

# Barriers To Implementation of Industry 4.0 in Indonesia: Case of The Textile and Automotive Industries

## *Hambatan Implementasi Industri 4.0 Di Indonesia: Kasus Industri Tekstile dan Otomotif*

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**Abstract** - For several years, Industry 4.0 has become one of the buzzwords in the industrial world and has expanded to other areas. Industry 4.0 is an industrial revolution that is taking place today, where the internet and information networks use create a new industrial revolution. Many benefits are expected came from the application of industry 4.0 in a company / organization, primarily being able to open a highly customized market. Although there are various advantages to the application of industry 4.0 in a company / organization, the effort to implement it is not free from many problems. Likewise in Indonesia, although Industry 4.0 was launched directly by President Jokowi, and was followed by all sectors, the implementation effort still faces obstacles. Because of this, the question arises as to whether industry 4.0 is really needed in Indonesia or not. Therefore, it is worth seeing the effort to implement Industry 4.0 in Indonesia, especially in industries that should be able to implement Industry 4.0 easily. As in Germany, in Indonesia the automotive manufacturing industry should be able to more easily apply the Industry 4.0 model. This paper discusses that added to the textile industry which should have similar properties. Discussion of the two industrial sectors at the same time has never been done in Indonesia. Meanwhile, one way to identify supporting and inhibiting factors is to use an analytical framework from Jan Stentof et.all (2019). Currently, the use of this analytical framework has not been widely used in Indonesia, particularly in the automotive and textile industries. By using an analytical framework from Jan Stentof et.all (2019) to conduct an analysis, it was found that both the automotive and textile industries still have many obstacles to applying industry model 4.0. Many of the problem is related to communication both external and internal. It was also found from interviews, that at all levels there are often misconceptions between industry 3.0 and industry 4.0 models, so the application of industry 4.0 is even more difficult. With this study, we hope that government can adjust its policy to how to implement industry 4.0 in Indonesia. However, with only two sectors being researched, more sectors still need to draw a general conclusion.

**Keywords:** Industry 4.0, Inhibiting Factors, Textile Industry, Automotive Industry

**Abstrak** - Sudah beberapa tahun ini Industri 4.0 menjadi salah satu buzzword di dunia industri dan merambah ke area lainnya. Industri 4.0 merupakan sebuah revolusi industri yang sedang berlangsung saat ini, dimana internet dan jejaring informasi mendasari revolusi itu. Banyak keuntungan yang diharapkan timbul dari penerapan industri 4.0 dalam sebuah perusahaan/organisasi, utamanya adalah mampu membuka celak pasar yang bersifat sangat terkustomisasi. Walaupun dengan berbagai keuntungan bagi penerapan industri 4.0 di suatu perusahaan/organisasi, namun usaha penerapannya itu tidak luput dari berbagai masalah. Demikian pula di Indonesia, walaupun Industri 4.0 dicanangkan langsung oleh Presiden Jokowi, dan diikuti oleh semua lini pemerintahan namun upaya penerapan masih juga mengalami hambatan. Karena itu timbul juga pertanyaan, apakah benar-benar industri 4.0 dibutuhkan di Indonesia. Oleh karena itu patut untuk dilihat upaya penerapan Industri 4.0 di Indonesia, terutama di industri-industri yang seharusnya dapat menerapkan industri 4.0 dengan mudah. Seperti halnya di Jerman asal industri 4.0, di Indonesia seharusnya dunia industri manufaktur otomotif dapat lebih mudah menerapkan model Industri 4.0. Tulisan ini membahas hal itu ditambah pada industri tekstil yang seharusnya memiliki sifat yang mirip. Pembahasan mengenai dua sektor industri sekaligus tersebut belum pernah dilakukan di Indonesia. Sedangkan salah satu cara untuk faktor pendukung dan menghambat adalah dengan menggunakan kerangka analisa dari Jan Stentof et.all (2019). Saat ini penggunaan kerangka analisa itu belum banyak digunakan di Indonesia, khususnya di bdiang industri otomotif dan tekstil. Dengan menggunakan sebuah kerangka analisa dari Jan Stentof et.all (2019) untuk melakukan analisa ditemukan bahwa baik industri

*otomotif maupun tekstil masih memiliki banyak hambatan untuk menerapkan model industri 4.0. Banyak dari faktor ini sebenarnya berkaitan dengan masalah komunikasi, baik secara eksternal maupun internal perusahaan. Ditemukan juga dari wawancara, bahwa di semua tingkat sering terdapat kekeliruan pengertian antara industri 3.0 dan industri 4.0, sehingga penerapan industri 4.0 lebih sulit lagi. Diharapkan dari hasil studi ini, pemerintah dapat memformulasikan kebijakan penerapan industri 4.0 yang lebih baik. Namun dengan hanya 2 sektor yang diteliti, diperlukan penelitian lanjutan pada sektor-sektor lainnya untuk dapat menarik sebuah kesimpulan umum.*

**Kata Kunci:** Industri 4.0, Faktor Penghambat, Industri Tekstil, Industri Otomotif

## INTRODUCTION

Currently, industry 4.0 is considered one of the best ways to increase company efficiency and market share through product customization (Nagy, Oláh, Erdei, Máté, & Popp, 2018). Industry 4.0 is an evolution of industry 3.0 which is essentially a mass production model based on computerized systems, for example with robots. Therefore industry 4.0 will be far more sophisticated than Revolution 3.0.

The 4th Industrial Revolution or Industry 4.0 has many definitions, but according to Andreja Rojko (2017) it is defined as "an approach based on integration of the business and manufacturing processes, as well as integration of all actors in the company's value chain (suppliers and customers)". Whereas the European Commission (2017) says that industry 4.0 aims to encourage the use of advanced digital manufacturing and also enhance the digitalization and interconnection of products, value chains and business models.

Basically Industry 4.0 has characteristic of customized mass production. Therefore there is an advantage is much more higher market penetration and maybe also efficiency compared to mass production in Industry 3.0 because of mixed the mass production with highly customized product according to the user's wishes. This of course will further open new markets for both highly specialized users or users who have a desire for an exclusive product that is different from the others which will expand the desires of customers who are at the top of Maslow's pyramid towards the bottom of the pyramid so that the number of customers will be increase significantly, and open a whole new market. It is very likely that at the end of the industrial 4.0 revolution factories will become not only smart factories but also universal factories where smart Factories can produce all kinds of goods as long as they have the same characteristics or basic ingredients.

The technology used by Industry 4.0 to achieve the above is basically based on 9 technology: virtual reality, additive manufacturing, IoT, big data, cloud computing, simulation, robot autonomy, universal

integration, and cyber security. Many of these technologies have existed in the previous industrial revolution or industry 3.0 model, but some of the technologies are specific to industry 4.0, especially those concerning integration and data. This technological similarity causes many people to have wrong perceptions about what is actually industry model 3.0 and which is industry model 4.0.

Indonesia is currently also following the world trend to apply industry 4.0 model in all aspect. Even the President of Indonesia, Joko Widodo (Jokowi) also launched the application of industry 4.0 in Indonesia (Kementrian Perindustrian, 2018). That causes an increase in activities that are considered to support the industrial model 4.0. Even many unrelated fields are predicted as "supporting" industry model 4.0. But to implement it there are many factors that influence the application of the industry 4.0 model in Indonesia. This is due to the specific conditions of Indonesia, namely the large population of Indonesia, social conditions, and the level/quality of existing human resources. It is very interesting to see how the application of industry 4.0 in Indonesia.

Implementing Industry 4.0 in an organization or industry frequently presents implementation challenges. This difficulty is caused by numerous factors, the majority of which have been identified as technical issues, but there are actually many more non-technical issues that can impede the implementation of a model in an organization or industry, including this Industry 4.0 model. This is explained by numerous models, including the one proposed by Jan Stentof et al (2019). No research or writing has yet been discovered on the obstacles to implementing Industry 4.0 using this model in Indonesia. Consequently, research was conducted on this topic.

To see the application of industry 4.0 in Indonesia, we used cases of 2 types of industry, the textile and automotive industries. The automotive industry is actually one of the industries that is most ready to run the industry 4.0 concept abroad. This is because inherently it requires customization of the

product in the form of at least models and colors for middle and lower level cars, and full customization for luxury cars. While the textile industry is also an industry that should be applied to industry 4.0 because it is now necessary to customize image/printing patterns and shift demand from basic clothing to functional clothing such as sportswear, defense and security clothing, the textile industry for health, or better known as diversification of textile products for technical textiles, home textiles, geo textiles or medical textiles, causing the opening of a highly custom market which is a feature that requires the application of industrial models 4.0.

Therefore, it is interesting to see how the efforts to implement industry 4.0 in both sectors. This application will of course have many problems that might become obstacles in the application of the Industry 4.0 concept in both industries. In this paper we will discuss descriptively about the inhibiting factors that exist in each industry chosen in applying the concept or model of Industry 4.0. However some of these factors are double factors, which on one hand is a driving factor if the factor is positive, but it will be an inhibiting factor if the factor is not present or is negative.

## **ANALYTICAL FRAMEWORK**

To implement Industry 4.0 in Indonesia, there are obstacles that slow the effort to implement it. Jan Stentof et. Al. (2019) explain that there are supporting and inhibiting factors in the application of industry 4.0 in a company/organization. The inhibiting factors mentioned are industry standard 4.0, management of the company/organization, and human resource factors. As for the supporting factors, in fact there remain in these 3 categories with the addition of public institutions that encourage industry 4.0.

This paper looks at these inhibiting factors so that it is expected to see the failure factors of the industry in Indonesia, especially automotive and textiles in implementing the 4.0 industry if something happens like this when viewed from the 3 inhibiting factors.

## **METHODOLOGY**

The discussion in this paper will be carried out using descriptive methods. The data used are data from research at P2KMI-LIPI in 2019. In conducting the discussion, multiple case study methods will be used

(Yin, 2003), where there are several case studies. There are 2 sectors to be discussed namely from the automotive sector and the textile industry sector. Data from the two sectors came from 6 companies in each sector. The companies included in this study were selected using the snowball method from the largest automotive manufacturers in Indonesia and textile industry trade associations.

Data obtained from this study will be discussed based on a theoretical framework (Stentoft, Jensen, Philipsen, & Haug, 2019) descriptively based on existing cases and will be classified to find general conclusions from existing data by looking at the similarities and differences that exist in two types of industry who were surveyed. It is also seen whether the sector is better prepared or not by adding the number of groups considered to support the implementation of industry 4.0.

Analysis is carried out by classifying the results of interviews and observations in those companies according to framework. From this classification, it can be seen quantitatively which sectors are better prepared to apply the industrial 4.0 concept. It will discuss why this happens by looking back at the existing theory. Also look at other interesting results from interviews with companies in these 2 sectors.

## **RESULTS AND DISCUSSION**

The Ministry of Industry is currently very encouraging the occurrence of Industry 4.0 by making the 'Making Indonesia 4.0' initiative (Kementrian Perindustrian, 2018) which aims to revitalize Indonesia's manufacturing sector and become one of the ways to accelerate the achievement of Indonesia's vision to become the 10th largest economy in the world. This is in accordance with President Jokowi's direction and vision of the industry in Indonesia, which also one of his political promises during presidential election.

With the strong encouragement and leadership from the government to implement industry 4.0 in Indonesia, up to presidential level, one of the driving factors behind the implementation of industry 4.0 from (Stentoft, Jensen, Philipsen, & Haug, 2019) is the existence of public institutions that encourage the implementation of industry 4.0 has been fulfilled. But what other 3 elements are the drivers or inhibitors of industry implementation in Indonesia?

The automotive industry in Indonesia as well as the automotive industry in Germany which defined the 4.0 industry for the first time, was technologically quite ready to implement smart manufacturing, that is a basis of industry 4.0. This is because not only they want to increase production efficiency, but also because of the desire of customers for large final product customization, which can be in the form of many colors, as well as various accessories and engine and transmission options. However, the supply chain which is mostly in the form of small and medium industries may not be able to implement the horizontal integration desired by Industry 4.0.

For the textile industry, many textile devices in the form of weaving and spinning machines if they have been upgraded to modern devices actually have smart manufacturing capabilities, but the question is whether they are only used as an automation tool or fully used so as to achieve the requirements for industry 4.0. Yet in terms of consumers, there are likely many highly specialized orders from boutiques that only require a small amount of fabric for a few clothes. But the fabric is very specific specifications, both in terms of pattern, type of material and sometimes in terms of function.

The next section will discuss one by one all the factors in the framework of Jan Stentof et al. (2019) in accordance with the results of interviews and observations made on research conducted in 2019.

### **Industry 4.0 Standard**

The first problem of industry 4.0 according to (Stentoft, Jensen, Philipsen, & Haug, 2019) is the existence of industry standards for the application of industry 4.0. This standard is important because there are differences in standards that used by industry 3.0 model which. For example, data security issues will require new industry standards in the field of data protection and ITC devices that are used. Although the Ministry of Industry as the holder of industry standards in Indonesia is also the main driver of the application of industry 4.0, there are still not many standard that conform to Industry 4.0 models. That's become one of main concern in implementing industry 4.0 model. In fact, to apply the concept of industry 4.0 in the industry, clear standards must first exist (Kagermann, Wahlster, & Helbig, 2013). This new standard is not on the product standards produced by the company/organization, but rather the standards on the

processes and management of the company/organization.

From industry that supply technology for industry 4.0, there is a statement that in Indonesia (in year 2018) it still uses ordinary industry standards that still reflect on industry 3.0 model. The Ministry of Industry still has not made many changes to the applicable standards, even for the Ministry of Industry from several interviews conducted there is an impression of mingling or confusion between the notions of the concept of industry 3.0 with industry 4.0, so that conform a way of thinking that existing industry standards is sufficient for industrial application 4.0 This was demonstrated at the time of the interview which was much discussed was factory automation and also this was seen in the indie 4.0 documents which emphasized more on factory automation which was actually a concept from industry 3.0.

This of course will cause difficulties to implement Industry 4.0 fully which has a different concept and requires a different industry standard from Industry 3.0. This can actually be avoided if there is a strong relationship between the regulator who initiated Industry 4.0 with other parties who have sufficient knowledge of Industry 4.0 such as research institutions. Although many partnerships have been formed between public and private R&D institutions with industry (Hermawati, Siahaan, Poerbosisworo, Manalu, & Santoso, 2018), but it seems that the relationship has not been enough for regulators or decision-making government agencies.

This is actually the same between the textile industry and the automotive industry, because the application of standardization is carried out by the same body. The interviews show that at that time (in 2019) there was still a profound confusion regarding the concept of industry 4.0 in agencies that should have supported this transformation towards industry 4.0. Therefore, as discussed above, it causes no identification of new standards needed in the application of industry 4.0 by the government because it is considered that the existing standard that refers to the standard for the industry concept 3.0 is sufficient.

### **Organizational/Company Management**

Within the organization and the company itself, many actually have realized the benefits of the Industry 4.0 concept, even though they have not yet seen the results of implementing Industry 4.0 (McKinsey Digital, 2016). Data shows that 6 out of 10 companies

surveyed by McKinsey have not been successful or have achieved only limited success in implementing Industry 4.0 in 2015. Therefore, there is currently no industry 4.0 application that is fully successful in the world. This is interesting because it is only at this time, only at the time of the industrial revolution 4.0 can we see changes that were previously conceptualized. This did not happen during the previous industrial revolution.

The application of industry 4.0 of course requires a change in the management system in addition to the application of technology from a company or organization that will implement industry 4.0. Often this is not realized by companies wishing to implement industry 4.0, they think that industry 4.0 can be achieved by purchasing and adopting appropriate new technology. Even though this change in management is one of the important things in implementing industry 4.0 because industry 4.0 requires a change in mindset and production processes that can only be changed by making management changes in accordance with industry 4.0.

One key word that needs to be present in organizations and companies that will implement Industry 4.0 is sufficient knowledge of Industry 4.0 and its technology. Also understand the strategic importance of industry 4.0 for the company or organization (Misthal, Geissbauer, Vedso, & Schrauf, 2016). This understanding is necessary so that the mindset of human resources both workers and company owners can understand the importance and benefits of using industry 4.0 concepts in their companies.

For automotive companies, actually strategic views that is in line with industry 4.0 are already exists. This driven by the nature of the automotive manufacturing industry both at the level of the assembly manufacturer and at the level of the supplier must supply of very specific needs that are driven by the desires of the buyers. Even demand for customization in the automotive industry is very large, so that many after-market industries arise for cater this customization demand. This is caused by the high price of the car and create a view that the car as a luxury item so that when viewed from the Maslow pyramid theory the buyers of the automotive industry products do not come from the lower level of the pyramid which is quite satisfied with products that are made en masse and have the same shape, but rather from the upper part

of the Maslow pyramid, that have ego and the importance of differentiation between one individual.

As for textiles and local textile products, it already has developed into industry 4.0 model, starting from upstream to downstream. This industry consists of fiber making, spinning, weaving, knitting, dyeing finishing and garment. This direction towards industry 4.0 can be seen from the development of the textile industry which is driven by changes in consumer behavior that demands innovative and competitive products. The textile and apparel industry must respond to the needs of consumers who are individualized (personalized), able to adapt (adaptable), and provide more attractive solutions, integrated services for a variety of consumers and businesses, knowledgeable and very demanding quality. These textile product innovations are driven by investment in research, innovation and development of textile machinery, all of which may support the concept of industry 4.0.

This shows that at least the decision makers in the textile industry have understood or at least know instinctively about the concept of Industry 4.0. This is caused by the same impetus as the automotive industry, namely product customization.

From the data obtained (Kardoyo, et al., 2019), for the supply industry in automotive industry, actual knowledge of technology and strategic views is sufficient in the concept of the manufacturing industry. This is evidenced by the high enough value in the Indie 4.0 survey conducted by the Ministry of Industry. But this knowledge to be changed into implementation is a different matter. This is because there are many considerations that are thought by these companies. One of the main considerations is that the market is still limited in Indonesia, so the use of conventional technology is still sufficient. But from in-depth interviews in the automotive industry, their understanding of industry 4.0 is very mixed with industry 3.0 model. On average all the respondent equating full automation with computer-based machines as industry 4.0, when in fact it is still in the category of industry 3.0. This is not much different from the textile industry which assumes that with automation it is already in industry 4.0, and some even do not really care / do not know whether the company is already in industry 4.0 or not.

Of the 6 automotive companies studied (Kardoyo, et al., 2019), all of them expressed the same thing as above. Their knowledge is good enough, and

if desired can easily implement Industry 4.0 in full by purchasing several new devices. But the existing market is not large enough to justify it, so its implementation is partial, awaiting market development. From the observations, there is an impression that the industry does not see the existence of market outside primary market the supply chain to the automotive industry, namely the secondary market in the form of products with the same nature but not necessarily having the same goals made possible by the full application of industry 4.0. This casts doubts to full application of Industry 4.0.

Adequate financial resources are also factors that are either driving or inhibiting factors for the application of industry 4.0 (Walendowski, 2016). The adequate allocation of financial resources from a company or organization will determine this factor as an obstacle or a driver for industry 4.0 application.

In automotive industry, actually companies engaged in the automotive industry, especially suppliers of automotive industry components are able to set aside sufficient funds to purchase machinery and make a full transformation to industry 4.0, but as for the previous factor, the existing market does not justify that. Basically, the company does not see the importance of the application of industry 4.0 when viewed from the effectiveness of the use of existing machines / resources. This is because a company is an organization that aims to get a profit (as much as possible) so that if an investment is seen as not giving sufficient results, then of course the investment will not be made. It's just for the case of industry 4.0, it needs to be seen for the long-term including the opportunity to open a new secondary market. This is not done in the automotive industry, especially the automotive component industry which should be able to open a secondary market in the form of various non-automotive components or automotive after market.

In the textile industry, the machines used in the production section can already be used to implement industry 4.0. However, due to insufficient funds, the obstacle faced by the company is that it is integrated, so it can be said that the company has not been able to implement Industry 4.0.

Human resources who are committed to support the application of industry 4.0 are also important factors for the application of industry 4.0 in organizations or companies. If too few people mobilized by companies or organizations to transform

to industry 4.0, then this will be an inhibiting factor in implementing industry 4.0.

From the survey in the automotive industry, there are many key experts who are very familiar with the automation and industry 4.0 available in the company and spearheading the company's change towards industry 4.0. This is due to the fact that, once again, market factors and often the misunderstanding of industry 3.0 and industry 4.0, especially in the company owner, hinder the full application of the industry 4.0 concept in the company.

In the textile industry by implementing an automation system it can reduce the amount of labor requirements. It also requires new, more specific skills to be able to cope with the capabilities of new technology, such as special machines for attaching buttons, making clothing collars, and installing pockets. This has a direct impact on company productivity and efficiency on human labor. Machines affect the decline in labor demand in certain parts, but increase in other parts such as sewing all parts into one garment, as long as the demand from the market also continues to increase. Cutting, packaging, and other activities have experienced a change in the direction of the machine including conveyor.

Therefore, at least the human resources in the textile industry know more than Industry 3.0 and understand the basics of industry 4.0. However, due to factors other than HR, HR capabilities in the textile industry have not moved towards Industry 4.0

Another key word in the application of industry 4.0 in a company is whether the company / organization focuses more attention on the company's operations or on company development. If there is a stronger focus on company operations at the expense of company development, then what will happen is that there are obstacles to the application of industry 4.0 in the company or organization.

For the automotive industry, this is a major weakness of the automotive component companies studied. They are more concerned with the company's operating conditions at this time. This is because again the market is available to them. Also, they are feared by the social conditions in the community, where the company does not conflict with its community surrounding the factory, because of social issues it requires labor absorption from the community surrounding the factory. This may not be the best course of action if we look from the view of the needs for application of industry 4.0 model. More efforts need to

be made to convince them about company's future if the concept of Industry 4.0 is to be applied in their industry.

Based on interviews with companies in the textile industry, most of them put more emphasis on the company's operations. That is because the company looks more at how companies can continue to operate (the sustainability of the company), because there are still many obstacles that must be faced such as competition with imported products, the number of fabric products and ready-made clothing originating from unknown imports or contraband, whereas for the company itself financing for material needs is very expensive because of the dependence of imported raw materials and supporting materials.

The last thing that concerns management in companies that will implement Industry 4.0 is a system that protects the company's digital data. This is due to the application of industry 4.0, data collection will be carried out for processing a large amount of data (Big Data). If the data is lost or stolen, the loss can be crippling for the company or organization.

Although this is very important for data integrity in the company, surveys in the automotive industry show that they still have not done much security for the data they have. They only rely on standard security according to the package provided by the technology provider they bought. Although security features according to standards have been implemented, but of course it can still be penetrated by experienced hackers. It is indicated by relatively small number of people specifically assigned or the appointment of a third party to secure data. This is also because the existing data is only used for the purposes of production, has not been processing as a big data significantly so the production trends and market desires can be known and the data becomes useful for industrial development.

For the textile industry, the management process is greatly helped by the presence of computers, so that all data has been able to be computerized. The management process experienced major leaps such as office administration, raw material management, human resource data management, financial transactions, logistics, etc. From the process of manually changing to using a computer. In addition, some parts of production have also been computerized and automated although they are still partial or only in a few parts. The process is also not yet integrated so that each part in the production is still done separately. But the same is the case in the automotive industry, the

use of data that is only used for administrative processes that may not involve many outsiders or the network is not exposed to the outside and cause companies not to see the need for good cyber security.

### **Organization/Company Workforce**

Workforce or human resources is one of the determining factors for the successful application of the industry 4.0 concept in a company or organization. This is because human resources or workers or staff of the company / organization are the ones that cause the organization can be run or produce something, so that only with the activities of human resources in the place, the transformation to industry 4.0 can occur. There are at least 4 human resource factors that will hamper the application of Industry 4.0

The main inhibiting factor is the lack of qualified human resources in general (Walendowski, 2016). If the average human resource capability is low then it will be difficult to carry out technological transformation, this is due to the lack of technical capabilities of the existing human resources.

Indonesia has an inherent weakness of low-quality human resources (Liputan 6, 2019). This makes the transformation to industry 4.0 more difficult, because there are many technological factors that need to be studied and a new mindset that must be understood. This will be clearly seen in the next factor regarding human resource below.

This also happened in the automotive manufacturing industry. Even though workers at the managerial level and above have sufficient education, workers at the lower or assembly level have not-so-good quality human resources, making it difficult to be burdened with new knowledge that will be needed in efforts to transform industry 4.0

For the textile industry, it needs to be understood that in making textiles there are 2 types of textile producers, one traditionally and one industrially advanced. Indonesia has a lot of both, but sometimes it's more often talked about in the form of a traditional industry. This is because the market for it is more open than the advanced textile industry which is now considered a sunset industry (Wie, 2009) (Salim & Ernawati, 2015). Traditional industry, of course, will be difficult to apply industry 4.0 model because of its traditional nature using a lot of human resources and relatively high quality / low education so that it is very difficult to provide knowledge about industry 4.0 to

them. Actually, even though it is labor intensive, industry 4.0 can also be applied. This is like what Schenaider did in his factory that manufactures electric panels that have adopted the concept of Industry 4.0 despite its work nature, without the use of automatic machines (Kardoyo, et al., 2019).

Specifically for industry transformation 4.0, lack of knowledge about industry 4.0 in existing human resources will cause major obstacles to its application (Ren, et al., 2015). Because industry transformation 4.0 not only involves new technology, but also new cultures and new paradigms of thinking.

It seems that this factor is interrelated with the previous factor, where generally the low quality of human resources will make it difficult to understand Industry 4.0 and the various technologies and mindset that accompany it. Of course, this will result in the difficulty of industrial models and processes 4.0 being fully implemented.

The company's information sharing culture will also have a significant impact on this element. Because more and more firm employees are aware of industry 4.0 knowledge, this component will improve as knowledge exchange improves within the company. This knowledge sharing consists of personal, organizational, and technology sharing knowledge (Setiawan, 2010), where technology refers to industry 4.0 knowledge and the organization to organizational culture.

In the automotive industry, in principle they are already very close to industry 4.0 because of the nature of its products that require high customization. This resulted in an advantage for the automotive industry. Although in general the level of education is not very good, but instinctively they know the processes and models of industry 4.0.

The same thing happens in the textile industry, although with different levels. Textile printing patterns, textile products that are very diverse and highly customized according to specific users are common in the textile industry, so that like the automotive industry, players from the textile industry instinctively know the process and model of industry 4.0, it's just how they can apply correctly the concept of industry 4.0 is another thing, which requires a deep technical understanding.

Another factor hampering the successful application of industry 4.0 in organizations / companies is the absence of an increase in HR capabilities through education / training (Kagermann, Wahlster, & Helbig, 2013). This will cause 2 weaknesses in the human

resources mentioned above. Only by conducting education and training, the ability of HR technically will increase and will broaden horizons so that they can better understand industry 4.0 concepts.

In the automotive industry, this factor is also not a significant obstacle. This is caused by 2 things, first the technology and model changes are fast enough so that training is needed to increase knowledge of new technologies that will be used on the latest models of a vehicle. Also in Indonesia, all component manufacturing industries are closely related and controlled with the automotive industry and are closely related to the principle, which is usually an overseas automotive industry that has been established so that education and training activities are very difficult to establish.

In the textile industry, the above factors are not an obstacle, because the technology used in the textile industry is mostly still on automation. The company itself has also committed to improving the ability and education of its employees. Such as doing training that includes operational technical training and leadership conducted on an ongoing basis to achieve competitiveness and productivity of the company. This training was also held considering the changing communication patterns between companies and buyers due to advances in information and communication technology. Workers with new skills and abilities are also performed as an example of pattern makers who translate digital patterns into designs.

Another factor hampering the successful adoption of industry 4.0 is the unpreparedness of human resources (Haug, Pedersen, & Arlbjörn, 2011). This readiness is not only from technical readiness, or ability, but readiness to change in various ways. This causes difficulties in general to change both in terms of technical and organizational to implement industry 4.0

In Indonesia, the low ability of human resources in the form of education level and skills possessed generally causes this to become an obstacle for many things in all fields of industry in Indonesia. This causes a number of industrial sectors, especially high-tech industries, are forced to spend a lot of effort to improve their human resource capabilities. Due to Indonesia's large population, the need for employment is also large, so that even though human resource capacity is low, it must be absorbed so as not to cause social issues. This also causes the issue of automation that reduces labor or any issue that reduces labor will have a large social



impact, which can lead to major social issues, such as demonstrations, riots and others. This causes the industry to be very careful in implementing automation in the company.

In the automotive industry, this factor actually does not become or at least less inhibitors. This is due to the fact that the existing equipment is sufficient to support the application of Industry 4.0. Only the integration of various machines and processes is needed. The most difficult is the change in mindset, because it often cannot distinguish between industries 3.0 and 4.0, there is resistance to change because it is considered to reduce the use of labor due to automation. This is because the issue of reducing labor is quite sensitive in Indonesia.

In this factor, the textile industry is not a significant obstacle because the use of technology is still partial, not integrated from upstream to downstream. But the problem is precisely the HR problem that is not ready to be employed, and the work ethic that is sometimes still low due to lack of ownership of the company. As a result, understanding of industry 4.0 will also be low. This will cause difficulties in applying the industry 4.0 concept in the company.

The final factor that impedes the adoption of industry 4.0 in a company or organization is the lack of readiness from existing human resources, and the lack of understanding of the relationship between people and technology (Stentoft, Mikkelsen, & Johnsen, 2015). This is the most difficult, because humans basically often distinguish between technology and humans who operate it (Lizut, 2016).

This factor is also the most difficult thing to deal with because understanding human and machine relations cannot be understood with a low level of reasoning that is very closely related to one's education. In Indonesia, because the level of general education is not so high, this factor is a factor that inhibits an attempt to apply the concept of industry 4.0 in Indonesia

Besides this factor is an internal factor of each individual, so it is very difficult to see in general whether employees generally understand the relationship between humans and machines. It could be that some employees have high knowledge, but a number of other employees have very low knowledge, but due to pareto factors, those who have knowledge can cover those who have low knowledge ( (Steen,

2010) and (Romadona, Setiawan, Manalu, Fizzanty, & Yuliar, 2016)). This is very dangerous at a later time when the need for knowledge is needed but in fact some of the employees do not have enough knowledge of the relationship between machines and people. This can be dangerous when the industry has implemented Industry 4.0

In the automotive industry, low knowledge caused by the level of education is also very visible. Even impressed by the interview also there is a lack of knowledge about human and machine relations in all the level of managers in the company. This is evidence that many industries are consider humans as only a production device, not as humans who has needs, for example, the addition of knowledge or a good work environment.

In the textile industry, the above factors are rather difficult to apply, because this requires a high understanding of industry 4.0 concept. In the textile industry is they only operate machines, especially newly acquired technology. This is likely because the level of knowledge possessed is too minimal because of low human resource quality or education level. and it takes a long time to upgrade the skill of human resources.

All factors above are factors that may be obstacles or driver towards the application of industry 4.0. From the factors above, there are several factors that are difficult to determine whether it is included as an obstacle or driver for the application of industry 4.0. This is caused because there are possibility that these factors are inhibitors, but caused by other factors outside the scope of this paper. Factors such as these can be considered as neutral, neither encouraging nor inhibiting, factors that are present but are difficult to explain without further explanation.

If we look at the discussion above, it is easier to see if we group those factor in a simple matrix. Factors that are stated as obstacles in the discussion above will be perceived as negative values, while factors that are not stated as inhibitors or even are driving factors will be stated as positive, and factors that are doubtful or inhibitors but are caused by other factors that may not be related or outside the scope of the discussion will be referred to as a neutral factor. The matrix can be seen in Table 1.

**Table 1** Drivers or barriers for Industry 4.0 Matrix

Factor	Catagory	Otomotive Industry	Textile Industry
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Standard	Industry 4.0 standards	Negative	Negative
Management	Understanding of the strategic importance of Industry 4.0	Positive	Positive
	Financial resources	Positive	Positive
	Enough human resources	Positive	Neutral
	Focus on operation or developing the company (ambidexterity)	Negative	Negative
Workforce	Cyber security	Positive	Positive
	Qualified work force	Negative	Negative
	Knowledge about Industry 4.0	Neutral	Neutral
	Continued education of employees	Positive	Positive
	Employee readiness	Negative	Negative
	Understanding the interplay between technology and human	Negative	Negative

From the table above it can be seen that many factors still indicate that these factors are more likely to become inhibiting factors compared to being a driver factor. This happens both in the automotive industry especially in the textile industry. There are 7 inhibiting factors and 2 neutral from 11 factors in the textile industry, while in the automotive industry there are 6 inhibiting factors and 1 neutral factor in the automotive industry. In general, this is most likely to occur in all fields of industry in Indonesia, therefore it will actually be quite difficult to transform the industry towards industry 4.0 nationally. But more study neede to verify this statement.

The table above shows that the automotive industry is more ready than the textile industry in implementing industry 4.0. This could have been foreseen because even though both actually require customized mass product results, the mechanization of the automotive industry compared to the textile industry in Indonesia which has experienced a sunset and its trandisional way will be difficult to compete with the automotive industry which requires scale automation and automation large, also dominated by

the principal industry from abroad who is more advanced and ready to apply the industry 4.0 concept than in Indonesia.

But all that can not be separated from the readiness to change from the organization. in general, the more ready to change, the easier it is to face obstacles to implementing a change (Romadona & Setiawan, 2018) including the application of the industrial model 4.0. Before making changes in a company / organization, it is necessary to study the readiness to change first to ensure the success of the changes. In the industries surveyed, many of them did not do that, change was considered an ordinary event. This might cause obstacles other than the obstacles shown in this paper, but further research is needed.

There are many factors that are negatif is infact related to HR problem. The solution is to increase education or training both in their expertise and inindustry 4.0 concept. It maybe neccesary to begin recruit new employee that already know the concept of industry 4.0. Another way to solve HR problems apart from conducting additional education / training and recruiting more qualified HR is to do knowledge management within the company. Through good knowledge management, existing knowledge can be codified and disseminated to other employees. A tacit-to-tacit transfer of knowledge can also be done, as in the SECI model (Nonaka & Takeuchi, 1995). Also, the reuse of knowledge that has been 'captured' will also reduce re-learning or in other words, re-use of existing knowledge (Setiawan, Penggunaan Kembali Knowledge (Re-Use Knowledge) : Suatu Pandangan Teoritis Terhadap Manajemen Knowledge, 2007) thereby reducing costs and time for formal education / training.

Another interesting thing to see is that many of these factors indicate that there is still an inability of company employees or company owners to understand more clearly the concept of industry 4.0. This was evident in the interviews, where many respondents linked: automation and computerization with the concept of industry 4.0, or automation using computer aids with the concept of industry 4.0, although all the definitions do not link to the concept of industry 4.0 but rather refer to the concept of industry 3.0

All this shows the occurrence of confusion or misunderstanding between the concept of industry 4.0 with industry 3.0, this actually happened both at the industry level and at the regulator level. The end result is a false perception of the concept of industry 4.0

which results in misdirection from all parties to lead to the actual concept of industry 4.0. What happened was an effort to automate a computer-based company that was considered an industry 4.0 application, even though it was more about the industry 3.0 application.

To explain this phenomenon, it is necessary to look at the differences between the concepts of industry 3.0 and industry 4.0 in sufficient detail. Chen-Fu Chien, Tzu-yen Hong and Hong-Zhi Guo (2017) stated in sufficient detail the differences as in table 2 below, after modified by authors in (Setiawan & Poerbosisworo, 2021).

**Table 2** Difference Between Industry 3.0 and Industry 4.0 Concepts

Features	Industry 3.0	Industry 4.0
Core Concept	Highly automated system	Smart factory with CPS and IoT
Production Strategy	Mass Production	Mass Customization
Quality Control	Statistical Process Control	Self-aware; Self-predict
Resources Management	Materials Management; Human Resource Management; etc.	Self-configure; Self-optimize
Development Priorities	Investment of hardware	Construction of CPS and IoT

**Source:** Chen-Fu Chien, Tzu-yen Hong dan Hong-Zhi Guo (2017) modified by authors in (Setiawan & Poerbosisworo, 2021)

It can be seen in the table above that 3 things that are often interpreted as Industry 4.0 concepts are actually Industry 3.0 concepts as described above. In interviews, it is always mentioned about equipment investment, whereas the concept of industry 4.0 is not always or it makes a large device investment. Likewise, the main concept, most of them are still talking about transformation from non digital/semi digital production system to the concept of automation or the use of computers in the production process which is actually an industrial concept 3.0.

Therefore, basically besides the unpreparedness of supporting / inhibiting factors from the application

of industrial model 4.0, what is more important is that there will be a mistake in understanding the concept of industry 4.0. It is likely that this happened because the time available from the President launched the 4.0 industry movement to the level of trying to implement it on the ground is too short, so the actual knowledge about industry 4.0 is not yet establish in the mindset of relevan stakeholders. They always take the shortcut relating computer/digital revolution or automation as industry 4.0 concept because they didnt learn enough about industry 4.0 concept. This fenomenon is also discussed by Setiawan & Poerbosisworo (2021).

The majority of these issues are created by a lack of communication between academics who are well-versed in the concept of Industry 4.0, government as decision-makers, and industry, which will implement the concept within the constraints established by the government. Communication is also crucial within the organization to ensure that each employee has sufficient understanding about industrial 4.0 concepts and technologies (Ingaldi & Ulewicz, 2020) to ensure that industrial 4.0 concepts and technologies are implemented smoothly.

**Conclusion**

By looking at the discussion before this, then we can draw some general conclusions about the inhibiting factors in implementing Industry 4.0, especially in the automotive industry and the textile industry. There are some similarities but there are also some differences in the two industries. This is of course quite reasonable given the differences in the nature and driving force of each of these industries.

Both types of industries are equally unprepared in implementing industry 4.0 in Indonesia. Nevertheless the automotive industry is better prepared than the textile industry. Most likely, this is the case with most types of industries in Indonesia, but further research can be done to see this reality.

The difference in readiness in the two types of industries is on the problem of financial resources and human resources. Financial resources in the textile industry is a barrier, but this is quite understandable because the textile industry is considered a sunset industry, and also many are in fact traditional or SMEs so they do not have much money to begin with. The next difference is human resources, although neither of them inhibits the implementation of Industry 4.0, but because the nature of the industry is not high-tech,

human resources in the textile industry are less ready to understand and implement Industry 4.0.

In both types of industries there is a confusion of concepts between Industry 3.0 and Industry 4.0. Most think that automation using computers is Industry 4.0 even though it is an Industry 3.0 concept. As a result, many industries or companies claim that they have implemented Industry 4.0, even though they have just entered Industry 3.0.

Further research should be conducted on all types of industries by researchers who understand correctly the concepts of industry 4.0 and industry 3.0 so that they do not fall into the wrong conclusions, to see the real conditions of the application of industry 4.0 in Indonesia. It is also interesting to study concept confusion between industry 3.0 and industry 4.0 from the government to the industry level.

Unfortunately our research center has moves its topic outside of Industry 4.0 theme, so there is possibility that further research cannot be conducted.

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