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# ADVANTAGES AND IMPACTS OF LOGISTICS INTEGRATION ON THE INDUSTRY 4.0 ERA IN CARDIG LOGISTICS

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**Abstract.** The goal of this research is to assess the advantages and impacts of logistics integration on the industrial era 4.0 in the Cardig Logistics Company. This company is one of the logistics companies in Indonesia that want to implement the transformation of digitalization integration in the industrial era 4.0 in order to get advantages of changes to a better system. In the current operation of Cardig Logistics, it is difficult to face the challenges that arise such as Globalization, e-commerce, and complicated organizational structures as well as new startups that become competitors and there is also increasingly high customer demand encouraging s Cardig Logistik to adopt digitalization technology that allows it to become a competitor in the global market of industrial era 4.0. This study applied a quantitative approach using survey methods by taking samples from a population, namely Cardig Logistik Indonesia customers, because the key data collection tool would be a questionnaire, the type of research performed is explanatory. This approach was carried out to determine the advantages and impacts of the operation of Cardig Logistics after adopting Digitalization technology for customers who use Cardig Logistics services for the delivery of goods. From this research, the overall advantages and impacts can be used as developments in the operation of digitalized freight forwarding and logistics integration.

***Keywords***: *Digitalization, Integrated Logistics, Industry Era 4.0, Industrial Revolution, Advantages and Impact*

## Introduction

The tremendous development of science and technology has astounded the globe in its growth. In today's current era of economic challenges, digitalization is an important sector as an economic role in Indonesia, especially in the transportation and logistics sector, which is increasingly receiving attention during the COVID-19 pandemic. Business actors must also take quick steps to adapt in order to survive during the pandemic, including the digitization of logistics. Disruption in the logistics industry itself can be seen in the reduced loading of cargo from trailers and containers. This can happen due to transportation restrictions since companies have to enforce higher security. As a result, the supply chain is disrupted and has an impact on decreasing the volume of containers in various regions.

The Digitalization Era was born with a series of features and benefits that it presents. Various conveniences can be obtained by implementing digitalization both in the daily life of individuals and in the operations of an organization or company.

According to (Brennen, J.S. and Kreiss, 2016), digitization is the increasing availability of digital data made possible by advances in creating, transferring, storing, and analyzing digital data, and has the potential to structure, shape, and influence the contemporary world.

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(Donald Waters, 2003) defines logistics as a function that involves moving, managing the movement of goods, and storage of materials on their way from the initial sender, through the supply chain, and to the final customer. Meanwhile, according to (Sondang P. Siagian, 2014), logistics is defined as part of the supply chain process (supply chain) which functions to plan, implement, control effectively, efficiently the procurement, management, storage of goods, services, and information starting from the point of origin to the point of consumption to meet consumer needs.

The idea of the fourth industrial revolution contributed significantly to the phrase Industry 4.0(DAVIES, 2015). Thus according (Prasetyo & Sutopo, 2018), the industrialization occurred four times, the creation of the steam power and machinery starting to substitute human workers within England throughout 1784, triggering the very first industrialization, the second revolution took place at the late 19th century, while large scale production activities were undertaken out to use electrically industrial machines, the use of computer technology for manufacturing automation starting in 1970 marked the third industrial revolution. Currently, the rapid development of sensor technology, interconnection, and data analysis has given rise to the idea of integrating all these technologies into various industrial fields. This idea is predicted to be the next industrial revolution, namely the Industrial Revolution 4.0. The number four in the term Industry 4.0 refers to the fourth revolution.

(Zezulka et al., 2016) uses Industry 4.0 terminology in three interrelated factors, namely: (i) digitalization and integration of simple technical-economic relationships with complex technicalities-network complex economies, (ii) digitizing product and service offerings, and (iii) new market models. All these human activities are interconnected with many communication systems today. The most widely used technologies are the Internet of Things (IoT), Internet of Service (IoS), and Internet of People (IoP) which are based on Cyber-Physical-Systems.

This technology allows communication entities (in an Industry 4.0 environment) to link to each other and leverage data from manufacturers throughout the life cycle of the system without being constrained by company and country barriers. All relevant parties can obtain relevant information and data at any time so that they can know with certainty the developments that occur in supply, processing, and transportation as a basis for planning, managing, and evaluating a business. Communication patterns have also changed, not only limited between humans (Customer to Customer) but also between humans and machines (Customer to Machine) and between machines (Machine to Machine)(Cooper & James, 2009).

With the industrial revolution 4.0, currently, many logistics companies from various parts of the world are starting to implement digitalization in logistics activities. According to (Kayikci, 2018), the concept of digitizing logistics is to enable transparency over time from suppliers to customers, or in other words, there must be transparency throughout the supply chain. In addition, logistics must get a bigger vision to meet industry 4.0 requirements sustainably in terms of using the right technology and increasing vertical and horizontal integration among supply chain partners.

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PT. Cardig Logistik Indonesia, which is one of the logistics companies in Indonesia that implements the transformation of digitalization integration in the industrial era 4.0, must take advantage of changes to a better system. With the adoption of the growing trend towards automation and data exchange in technology in the industrial digitization industry 4.0 is to use cyber-physical systems (CPS) which means integrating computerized, networked, and real, these physical processes provide the basis for new business models and business solutions.

In the logistics industry, the use of digitalization systems must be integrated with all activities. Starting from warehousing, trucking, and logistics transportation, upstream to downstream industries. This is also at the same time anticipating the growth of logistics needs in Indonesia which are starting to shift to the era of digitalization and the industrial revolution 4.0. (Cahn, 2019), states that to gain stability in a constantly changing economy, businesses need to undergo digital transformation. Many businesses are already on a digital transformation journey; if companies haven't started to change, they have to do it right away or fall behind.

Industry 4.0's digital transformation is not as easy as turning a hand, it takes awareness and willingness from various parties in the supply chain to work together to make it happen. However, the benefits that arise from digitizing the core operational activities of logistics business players are enormous. Due to this, operational activities become more effective as well as cost-effective. PT Cardig Indonesia is indeed an illustration about how technological innovation will be used in the business process. This company performs truck-driver plotting (assignment) which contains the number of shipments of goods, total weight of cargo, truck data, and driver data, as well as recording trips by trucks from the point of departure to the point of destination using an Android application (driver). Thus, drivers and customers can find out the estimated travel path to be traversed, the determination of departure and arrival in real-time is stored in the database, as well as more planned trips according to the delivery schedule. In the end, delivery of goods can be more on time and unexpected costs can be better anticipated.

In the current operation of Cardig Logistics, it will be difficult to face the challenges that will arise such as globalization, e-commerce, and complex organizational structures, new startups that will become competitors and increasingly high customer demand prompts Cardig Logistik to adopt digitalization technology that allows it to become a competitor in the global market industrial era 4.0.

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## Method

a. Types of research

This technique of observational research is associative descriptive, demonstrating the correlation between the independent and selected variables. The type of research adopted for this research was informative, since it used a survey method to gather samples from a population using a questionnaire as the main research instrument. July 2021 was the timeframe for research.

b. Population and Sample

The population is a generalization area consisting of; objects/subjects that have certain quantities and characteristics determined by researchers to be studied and then conclusions are drawn (Sugiyono, 2017). The population in this study was all customers who use Indonesia's Cardig Logistics services. The sample was part of the number and characteristics possessed by the population (Sugiyono, 2017). In this study, the authors used saturated sampling. Because the population was relatively small, the saturated sampling technique used was saturated sampling, in which all the population was used as a sample (Sugiyono, 2017) as many as thirty-six people, namely anyone who had been a customer of Indonesia's Cardig Logistics.

c. Sources and Methods of Data Collection

Primary data sources, which were obtained or collected directly from research or field sources obtained through careful observation and recording through distributing questionnaires to Cardig Logistik customers. The data were the respondents' answer which will be analyzed systematically.

Sources of secondary data, the research included various information obtained based on the literature as well as documentation and journals that can support this research.

d. Instrument Testing

Before the instrument is used to collect the necessary data, it is necessary to test the instrument first to obtain empirically valid statement items. By using SPSS 16.

a) Multiple Regression Analysis

Multiple linear regression was used for one dependent variable and two or more independent variables. Multiple linear regression is also a tool that can be used to determine the effect of one or more independent variables on one dependent variable. According to (Sugiyono, 2017), the multiple linear regression formula is as follows:

$$Y = a+b1X1+b2X2$$

| | |
|---|---|
| Y | = Related Variable |
| X1 | = First Independent Variable |
| X2 | = Second Independent Variable |
| a and b1 and b2 | = Constant |

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## Discussion and Result

a. Validity Test

The level to which the measuring instrument is used to measure what is being measured is fully informed the evaluation. The technique involves correlating the individual's total score with the scores obtained on each question item.

Validity tests were conducted with the help of a computer as well as the SPSS.16 program. Validity testing was only conducted on thirty-six respondents in this study. The value of $\mathbf{r_{count}}$ (Corrected Item-Total Correlation) > $\mathbf{r_{table}}$ of 0.3291 has been used to make informed decisions.

It would be as below, based on the results of the validity test of the Logistics Integration Advantages variable with six question items:

Table 1.1 Logistics Integration Advantages Validity Test

| **Item-Total Statistics** | | | |
|---|---|---|---|
| **Statement** | **Corrected Item Total-Correlation ($r_{count}$)** | **$r_{table}$** | **Validity** |
| Statement X1.1 | 0.637 | 0.3291 | VALID |
| Statement X1.2 | 0.645 | 0.3291 | VALID |
| Statement X1.3 | 0.605 | 0.3291 | VALID |
| Statement X1.4 | 0.521 | 0.3291 | VALID |
| Statement X1.5 | 0.645 | 0.3291 | VALID |
| Statement X1.6 | 0.492 | 0.3291 | VALID |

Source: SPSS.16 Processing Data Output (processed by the author)

Because the value of $\mathbf{r_{count}}$ (Corrected Item-Total Correlation) > $\mathbf{r_{table}}$ is 0.3291, every question for said Logistics Integration Advantages variable get a valid status, as shown by the Table 1.1.

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Table 1.2 Logistics Integration Impact Validity Test

| Item-Total Statistics | | | |
|---|---|---|---|
| **Statement** | **Corrected Item Total-Correlation ($r_{count}$)** | **$r_{table}$** | **Validity** |
| Statement X2.1 | 0530 | 0.3291 | VALID |
| Statement X2.2 | 0333 | 0.3291 | VALID |
| Statement X2.3 | 0.429 | 0.3291 | VALID |
| Statement X2.4 | 0.486 | 0.3291 | VALID |
| Statement X2.5 | 0.630 | 0.3291 | VA LID |
| Statement X2.6 | 0.724 | 0.3291 | VALID |
| Statement X2.7 | 0.626 | 0.3291 | VALID |
| Statement X2.8 | 0.599 | 0.3291 | VALID |
| Statement X2.9 | 0.603 | 0.3291 | VALID |

Source: SPSS.16 Processing Data Output (processed by the author)

And as such the value of $r_{count}$ (Corrected Item-Total Correlation) > $r_{tabel}$ is 0.3291, all questions for the Logistics Integration Impact variable also have valid result, as seen in Table 1.2.

Table 1.3 Industrial Revolution 4.0 Validity Test

| Item-Total Statistics | | | |
|---|---|---|---|
| **Statement** | **Corrected Item Total-Correlation ($r_{count}$)** | **$r_{tabel}$** | **Validity** |
| Statement Y.1 | 0.449 | 0.3291 | VALID |
| Statement Y.2 | 0.613 | 0.3291 | VALID |
| Statement Y.3 | 0.465 | 0.3291 | VALID |
| Statement Y.4 | 0.575 | 0.3291 | VALID |
| Statement Y.5 | 0.702 | 0.3291 | VALID |
| Statement Y.6 | 0.586 | 0.3291 | VALID |
| Statement Y.7 | 0.724 | 0.3291 | VALID |
| Statement Y.8 | 0.458 | 0.3291 | VALID |
| Statement Y.9 | 0.511 | 0.3291 | VALID |
| Statement Y.10 | 0.416 | 0.3291 | VALID |

Source: SPSS.16 Processing Data Output (processed by the author)

So, the value of $r_{count}$ (Corrected Item-Total Correlation) > $r_{tabel}$ is 0.3291, the questions for Industrial Revolution 4.0 variable do have valid category, as shown by the Table 1.3.

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b. Reliability Test

On question items that have been established to be valid, a reliability testing is conducted. If such responses to inquiry are continuously consistent, a variable is referred to as reliability.

The instrument reliability coefficient is also used to examine the consistency of the respondents' replies to the Statement items. The split-half procedure has been used in the analysis tool, whereby compares the overall odd and even scores, and then calculates the reliability using the "Alpha Cronbach" formula. The measurement was carried out by using SPSS.16 computer program. The results of the descriptive assessments for each variable are included in the table below.

Table 1.4 Reliability Test Results

| **Variable** | ***Alpha Cronbach*** | >/< | **Constant** | **Description** |
|---|---|---|---|---|
| Advantages of Logistics Integration | 0.625 | > | 0.600 | Reliability |
| Impact of Logistics Integration | 0.734 | > | 0.600 | Reliability |
| Industrial Revolution 4.0 | 0.778 | > | 0.600 | Reliability |

Source: SPSS.16 Processing Data Output (processed by the author)

The reliability analysis was conducted on the question items that were certified acceptable, which is shown in Table 1.4. Whenever the answers to queries are consistent, a variable was said to have been reliable. As just a conclusion, the Logistics Integration Advantages instrument does indeed have a reliability coefficient of = 0.625, the Logistics Integration Impact instrument does have a reliability coefficient of = 0.734, and the Industrial Revolution 4.0 instrument has such a reliability coefficient of = 0.778. Which has a "Cronbach Alpha" score over than 0.600, demonstrating that the instruments are deemed credible or meet the expectations.

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c. Multiple Regression Analysis

Multiple Regression Analysis is more accurate in conducting correlation analysis on this data because in this analysis it is difficult to show the slope (the rate of change of one variable to another variable can be determined). Based on the results of calculations using SPSS, the following results are obtained:

Table 1.5 Multiple Linear Regression

**Coefficients[a]**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| 1 (Constant) | 10.427 | 5.216 | | 1.999 | .054 |
| Advantages | .824 | .179 | .568 | 4.600 | .000 |
| Impact | .287 | .104 | .341 | 2.764 | .009 |

a. Dependent Variable: Revolution Industry 4.0

Source: SPSS.16 Processing Data Output (processed by the author)

From table 1.5 above, it can be seen that the Multiple Linear Regression equation is as follows:

$$Y = a+b1X1+b2X2$$

$$Y = 10{,}427+0{,}824X_1+0{,}287X_2$$

a) The constant value (a) of 10.427, if the independent variable is really not put into consideration, or if there haven't been any variables advantages of logistics integration and the impact of logistics integration, the industrial revolution of Cardig Logistics will be worth 10.427.
b) The value of the coefficient of logistics integration advantages (X1) is 0.824, which indicates that its advantages of logistics integration fluctuate among each point increase, assuming the variable impact of logistics integration is constant, the industrial revolution 4.0 will increase by 0.824.
c) The contribution coefficient of logistics integration (X2) is 0.287, that further suggests that each and every away and moved in the impact of logistics integration, the industrial revolution 4.0 will enhance by 0.287, presuming that the variable advantages of logistics integration remain unchanged.

d. Correlation Coefficient Analysis

Correlation coefficient analysis is used to determine the close relationship between two or more variables and to determine the direction of the relationship.

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Table 1.6 Correlation coefficient

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .719[a] | .518 | .488 | 1.880 |

a. Predictors: (Constant), Advantages, Impact

Source: SPSS.16 Processing Data Output (processed by the author)

Based on a calculation of table 1.6 using the SPSS.16 method, the R result is 0.719. The strength of the relationship between the advantages and impact of logistics integration on the industrial revolution 4.0 is very strong, indicated by the R-value of 0.719 which is included in the coefficient interval 0.60 - 0.799.

e. Coefficient of Determination Analysis

The coefficient of determination test is carried out to find out how much the dependent variable can be explained by the independent variables in this study.

Referring to table 1.6 and thus the subsequent formula, the coefficient of determination is used to measure how many inputs or adjustment the independent variable produces to the dependent variable:

$$KD = R^2 \times 100\%$$

Then $= (0719)^2 \times 100\%$
$= 0.518 \times 100\%$
$= 51.8\%$

The value ($R^2$) of 0.518, performed on the information above, demonstrates that the independent variable would represent 51.8 percent of such variation in the dependent variable, with all the remaining influenced by other variables not investigated.

f. Simultaneous Test

The next step is to conduct a Simultaneous Test to determine the effect of the independent variables that is the advantages of logistics integration and the impact of logistics integration on the dependent variable, namely the industrial revolution 4.0 simultaneously.

$H_0$ : There is no simultaneous effect

$H_a$ : There is a simultaneous effect

Based on decision making If the statistical value is <0.05 then $H_a$ is accepted, otherwise if the statistical value> 0.05 $H_0$ is rejected.

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Table 1.7 Simultaneous Tests

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 125.053 | 2 | 62.526 | 17.698 | .000[a] |
| | Residual | 116.586 | 33 | 3.533 | | |
| | Total | 241.639 | 35 | | | |

Source: SPSS.16 Processing Data Output (processed by the author)

From the results of computer calculations using the SPSS.16 program table 1.7, it is known that the variable Advantages of Logistics Integration (X1) and the variable Impact of Logistics Integration (X2) with the Industrial Revolution 4.0 variable (Y) results show a significance output <0.05. The outcome seems to be that $H_a$ is supported, signifying that the Advantages of Logistics Integration variable and the Impact of Logistics Integration on the Industrial Revolution 4.0 variables have quite a simultaneous influence.

g. Hypothesis test

Hypothesis is also used to discover not if the independent variables and the dependent variable do have significant relationship. As such an illustration, suggest the following:

Table 1.8 Hypothesis test

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| 1 (Constant) | 10.427 | 5.216 | | 1.999 | .054 |
| Advantages | .824 | .179 | .568 | 4.600 | .000 |
| Impact | .287 | .104 | .341 | 2.764 | .009 |

a. Dependent Variable: Industrial Revolution 4.0

Source: SPSS.16 Processing Data Output (processed by the author)

a) Advantages of Logistics Integration (X1) on the Industrial Revolution 4.0 (Y)

Throughout the Coefficients a table, the Advantages of Logistics Integration therefore have substantial value (Sig.) of 0.000 with such a level of a (degree of significance) of 0.05, meaning 0.000 <0.05 or the independent variable has a massive impact. Logistics Integration's Advantages in the Fourth Industrial Revolution.

b) Impact of Logistics Integration (X2) on the Industrial Revolution 4.0 (Y)

That impact of logistics integration on the industrial revolution seems to have a confidence interval (Sig.) of 0.009 with a significance level of 0.05 (degree of consideration), signifying either 0.009 <0.05 or there is a major influence on the variable impact of logistics integration on the industrial revolution. 4.0.

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## Conclusion

The preceding can indeed be inferred based upon the results of all the above discussion and analysis:

a) In Multiple Linear Regression, the advantages of logistics integration and the impact of logistics integration have a significant effect on the 4.0 industrial revolution, meaning that the more advantageous and impact of logistics integration, the higher the development of the 4.0 industrial revolution.
b) In the simultaneous test, there is a positive influence between the advantages and the impact of logistics integration on the era of the industrial revolution 4.0. This shows the simultaneous effect of the advantages variable and the impact of logistics integration on the 4.0 Indonesian Cardig industrial revolutions.
c) In the hypothesis test, there is a significant relationship between Advantages of Logistics Integration and the impact of Logistics Integration on Industrial Revolution 4.0.

Revolution 4.0 brought changes in PT. Cardig Logistics Indonesia. It has fundamentally changed and has had a major impact on its implementation. Industry 4.0 does have a favorable effect in related to resource usefulness, as well as lower labor costs, and also has a severe effect on the amount of worker shortfalls. Employees having literacy skills and technological literacy will essential in Industry 4.0.

Digitization of logistics enables companies to meet customer demands, overcome supply-side weaknesses and deficiencies, and improve services for customer satisfaction.

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