statement Analysis

e. Computer Auditing

Attitude :

Demonstrate an attitude of responsibility for work in their field of expertise independently

General Skills :

Able to combine technical competence and professional expertise to complete work assignments

SPECIAL SKILLS :

Able to operate softwere / software in the context of preparing financial statements, auditing, public sector accounting reports and research

KNOWLEDGE :

Mastering the Electronic Data Procesing (EDP) procedure in the preparation to inform financial statements, auditing, public sector accounting reports and research

Study Materials:

The Scientific Core of the Study Program

Learning Materials:

1. Audit Process
2. Analysis of Audit Results

CHAPTER IV

CONCLUSION

Intellectual capital (IC) play a role in the management of organizations in various sectors. By maximizing the components of the IC (HC, SC, and RC) it is possible to be able to improve performance, competitiveness and well-being. All of that can be done by linking ICs with innovation. ICs consisting of HC, SC and RC can maximize the indicators they have to influence other IC components or interact between IC components for performance, competitiveness and well-being.

Innovation has to do with something new or updated. This means that with innovation there will always be improvements to the products or services provided by the organization or company. With improvements, it is hoped that it will be able to provide service or product satisfaction to customers. With innovation, it is also expected that there will be new products or services as pioneers or first mover products that will bring large profit margins to the organization or company.

IC and innovation also played a very important role during the industrial revolution 4.0. This role can be carried out by HC, SC, and RC as well as innovation because RI 4.0 is more related to the rampant use of IT in all sectors. For the accounting education sector, it is also very affected by the existence of RI 4.0. For this reason, the accounting study program must prepare its graduates by providing a number of knowledge, skills, and attitudes to students so that they are able to be accepted by the industrial world business world (DUDI) which is oriented towards RI 4.0. What the accounting study program can do is to change the curriculum to the RI 4.0 curriculum.

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