

The Effect of Perceived Quality, Perceived Value, Brand Preference, and Customer Satisfaction on ERP Implementation in Construction Services

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Abstract

Enterprise Resource Planning (ERP) is an information system in a company to optimize business processes and transactions. System Applications and Products (SAP) is one application that uses ERP system applications. The purpose of this study is to determine the effect of each variable indicating whether the system has been operating properly so that it can support maximum system performance. The research variables are Perceived Quality (PQ), Perceived Value (PV), Brand Preference (BP), dan Customer Satisfaction (CS). The data analysis method used a structural equation model or Structural Equation Model-Partial Least Square (SEM-PLS) using the SmartPLS 3.0 application. The case study used in this research is PT Hutama Karya, a construction service company. Data collection was carried out using questionnaires to 68 respondents, who are users of the SAP application with a Likert scale measurement. The result shows that PQ positively and significantly impacts on CS, PV, and BP. Brand Preference has a positive and significant influence on CS. Perceived value has a positive and significant influence on BP, but does not have a positive and insignificant effect on CS.

Keywords: Perceived Quality, Perceived Value, Brand Preference, Customer Satisfaction, Partial Least Square.

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1. Introduction

Changes in the world's business have resulted in companies facing challenges to expanding markets and customer expectations (Li, 2000);(Umble et al., 2003); (Tambovcevs & Merkurjev, 2009). In facing competition, companies need to efficiently coordinate all global demand, supply, and production (Lubis, 2021). With the emergence of Industry 4.0, new technologies have become available that help companies to monitor, integrate, and track processes through digital systems (Frank et al., 2019); (Orr et al., 2021). The problem that often occurs in company management processes is the lack of integration between existing business processes. The functions of each work unit are not fully integrated (Mahardika, 2022). This makes companies need technology to support planning and control (Gozali & Supranto, 2020).

The Information Technology (IT) sector helps companies achieve their goals. One technology that can improve business capabilities through integrated system development is Enterprise Resource Planning (ERP) (Gupta & Kohli, 2006); (Lubis, 2021). Enterprise Resource Planning (ERP) is a borderless information system that effectively and efficiently integrates all company units (Lee et al., 2020). ERP systems are able to integrate all of the company's business processes to maintain a competitive position and increase efficiency (Ar, 2012).

In recent decades, ERP systems have been implemented in construction companies facing the global competitiveness challenge (AboAbdo et al., 2019). ERP implementation in construction companies assists in project reporting and documentation, strengthens the supply chain supply chain, capable of remote procurement, improves decision-making capabilities, reduces project completion time, and lowers operational costs (AboAbdo et al., 2019). One of the software in the ERP system is System Applications and Products (SAP). Implementation of ERP using SAP in companies can increase productivity, handle business processes as a whole, and obtain real-time information (Lubis, 2021).

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PT Hutama Karya, especially the General Civil Division Project, decided to implement an ERP system on SAP. Complex ERP systems are used to facilitate the use of SAP integrated in the system.

SAP was developed to support a company in carrying out more effective and efficient operational (Lubis, 2021). SAP implementation involves four main modules, namely the Project System (PS), Sales Distribution (SD), Materials Management (MM) and Finance and Controlling (FICO) modules. SAP has the ability to integrate all production processes and supporting activities into modules so that they support current transactions in accordance with the company's business processes (Yolanda & Dessyana, 2022).

The variables used in this research are perceived quality, perceived value, brand preference, and customer satisfaction. The relationship between these variables can be identified through a research framework and analysis through testing methods (Ningsi, 2018). The analysis used is a structural equation model or Structural Equation Model-Partial Least Square (SEM-PLS) using the SmartPLS 3.0 application. Data analysis techniques in SEM-PLS consist of two models, namely the measurement model (outer model) and the structural model (inner model). SEM-PLS aims to test the measurement model and structural model so that evaluation results will be obtained in an overall picture of the model (Ringle et al., 2020).

Primary data collection in this study was carried out using a measurement method in the form of a questionnaire (Sigalingging & Permatasari, 2021). Then testing the measurement model and testing the structural model was carried out on the results of the questionnaire. The research questionnaire uses a Likert scale measurement which consists of a list of questions to find out and measure respondents' ratings by responding to 5 alternative answers to each question (Likert, 1932).

The purpose of this study was to determine the effect of each variable on the implementation of ERP using integrated SAP at the Construction Services company PT Hutama Karya General Civil Division. Evaluation is carried out on each module in SAP (Hancerliogullari Koksalmis & Damar, 2022). The results of the influence analysis between these variables indicate whether the system has been operating properly so that it can support maximum system performance.

2. Literature Review

2.1. Operation Management

Operations management is a process of creating a product by transforming inputs into outputs. In producing a product, the company carries out three functions which will also play a role in maintaining the running of the company. The three functions are marketing, operations, and finance functions. The scope of operations management includes the preparation and operation of production systems (Efendi et al., 2019).

In the process of transforming inputs into outputs, it is also influenced by customer participation and information about the performance of internal and external resources. Customer participation occurs when the customer not only receives output, but also acts proactively in the transformation process.

2.2. Perceived Quality

Perceived Quality is an overall consumer assessment of the attributes of a product (Hellier et al., 2003). Perceived Quality is formed from the experience of each individual in using a product and can be used as a decision-making consideration so as to increase satisfaction in individuals (Ayu, 2009). Therefore, Perceived Quality has a positive effect on customer satisfaction. Based on the above arguments, it can be hypothesized that:

H₁. Perceived Quality has a positive effect on Customer Satisfaction.

Figures should be prepared taking into account that the printed version will be in black and white. Only the online version may have figures in color. The higher the Perceived Quality, the higher the user's Perceived Value regarding the benefits obtained from using a product (Ayu, 2009). Therefore, Perceived Quality has a positive effect on perceived value. Thus, it can be hypothesized that:

H₂. Perceived Quality has a positive effect on Perceived Value.

The tendency of the user or users in choosing a product is influenced by how much the product is known to the user and it is known as Brand Preference. Brand Preference is influenced by Perceived Quality (Kusuma & Miartana,

2018). This proves that the higher the Perceived Quality, the higher the Brand Preference. Therefore, Perceived Quality has a positive effect on Brand Preference. Thus:

H₃. Perceived Quality has a positive effect on Brand Preference.

2.3. Perceived Value

Perceived Value is a customer's assessment of the overall product benefits based on the customer's assessment of the benefits and costs of obtaining and using the product (Hellier et al., 2003). Perceived value plays an important role and is an important variable related to customer satisfaction (Juliana et al., 2022). This shows that the higher the Perceived Value, the higher the Customer Satisfaction. Therefore, Perceived Value has a positive effect on Customer Satisfaction. Thus, it can be hypothesized that:

H₄. Perceived Value has a positive effect on Customer Satisfaction.

Perceived Value of a product are also based on how well the product is known to users (Ayu, 2009). This shows that the higher the Perceived Value, the higher the Brand Preference (Ar, 2012). Therefore, Perceived Value has a positive effect on Brand Preference. Based on the above arguments, it can be hypothesized that:

H₅. Perceived Value has a positive effect on Brand Preference.

2.4. Brand Preference

Brand Preference as a comparison made by consumers on a product with other products (Hellier et al., 2003). Brand preference is a customer's tendency towards a particular brand (Chang & Liu, 2009). When a brand can meet consumer expectations, the consumer will fall in love and choose the product. This shows that the higher the Brand Preference, the higher the Customer Satisfaction (Poranki, 2015). Therefore, Brand Preference has a positive effect on Customer Satisfaction. Thus:

H₆. Brand Preference has a positive effect on Customer Satisfaction.

2.5. Customer Satisfaction

Customer Satisfaction is overall customer satisfaction obtained from the product's ability to fulfill customer desires (Hellier et al., 2003).. The Customer Satisfaction variable consists of 4 measurement aspects, namely satisfaction with product durability, satisfaction with product performance, satisfaction with product features, and satisfaction with reusability (Ayu, 2009).

2.6. System Applications and Products (SAP)

SAP is an ERP application to help companies plan and carry out production activities. This application was developed to support organizations so that they are more efficient and effective in carrying out their operational activities (Maulidina et al., 2020). According to Seto, SAP consists of modules that support all company transactions and each module is interrelated with one another (Bashirudin et al., 2017). With the integrated module in the SAP system, making the production process within the company more effective. Apart from providing data in real time, SAP is able to minimize errors in inputting data into the system.

3. Research Method and Materials

This study uses a quantitative approach to the survey method. According to (Stockemer et al., 2019) quantitative research is related to statistical calculations that aim to obtain a numerical description of phenomena and determine the relationship between two or more variables. This study uses primary data collection and secondary data. Secondary data sources are expected to play a role in helping reveal the expected data.

The technique of determining the number of samples used is purposive sampling and census sampling. The purposive sampling technique or judgment sampling is a sampling technique from the population and is chosen deliberately based on considerations and research objectives (Mweshi & Sakyi, 2020). The census sampling technique is a sampling technique with all members of the population used as samples.

Primary data in this study were obtained by distributing questionnaires to predetermined respondents, namely users or users of the Integrated SAP application in the General Civil Division of PT Hutama Karya (Persero). The questionnaire used uses a Likert scale measurement with 5 answer choices and a total of 20 question indicators. This research questionnaire measures four variables, namely Perceived Quality, Perceived Value, Brand Preference, and Customer Satisfaction distributed via Google Form to users of each SAP module in 17 projects of the General Civil Division with a total sample of 68 people. To test the hypothesis, the analysis technique used is Structural Equation Model-Partial Least Square (SEM-PLS) using the SmartPLS 3.0 application with the aim of testing the causal relationship between variables (Shmueli et al., 2019). One approach from PLS is Multi-Group Analysis with Partial Least Square (MGA-PLS) which can be applied to solve this problem. MGA analysis is used when there are clusters of data to determine whether there are significant differences in the parameter estimates (Ilmani & Herlina, 2022);(Cheah et al., 2020).

4. Results and Discussion

4.1. Research Framework

This study uses six hypotheses that predict the relationship between exogenous and endogenous variables. The formulation of this hypothesis is described in the form of a research framework or structural model. This research framework describes the process of influencing Perceived Quality, Perceived Value, Brand Preference, and Customer Satisfaction. The framework for this research is presented in Figure 1.

Figure 1 explains that H1 shows the effect of Perceived Quality on Customer Satisfaction. H2 shows the effect of Perceived Quality on Perceived Value. H3 shows the effect of Perceived Quality on Brand Preference. H4 shows the effect of Perceived Value on Customer Satisfaction. H5 shows the effect of Brand Preference on Perceived Value. H6 shows the effect of Brand Preference on Customer Satisfaction.

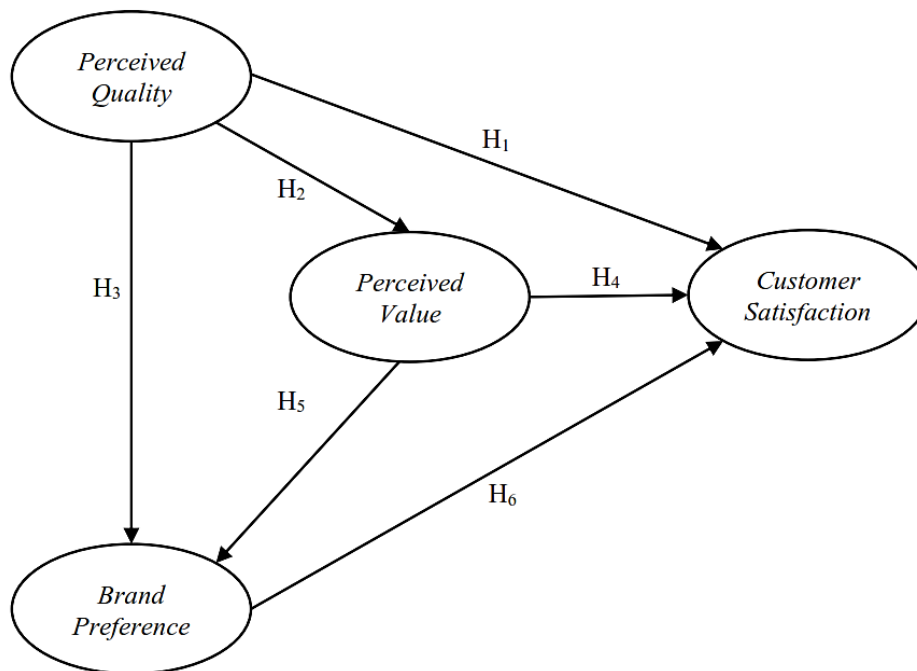


Figure 1. Research Method

4.2. Outer Model

The outer model is a model that describes the relationship between latent variables (constructs) and their indicators. The measurement model is assessed using validity and reliability tests. The criteria for this measurement model are obtained from the SmartPLS 3.0 application by calculating construct reliability and validity and discriminant validity.

4.2.1. Outer Model

a. Convergent Validity Test

Convergent validity values can be seen through the outer loading values on exogenous and endogenous variables. The outer loading value shows the correlation between the indicators and their latent variables. A correlation with an outer loading value of > 0.5 is said to meet convergent validity.

Table 1. Outer Loading Research Result

	Brand Preference	Customer Satisfaction	Perceived Quality	Perceived Value
BP1	0,841			
BP2	0,805			
BP3	0,752			
BP4	0,834			
BP5	0,775			
BP8	0,726			
CS1		0,815		
CS3		0,749		
CS4		0,732		
CS5		0,838		
CS8		0,764		
CS9		0,691		
PQ1			0,680	
PQ4			0,756	
PQ5			0,619	
PQ9			0,501	
PV1				0,728
PV3				0,833
PV6				0,808
PV7				0,820

Based on Table 1 it can be seen that the outer loading value on the PQ9 indicator is 0.501. This means that the PQ9 indicator is still acceptable but the relationship between the indicator and the latent variable is in the sufficient category. Indicators with an Outer Loading value of 0.6 mean that they are still acceptable, but the relationship between indicators and latent variables is in the sufficient category. While indicators that have an outer loading value of 0.7 are included in the high validity category. This indicates that the relationship between the indicators and their latent variables is good.

b. Discriminant Validity Test

The criterion for discriminant validity is cross loading. In particular, the outer loading on the latent variable must be greater than all the outer loading on the other latent variable.

The cross loading value in Table 2 indicates the level of correlation between latent variables. The cross loading value on the Brand Preference variable indicator shows a higher value when compared to other variable indicators. The BP1 indicator has a cross loading of 0.841, BP2 has a cross loading of 0.805, BP3 has a cross loading of 0.752, BP4 has a cross loading of 0.834, BP5 has a cross loading of 0.775, and BP8 has a cross loading of 0.726. These values are greater than other variable indicators. This means that the Brand Preference latent variable is able to better predict the indicators in the block and informs that each indicator is different and has varied values.

4.2.2. Reliability Test

To test the reliability, the parameter in the form of Cronbach's Alpha is used with the help of the SmartPLS 3.0 application. If the value of Cronbach's Alpha > 0.6 then the latent variable has good reliability. The result shows that variable Perceived Quality, Perceived Value, Brand Preference, and Customer Satisfaction have Cronbach's Alpha value 0,879; 0,858; 0,529; and 0,810, respectively.

It can be seen that the variables Perceived Quality, Perceived Value, and Customer Satisfaction have Cronbach's Alpha values > 0.6 . Meanwhile, the Brand Preference variable has a Cronbach's Alpha value of < 0.6 but can still be used because its value exceeds 0.5.

Table 2. Cross Loading Research Result

	Brand Preference	Customer Satisfaction	Perceived Quality	Perceived Value
BP1	0.841	0.700	0.646	0.723
BP2	0.805	0.674	0.628	0.675
BP3	0.752	0.542	0.579	0.654
BP4	0.834	0.742	0.726	0.834
BP5	0.775	0.583	0.597	0.660
BP8	0.726	0.653	0.564	0.637
CS1	0.728	0.815	0.645	0.724
CS3	0.565	0.749	0.578	0.577
CS4	0.620	0.732	0.658	0.537
CS5	0.726	0.838	0.605	0.740
CS8	0.544	0.764	0.563	0.571
CS9	0.588	0.691	0.574	0.559
PQ1	0.523	0.604	0.68	0.583
PQ4	0.616	0.551	0.756	0.619
PQ5	0.554	0.427	0.619	0.452
PQ9	0.310	0.444	0.501	0.335
PV1	0.618	0.619	0.581	0.728
PV3	0.774	0.691	0.705	0.833
PV6	0.683	0.639	0.582	0.808
PV7	0.748	0.647	0.644	0.820

4.3. Inner Model

4.3.1. Path Coefficient

Path coefficients show the direction of the relationship in hypothesis testing. Based on the SmartPLS 3.0, the Path coefficient values for all paths are positive. Recapitulation of the research Path coefficient values can be seen in Table 3.

Table 3. Path Coefficient Research Result

Variable Relationship	Path Coefficient	Explanation
Perceived Quality → Customer Satisfaction	0,301	Positive
Perceived Quality → Perceived Value	0,789	Positive
Perceived Quality → Brand Preference	0,244	Positive
Perceived Value → Customer Satisfaction	0,254	Positive
Perceived Value → Brand Preference	0,695	Positive
Brand Preference → Customer Satisfaction	0,364	Positive

A positive path coefficient value indicates that the effect of an exogenous variable on the endogenous variable is unidirectional. This indicates that Perceived Quality has a unidirectional influence on Brand Preference. If the Perceived Quality value increases, the Brand Preference value also increases.

4.3.2. P-Value

P-Value or probability value indicates the level of significance between latent variables. The research P-Value is presented in Table 4 and Figure 2. The P-Value in Figure 2 is found in the one-way arrows connecting the latent variables. The probability value or P-Value on all paths is significant, except for the effect of the Perceived Value

variable on Customer Satisfaction because the P-Value is 0.07. This value does not meet the significance criteria which must be below 0.05.

Table 4. P-Value Research Result

Variable Relationship	P-Value	Explanation
Perceived Quality → Customer Satisfaction	0,014	Significantly affected
Perceived Quality → Perceived Value	0,000	Significantly affected
Perceived Quality → Brand Preference	0,011	Significantly affected
Perceived Value → Customer Satisfaction	0,070	No significant effect
Perceived Value → Brand Preference	0,000	Significantly affected
Brand Preference → Customer Satisfaction	0,002	Significantly affected

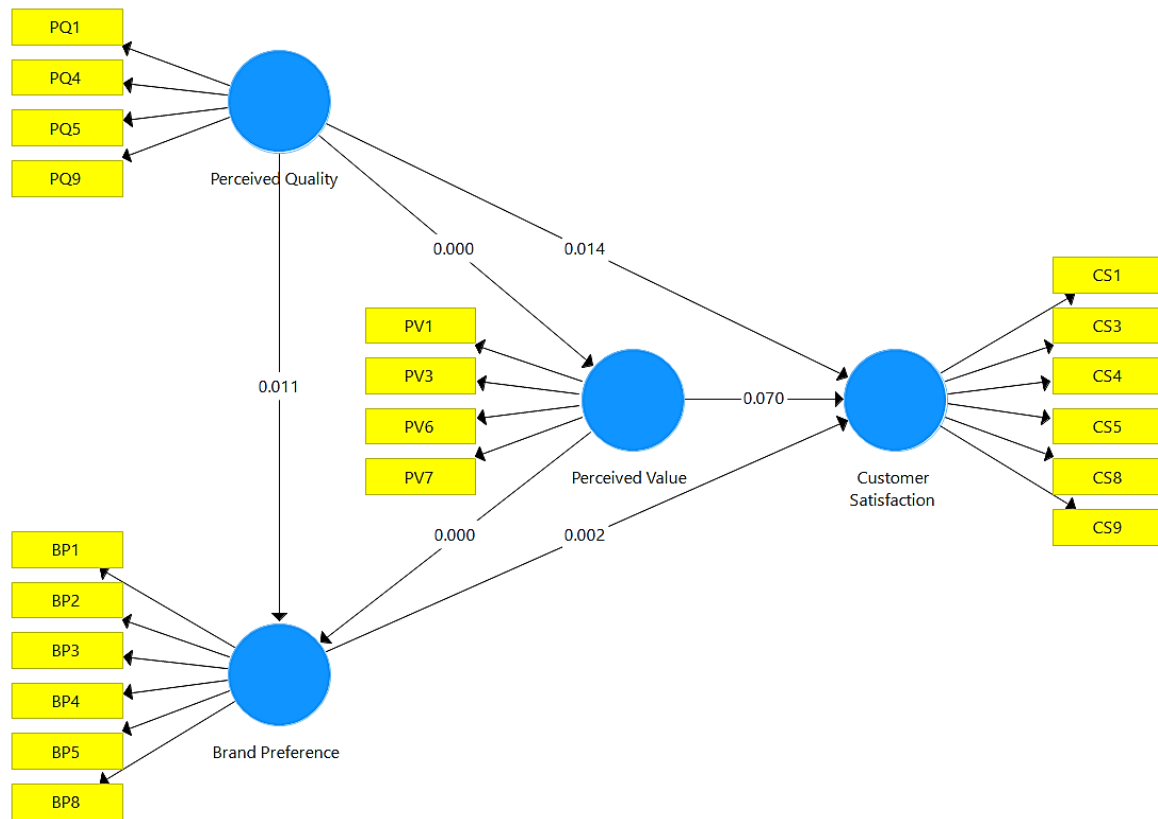


Figure 2. P-Value in Research Model

4.3.3. T-Statistics

T-Statistics can be used to see the evaluation of structural models. The T-Statistics in Figure 3 are found in the one-way arrows connecting the latent variables. Based on Figure 3, the T-Statistics values for all paths have a significant effect, which is above 1.96. This indicates a significant predictive effect between latent variables.

Table 5. T-Statistics Research Result

Hubungan Variabel	T-Statistics	Explanation
Perceived Quality → Customer Satisfaction	2,459	Significantly Affected
Perceived Quality → Perceived Value	18,828	Significantly Affected
Perceived Quality → Brand Preference	2,561	Significantly Affected
Perceived Value → Customer Satisfaction	1,816	Significantly Affected
Perceived Value → Brand Preference	7,561	Significantly Affected
Brand Preference → Customer Satisfaction	3,143	Significantly Affected

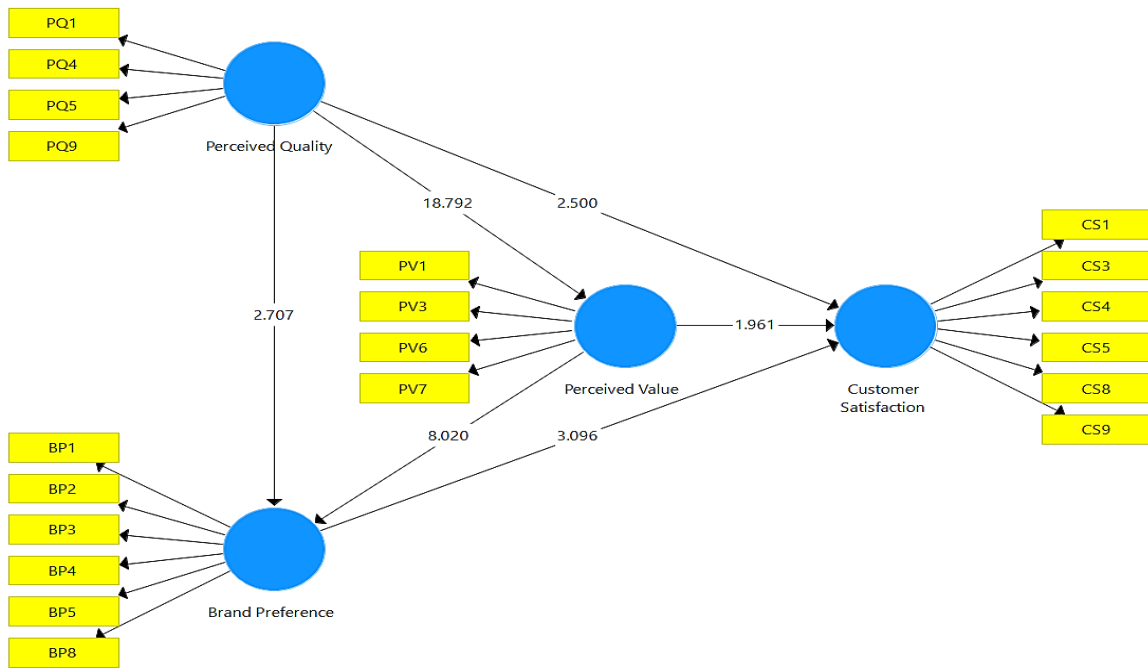


Figure 3. T-Statistics in Research Model

4.4. Hypothesis Test Result

The criteria for testing the research hypothesis are:

- a. Accept the hypothesis if T-Statistics > 1.65 or P-Value < 0.05.
- b. Reject the hypothesis if T-Statistics < 1.65 or P-Value > 0.05.

Based on the research criteria above, it is necessary to recapitulate the interpretation of the relationship between variables presented in Table 6.

Table 6. Interpretation of Influence Relationship Between Latent Variables

Variable Relationship	Path Coefficient	P-Value	T-Statistics	Explanation
Perceived Quality → Customer Satisfaction	0,301	0,014	2,459	Significantly affected
Perceived Quality → Perceived Value	0,789	0,000	18,828	Significantly affected
Perceived Quality → Brand Preference	0,244	0,011	2,561	Significantly affected
Perceived Value → Customer Satisfaction	0,254	0,070	1,816	No significant effect
Perceived Value → Brand Preference	0,695	0,000	7,561	Significantly affected
Brand Preference → Customer Satisfaction	0,364	0,002	3,143	Significantly affected

Hypothesis 1: Perceived Quality has a positive effect on Customer Satisfaction.

Based on the results of research that has been carried out through analysis through hypothesis testing, it is known that Perceived Quality has a positive influence on Customer Satisfaction. The results of this study are in accordance with the research of (Iglesias & Guillen, 2004) where their research states that the factors that determine the level of customer satisfaction are the quality obtained and the price of the goods they receive. It is further explained that the satisfaction obtained increases along with the level of quality they feel from a restaurant.

In connection with this research, the research respondents have felt the differences and advantages that are felt when implementing SAP compared to other ERP applications. Seen in the implementation of project control, respondents chose to use SAP.

Hypothesis 2: Perceived Quality has a positive effect on Perceived Value.

Based on the results of research that has been carried out through analysis through hypothesis testing, it is known that Perceived Quality has a positive influence on Perceived Value. This means that the quality of SAP that is felt by customers affects the assessment of the benefits that users feel from the SAP application itself.

The results of this study are in line with research conducted by (Setiowati & Liem, 2018), namely Perceived Quality has a significant relationship to Perceived Value. So based on this research, users who are research respondents provide a good assessment of the quality of SAP so that they also experience positive benefits from implementing SAP.

Hypothesis 3: Perceived Quality has a positive effect on Brand Preference.

Based on the results of research that has been carried out through analysis through hypothesis testing, it is known that Perceived Quality has a positive influence on Brand Preference. When the Perceived Quality of SAP users increases, the Brand Preference of SAP users also increases.

Similar research conducted by (Kusuma & Miartana, 2018) supports the results of this study, stating that Perceived Quality has a significant effect on Brand Preference. In line with this research, the advantages of SAP in integrating four modules at once have been felt by users so that they prefer and choose to apply ERP using SAP rather than other applications.

Hypothesis 4: Perceived Value has a positive effect on Customer Satisfaction.

Based on the hypothesis testing that has been done, it is found that Perceived Value has no effect on Customer Satisfaction. Described by (Eggert & Ulaga, 2002) that Perceived Value and Customer Satisfaction are different constructs where Perceived Value is a cognitive-based construct and Customer Value is an affective-based construct, so that Perceived Value is less able to indicate influence on Customer Satisfaction.

Based on this research, it is known that developing SAP applications requires high costs, causing users to feel dissatisfied.

Hypothesis 5: Perceived Value has a positive influence on Brand Preference. When the Perceived Value of SAP users increases, the Brand Preference of SAP users also increases.

There is a positive influence from Brand Preference, so Perceived Value or assessment of product benefits is considered important because creating Perceived Value in customers will increase positive attitudes towards a brand. In connection with this research, users are more likely to choose to use SAP applications due to the benefits and functions that users feel about implementing SAP in their daily activities.

Hypothesis 6: Brand Preference has a positive effect on Customer Satisfaction

Brand preference has a positive effect on customer satisfaction. When Brand Preference for SAP users increases, satisfaction with SAP implementation also increases.

This research is supported by the results of a study conducted by Rust and Oliver, customer satisfaction can be driven by many factors, one of which is brand preference where brand preferences reflect positive cognitive judgments that create satisfaction with a brand (Jamal & Al-Marri, 2007). The tendency of respondents to choose SAP over other ERP applications is due to their good experience with the brand. Customers' positive experience with SAP is reflected in the satisfaction felt by respondents because SAP consists of four modules and integration in the SAP system makes the production process more effective and provides data in real time.

MGA analysis based on SAP usage time divides characteristics into two groups, namely Group 1 for SAP users < 1 year and group 2 for SAP users > 1 year. Therefore, in the input/raw data, 1 new column is added for users with code 1 as SAP user < 1 year and code 2 for SAP user > 1 year. SAP users < 1 year consist of SIPP, SIAK, Mekari, and QAD users. Whereas SAP users > 1 year consist of SIPP and SIAK users. Based on the results of the MGA test, P-Value (PLS-MGA) = 0.997 > 0.05, P-Value (Parametric Test) = 0.959 > 0.05, and P-Value (Welch-Satterthwait Test) = 0.960 > 0.05. So that the length of time for using SAP does not significantly moderate the effect of Perceived Quality on Perceived Value. In other words, there is no significant difference in the effect of Perceived Quality on Perceived Value between SAP users < 1 year and SAP users > 1 year.

5. Conclusion

The result shows that the variable Perceived Quality has a positive and significant impact on Customer Satisfaction, Perceived Value, and Brand Preference. Brand Preference has a positive and significant influence on Customer Satisfaction. Perceived value positively and significantly impacts on Brand Preference, but does not have a positive and insignificant effect on Customer Satisfaction. So, the user's perception of the benefits of SAP has no effect on Customer Satisfaction in implementing SAP as a data integration system.

SAP application development requires high costs, causing users to feel dissatisfied. That is, the price which is an indicator of Perceived Value is considered by the user has no effect on user satisfaction, where the costs sacrificed in SAP development are greater when compared to the benefits felt by users, causing dissatisfaction with SAP implementation. Multi-Group Analysis based on SAP usage time does not significantly moderate the effect of Perceived Quality on Perceived Value. In other words, there is no significant difference in the effect of Perceived Quality on Perceived Value between SAP users < 1 year and SAP users > 1 year.

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