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ERP SYSTEM ADOPTION DETERMINANTS

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ABSTRAK

Penelitian ini menguji faktor-faktor yang mempengaruhi penggunaan Enterprise Resource Planning (ERP) di PT Kereta Api Indonesia area operasi 8 Surabaya. Responden penelitian ini sebanyak 70 pengguna sistem ERP. Pengujian hipotesis dilakukan menggunakan model SEM-PLS. Hasil penelitian ini menunjukkan bahwa karakteristik individu, karakteristik organisasi, dan karakteristik teknologi memiliki pengaruh positif yang signifikan terhadap manfaat yang dirasakan dari ERP dan persepsi kemudahan penggunaan ERP. Manfaat yang dirasakan dari ERP dan persepsi kemudahan penggunaan ERP memiliki pengaruh positif yang signifikan terhadap niat untuk menggunakan ERP. Persepsi kemudahan penggunaan ERP mempengaruhi secara positif dan signifikan terhadap manfaat yang dirasakan dari ERP. Sementara itu, niat untuk menggunakan ERP memiliki pengaruh positif yang signifikan terhadap penggunaan ERP. Hasil penelitian ini dapat digunakan sebagai pertimbangan untuk menilai efektivitas penerimaan implementasi sistem ERP. Selanjutnya, hasil penelitian ini juga dapat digunakan untuk meningkatkan pengembangan sistem ERP di masa depan.

Keyword : ***Enterprise Resourece Planning, Karakter, Kegunaan, Persepsi***

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Introduction

Modern companies are currently investing heavily in information systems. The investment information system that is currently widely adopted is Enterprise Resource Planning (ERP). ERP is able to integrate existing data across various business lines of the company (Rajan and Baral, 2015). The results show that more than two-thirds of ERP implementations fail (Chang et al., 2008). This is supported by subsequent findings by Sudhaman and Thangavel (2015), which state that 70% of ERP projects are weak in terms of quality efficiency. This is because the ERP implementation involves not only technical skills, but also includes broader behavioral factors (Skok and Dörigger, 2001).

Companies need to understand the adoption of the system from the user's point of view in order to prepare employees for new challenges and to learn how to use technology so that the benefits of the technology can be achieved (Chang et al., 2008). According to Amadi-Echendu and de Wit (2015) user perceptions affect the acceptance of technology. In addition to user perceptions, communication to users is also able to increase user satisfaction of the technology employed (Ju et al.,2016). However, organizational, technological, and individual factors can be challenges that must be faced in ERP implementation (Babaei et al.,2015).

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Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
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PT Kereta Api Indonesia is one of the State-Owned Organizations (BUMN) in Indonesia that has implemented the ERP system in its business process since 2014. The investment in this system is aimed to improve productivity and service quality. PT Kereta Api Indonesia is required to be able to manage various business lines in an integrated manner to provide the best service. Management of various lines of business in an integrated manner would require an adequate information system. However, information systems investment is very expensive and should be adjusted to the company's business processes and user acceptance of the information system used.

Based on the results of previous research that shows the importance of determinants that affect the effectiveness of ERP implementation, it is important to do more research related to it. This article consists of several sections, namely literature review, methods, result, and discussion. In the literature review section, a review is concerned with the determinants that influence the use of ERP. In the method section, it presents an explanation of the research approach used in this study, the definition of operations and how to measure the variables used in the study. In this section, the development of research hypotheses is also presented. Furthermore, the results section delivers the statistical outputs of hypothesis testing and its interpretation. The final section of this article discusses the test results, contributions, and their implications.

Literature Review and Hypotheses

Technology Acceptance Model (TAM)

TAM is a theoretical model that is currently widely used to explain user acceptance of the adoption of information systems technology (Rajan and Baral, 2015). TAM is the most powerful theoretical model that can be used to measure the level of acceptance of end-user computer technology (Igbaria et al.,1995). Therefore, TAM can be used on ERP systems to explain the complex implementation of information systems technology to the Stakeholders and the end users (Amoako-Gyampah and Salam, 2004).

There are two main variables that influence one's acceptance of information technology, according to TAM, namely Perceived Usefulness of ERP and Perceived Ease of Use of ERP. Perceived Usefulness is the perception of someone who believes that using a system will improve his performance; while Perceived Ease of Use is the perception of someone who believes that information technology systems are easy to apply (Davis, 1989).

The theoretical model of TAM also states that Perceived Ease of Use affects Perceived Usefulness because the ease of using the system will increase the benefits of the information technology system itself (Robey and Farrow, 1982). Usage as the real condition of application of information technology systems is more influenced by Perceived Usefulness than Perceived Ease of Use which can be reviewed from the frequency and duration of technology usage over time (Davis, 1989).

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

Hypothesis Development

The researchers used self-efficacy computer indicators to measure the effect of individual characteristics on perceived usefulness and perceived ease of use of ERP. Rajan and Baral (2015) stated that computer self-efficacy has a significant and positive impact on TAM variables, in line with research conducted by Agarwal and Karahanna (2000). Computer self-efficacy plays an important role in influencing one's willingness to use a system through perceived usefulness. Venkatesh and Davis (2000) stated that computer self-efficacy is the main determinant of Ease of Use Perception. Based on research conducted by Hu et al., (2003) stated that who examine the acceptance of technology by school teachers, the results suggest that computer self-efficacy impacts on technology acceptance and perceived ease of use.

H1: individual characteristics affect the perceived usefulness of ERP
H2 : individual characteristics affect the perceived ease of use of ERP

To measure the effect of organizational characteristics on perceived usefulness and perceived ease of use of ERP, researchers used indicators of organizational support and training. Rajan and Baral (2015) stated that organizational support and training have a significant positive impact on perceived usefulness. However, organizational support has a more significant impact on perceived usefulness than training. Supported by the results of research (Lee et al., 2010) which said that organizations that support employees to do work using the system make employees enjoy their work more and improve employee performance through the use of new systems. Rajan and Baral (2015) also stated that organizational support and training have a significant positive impact on perceived ease of use. Training has a more significant impact on perceived ease of use of ERP. This is also reinforced by research conducted by Lee et al.,(2010) .

H3 : organizational characteristics affect the perceived usefulness of ERP
H4 : organizational characteristics affect the perceived ease of use of ERP

To measure the effect of technological characteristics on perceived usefulness and perceived ease of use of ERP, the researcher uses compatibility indicators and complexity of information technology systems. Hu et al., (2003) stated that compatibility has a significant impact on the perceived usefulness of ERP. This is supported by further research (Rajan and Baral, 2015) which states that compatibility has a significant positive impact on perceived usefulness. Hu et al., (2003) stated that compatibility has a significant impact on perceived ease of use. Rajan and Baral (2015) also stated that compatibility has a significant positive impact on perceived ease of use of ERP.

H5 : technological characteristics affect the perceived usefulness of ERP
H6 : technology characteristics affect the perceived ease of use of ERP

Based on the concept of the TAM model, perceived usefulness refers to the relationship of productivity, performance, and work-related effectiveness (Davis, 1989). Previous research has suggested that perceived usefulness is an important indicator of technological acceptability (Taylor and Todd, 1995).

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

Perceived usefulness in some studies indicates a direct impact on the intention to use (Davis, 1989 ; Taylor and Todd, 1995). Rajan and Baral (2015) stated that perceived usefulness has a significant impact on the intention to use. Perceived usefulness has a stronger effect on the intention to use than perceived ease of use. Rajan and Baral (2015) stated that perceived ease of use has a significant positive impact on the intention to use; this is in line with the research (Davis, 1989).

H7 : perceived usefulness of ERP affects the intention to use ERP

H8 : perceived ease of use of ERP affects the intention to use ERP

Davis (1989) defined perceived ease of use as when someone believes that a system is easy to use, while the perceived usefulness is defined as when someone believes that the system is able to make his/her performance increase. Previous research (Amoako-Gyampah and Salam, 2004 ; Davis, 1989) showed that perceived ease of use is positively associated with perceived usefulness.

H9 **: perceived ease of use of ERP affects perceived usefulness of ERP**

Rajan and Baral (2015) stated that the intention to use has a positive impact on the use of ERP. According to Davis (1989) usefulness affects more the use, rather than ease of use itself. Then the hypothesis of this research is:

H10 : the intention to use ERP affects the use of ERP

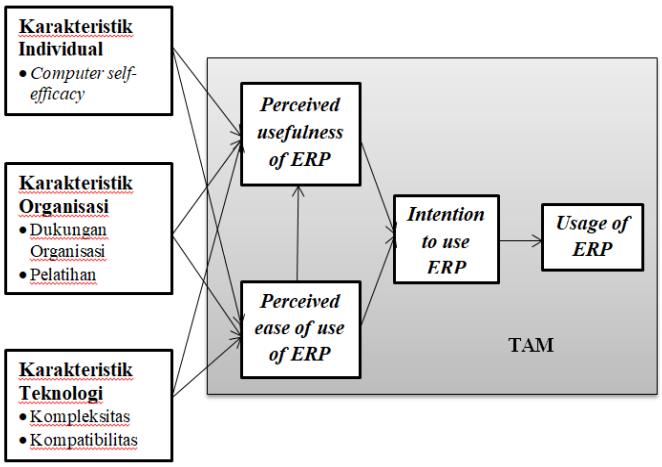

Figure 1 Conceptual Framework

Source : Rajan dan Baral (2015)

Research Method

Sample and Sampling Technique

This study specifies end-users of ERP SAP PT Kereta Api Indonesia Operating Area 8 Surabaya as the research population. The number of the population in this study is calculated by using the number of computers that installed ERP SAP in the environment of PT Kereta Api Indonesia Operating Area 8 Surabaya, which number 145 computers. The sampling technique used in this research is saturated sampling. Since the saturated sampling is used as a

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

sampling technique, then the entire population will be used in this study. The number of responses received back by the researchers is a total of 70 people.

Research Variables

The variables measured by the lowest to the highest on the Likert scale are given 1, 2, 3, 4, 5, for each question or statement of each variable. Individual characteristics show that the ability and knowledge possessed by an individual can affect his/her acceptance of a system implementation. Individual characteristics are measured by using self-efficacy computer indicators as outlined in items numbered 1 to 10.

Organizational characteristics show the organization's ability to influence end-user behavior to use the system. The organizational characteristics are measured using organizational support and training indicators as outlined in items numbered 11 to 22. Technological characteristics show the state of technology used to support end-user behavior in using the system. The technological characteristics are measured by using the indicator of complexity and compatibility as outlined in items numbered 23 to 30.

Perceived Usefulness of ERP shows how much information technology is useful to improve the effectiveness and efficiency of a person in the workplace so that it can affect the performance of the person's work. Perceived Usefulness is measured using question items numbered 31 to 34. Perceived Ease of Use of ERP shows a person's confidence that information technology is easy to use. Perceived ease of use is measured using question items numbered from 35 to 38.

Intention to Use ERP shows a person's willingness to keep using information technology. Intention to use is measured using question items numbered 39 to 40. Usage of ERP shows the real conditions of application of information technology systems that can be seen from how often users use information technology in their daily work. Usage is measured using question items numbered 41 to 43.

Result And Discussion

Result

Table 1 presents the descriptive statistics of the variables used in the study. Based on this table, the minimum value of the variables used in this study is 1 except the Perceived Usefulness of ERP variable that has a minimum value of 2, while the maximum value of the variable is 5. This is because the use of a Likert scale 1 to 5 in the research questionnaire causes the minimum value of 1 which describes the highest level of disagreement and maximum value of 5 reflects the highest level of approval. The highest average value is indicated by an individual characteristic variable of 4.33 while the lowest average value is indicated by Perceived Ease of Use of ERP of 3.66. The highest standard deviation is shown by the organizational characteristic variable of 1,089, whereas the lowest standard deviation is indicated by the individual characteristic of 0.819.

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

Table 1: Descriptive Statistics

Variable	N	Min	Max	Mean	Std. Deviation
IC	70	1	5	4.33	0.819407451
OC	70	1	5	3.95	1.089503581
TC	70	1	5	3.81	0.881851785
PU	70	2	5	3.96	0.859154492
PEOU	70	1	5	3.66	0.94365046
IU	70	1	5	3.84	0.933861129
USG	70	1	5	3.9	1.041943344

Source: Processed Data, 2018

Hypothesis 1, which states that individual characteristics have an effect on the perceived usefulness of ERP, is supported. Individual characteristics (IC) have significant positive effect on the perceived usefulness of ERP (PU) seen from the value of $\beta = 0{,}53$ and $p < 0{,}01$ which means a higher level of end users believe in their ability to use ERP; therefore the adoption of an ERP system will increase end-user perceptions that adopted ERP is useful for improving performance. In addition, $R^2 = 0.28$ shows that independent variables of individual characteristics are able to explain the dependent variable of perceived usefulness by 28%.

Hypothesis 2, which states that individual characteristics affect the perceived ease of use of ERP, is supported. Individual characteristics (IC) have a significant positive effect on perceived ease of use of ERP (PEOU) seen from the value of $\beta = 0{,}55$ and $p < 0{,}01$, which means that the higher level of end user trust on his/her ability to use ERP. ERP will further enhance end-user confidence that information technology is easy to use. Then, $R^2 = 0.31$ indicates that the independent variable of individual characteristics is able to explain the dependent variable of perceived ease of use of ERP of 31%.

Hypothesis 3, which states that organizational characteristics have an effect on the perceived usefulness of ERP, is supported. Organizational characteristics (OC) have a significant positive effect on the perceived usefulness of ERP (PU) seen from the value of $\beta = 0.82$ and $p < 0.01$, which means that the perception that an information technology is useful in improving end user performance will increase the presence of organizational support and training conducted by companies that adopt ERP systems. Then, $R^2 = 0.68$ indicates that independent variables of organization characteristics are able to explain the dependent variable of perceived usefulness equal to 68%.

Hypothesis 4, which states that organizational characteristics have an effect on perceived ease of use of ERP, is supported. The organizational characteristics (OC) have a significant positive effect on perceived ease of use of ERP (PEOU) seen from the values of $\beta = 0.70$ and $p < 0.01$, which means the greater the support of the organization and the more frequent the training, so too does the end user's perception of technology information as being easy to use increase. Then, $R^2 = 0.48$ indicates that independent variables of organization characteristics are able to explain the dependent variable of perceived ease of use equal to 48%.

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

Hypothesis 5, which states that the characteristics of technology affect the perceived usefulness of ERP, is supported. The characteristics of technology (TC) have a significant positive effect on the perceived usefulness of ERP (PU) seen from the value of $\beta = 0.77$ and $p < 0.01$ which means that the more appropriate an information technology is to the business process of the company, then the end user's perception about adopting information technology being of benefit for increased performance will also be greater. Then, $R^2 = 0.59$ indicates that the independent variable of technological characteristics is able to explain the dependent variable of perceived usefulness of 59%.

Hypothesis 6, which states that the characteristics of technology affect the perceived ease of use of ERP, is supported. The characteristics of technology have a significant positive effect on perceived ease of use of ERP (PEOU) seen from the value of $\beta = 0.78$ and $p < 0.01$, which means the more suitable an information technology is to the business process of the company, then the end user's perception that the information technology adopted is easy to use will also be greater. Then, $R^2 = 0.60$ indicates that the independent variables of technological characteristics are able to explain the dependent variable of perceived ease of use of ERP by 60%.

Hypothesis 7, which states that perceived usefulness of ERP affects the intention to use ERP, is supported. Perceived usefulness of ERP (PU) has a significant positive effect on the intention to use ERP (IU) seen from the value of $\beta = 0.68$ and $p < 0.01$, which means the more useful an information technology is for end users, then the greater the desire to use information technology itself. Then, $R^2 = 0.46$ shows that the independent variable of perceived usefulness is able to explain the intention to use the dependent variable by 46%.

Hypothesis 8, which states that perceived ease of use of ERP affects the intention to use ERP, is supported. Perceived ease of use of ERP (PEOU) has a significant positive effect on the intention to use ERP (IU) seen from the value of $\beta = 0.66$ and $p < 0.01$, which means that the easier an information technology is to use, then the greater the willingness of end users to use information technology adopted. Then, $R^2 = 0.44$ indicates that the independent variable of perceived ease of use of ERP is able to explain the dependent variable intention to use ERP about 44%.

Hypothesis 9, which states that perceived ease of use of ERP affects perceived usefulness of ERP, is supported. Perceived ease of use of ERP (PEOU) has a significant positive effect on perceived usefulness (PU) seen from the value of $\beta = 0.75$ and $p < 0.01$, which means that the easier an information technology is to use, then the end user's perception of the benefits of information technology will also increase. Then, $R^2 = 0.56$ indicates that the independent variable perceived ease of use of ERP is able to explain the dependent variable of perceived usefulness of ERP of 56%.

Hypothesis 10, which states that the intention to use ERP effects the use of ERP, is supported. Intention to use ERP (IU) has a significant positive effect on the use of ERP (USG) seen from the value of $\beta = 0.63$ and $p < 0.01$, which means the greater the willingness of end users to use information technology, the more end users will use information technology in daily work. Then, $R^2 = 0.40$

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

indicates that the independent variable of intention to use ERP is able to explain the dependent of variable usage of ERP by 40%.

Discussion

The higher the level of end user confidence in his/her ability to use ERP, then the adoption of an ERP system will further enhance the end user's perception that adopted ERP is useful for improving performance. The results of this study are in line with research done by Rajan & Baral (2015) who stated that computer self-efficacy has a significant positive effect on perceived usefulness.

The higher the level of end user confidence in his/her ability to use ERP, then the adoption of an ERP system will further enhance the end user's confidence that the information technology is easy to use. This is in line with research conducted by Hu, Clark & Ma (2003) and Venkatesh and Davis (2000, who) stated that computer self-efficacy is a major factor affecting perceived ease of use.

The perception that an information technology is useful in improving end user performance will increase with the support of organizations and training conducted by companies that adopt the ERP system. This is in line with the research by Rajan & Baral (2015) which concluded that both organizational and training support have a significant positive effect on perceived usefulness, but greater organizational support than training. Organizational support will encourage users to use ERP and realize the benefits that can be gained by using ERP.

The greater the support of the organization and the more frequently that training sessions are being held, then the end user's perception that the information technology is easy to use is also greater. This is in line with the research by Rajan & Baral (2015), Lee et al. (2010), and Ngai et al. (2007) who stated that both organizational and training support have a significant positive effect on perceived ease of use, but greater training influence than organizational support. Training will eliminate negative views about the ERP system.

The more appropriate an information technology is to the company's business processes, then the end user's perception of the adopted information technology being beneficial for the performance improvement is also greater. This is in line with research by Rajan & Baral (2015) and Hu et al. (2003) who said that the implementation of ERP that matches the company's business processes will be more accepted by end users.

The more consistent an information technology is to the company's business processes, then the end user's perception that the information technology adopted is easy to use will also be greater. This is supported by previous research conducted by Rajan & Baral (2015) and Hu et al. (2003) which concluded that ERP implementation that matches the company's business processes will be more accepted by the end users.

The more useful an information technology for end users, then the greater the desire to use the information technology itself. The results of this study are in line with research by Rajan & Baral (2015) which stated that perceived usefulness has a significant impact on the intention to use.

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
ISSN 2548-1401 (Print) ISSN 2548-4346 (Online)

The easier an information technology is to use, the greater the willingness of the end user to use the information technology that is adopted. The results of this study are in line with research by Rajan & Baral (2015) and Davis (1989), who stated that perceived ease of use of ERP has a significant impact on the intention to use ERP.

The easier an information technology to use, then the end user's perception of the benefits of information technology will also increase. The results of this study are supported by research conducted by Amoako-Gyampah & Salam (2004) and Davis (1989).

The greater the willingness of end users to use information technology, the more end users use information technology in their daily work. The results of this study are supported by previous research conducted by Rajan & Baral (2015) and Davis (1989).

Based on the results of the research, it is found that individual characteristics, organizational characteristics, and technological characteristics positively affect end user perceptions of perceived usefulness and perceived ease of use of ERP. The results also show that perceived usefulness and perceived ease of use affect positively the intention to use. Intention to use then influences the use of ERP. The Technology Acceptance Model (TAM) theory states that the use of information technology can improve one's effectiveness and efficiency in working. Thus, if it is linked to this study, the better individual, organizational, and technological characteristics will increase perceived usefulness and perceived ease of use of ERP, which will have an impact on increasing intentions to use and the use of ERP which will ultimately improve efficiency and effectiveness of the end user's performance.

Conclusion

The results of this research that uses the data of 70 end users from PT Kereta Api Indonesia operating area 8 Surabaya, show that individual characteristics, organizational characteristics, and technological characteristics have significant positive effects on the perceived usefulness of ERP and perceived ease of use of ERP. Both of these have a significant positive effect on the intention to use ERP. Perceived ease of use of ERP has a significant positive effect on the perceived usefulness of ERP, while the intention to use ERP has a significant positive effect on the usage of ERP. These results can be used as a consideration to assess the effectiveness of the acceptance of ERP system implementation.

Limitation

The results of this research are not intended to carry out generalization. Further research can be done at the company level.

Implication

The results of this study can be used as a consideration to assess the effectiveness of the acceptance of ERP system implementation. Furthermore, the results of this research can also be used to improve the development of ERP systems in the future.

Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
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Jurnal Riset Akuntansi dan Bisnis Airlangga Vol. 3. No. 2 (2018) 470-480
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