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The Impact of Enterprise Resource Planning Implementation on Supply Chain Management Performance

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Abstract: Enterprise resource planning has been used by many companies with the aim of increasing competitive advantage through the efficiency of business activities that balance supply and demand, connecting customers with suppliers in a unified supply chain management and integrating all functional organizations in the company. This study aims to determine and analyse the impact enterprise resource planning implementation to supply chain management performance. This research was conducted on 335 employees of PT. Citra Nugerah Karya involved in ERP operations to serve as respondents. This type of research is causal associative research using a questionnaire survey method and measured by a semantic differential scale, the lowest value is 1 and the highest point is 10. Structural Equation Modeling (SEM) analysis was carried out using AMOS 23 software. The calculation results show that the standardized loading estimate of the influence of the ERP variable on the SCM performance variable is 0.567 which is greater than 0.5 and the probability value of 0.001 shows that ERP implementation has a positive effect on SCM performance.
Keywords: ERP, SCM, SEM, AMOS

I. INTRODUCTION

PT. Citra NugerahKarya is a manufacturing industry company that produces products in the form of assembling components for motorized vehicles in Indonesia, currently the company has four factory locations, which are divided into three buildings for the production process and one building for the location of Finish Goods and Raw Materials. The supply of raw materials for the production process is sent from raw materials in accordance with requests from the production department, as well as manufactured goods transported from each factory to be stored in finished good warehouses. The company sees a problem that exists throughout the production floor, namely the occurrence of excess in making goods or often referred to as over production. This problem occurs in almost the entire flow of the production process, from the cutting of raw materials to the process of checking the goods resulting from the production process, visually this problem can be seen from the accumulation of materials and goods resulting from the production process that cannot be flowed to the next process. The buildup of goods is due to the production process being carried out beyond the planning made, other problems are found in the distribution of goods from production to the finished good warehouse, the problem that occurs is that goods that have been sent by the production department are often rejected and must be returned to each the factory because the inventory at the finish good is sufficient, in this condition the production has difficulty knowing how many items are needed to meet the predetermined inventory. In fact, there is no visualization and information that can be used by the production department to send goods according to inventory needs [10]

The implementation of Enterprise Resource Planning (ERP) is chosen by company management to improve supply chain management. ERP systems or other IT systems have benefits for supply chain management (SCM), the implementation stage is carried out with the help of consultants selected through the results of the selection in order to get a system that is best for the company and can coordinate all operational activities on the factory floor and other needs such as finance, material planning, sub-contractors, and other needs that can be used as a tool for company management decision making [12]. In another studythat supply chain management performance improvement is carried out by integrating all functional organizations within the company [15]. ERP implementation has a positive effect on supply chain management performance [9]. This study will measure the effect of ERP implementation on supply chain management performance at PT. Citra NugerahKarya

II. LITERATUR REVIEW

Enterprise Resource Planning

Enterprise resource planning (ERP) is a method for industry as an effort to make business processes more efficient by sharing information within and between business processes and run electronically [11]. The core of this software is a centralized database that retrieves and provides data to various modular applications that operate on the same computer system [5]

To measure the level of success of an information system, a model is needed to analyze the factors that influence its success. DeLone and McLean created an information system success model consisting of six measurement dimensions, system quality, information quality, service quality, intention to use, user satisfaction, and net benefit [1]. based on the theory of researchers measuring enterprise resource planning variables with 6 dimensions and 20 indicators which are summarized in Table 1 below

Table 1. Enterprise Resource Planning variable

Variable	Dimensions	Indicator	Code
Enterprise Resource Planning	System Quality	Easy of Use	ERP11
		Flexibility	ERP12
		Realibility	ERP13
		Response Time	ERP14
	Infrmation Quality	Competitiveness	ERP21
		Format	ERP22
		Relevance	ERP23
		Accurate	ERP24
	Sevice Quality	Responsiveness	ERP31
		Empathy	ERP32
		Assurance	ERP33
	Intention To Use	Nature of Use	ERP41
		Frequency of Use	ERP42
		Number of Transactions	ERP43
	User Satisfaction	Effectivity	ERP51
		Efficiency	ERP52
		Overall Satisfaction	ERP53
	Net Benefit	Benefit to Soft Skill	ERP61
		Motivation	ERP62
		Time Saving	ERP63

Source: DeLone and McLean (2015)

Supply Chain Management Perforomance

Supply Chain Management is a coordinating network consisting of suppliers, manufacturers, distributors, retailers and customers. This network supports careful planning and close coordination within the company's internal and external [7]. There are three components in supply chain management, upstream supply chain management, internal supply chain management, and downstream supply chain management [13].

Supply chain management performance measurement is used to determine what will be measured and monitored as well as to create a match between the supply chain strategy and the measurement matrix. Supply chain performance measurement is divided into six measurement dimensions, just in time, inventory turn over, customer lead time, delivery performance, inventory management, and total logistics cost [6]. based on the theory of researchers measuring supply chain management performance variables with 6 dimensions and 20 indicators which are summarized in Table 2 below

Tabel 2. Supply Chain Management Performance

Variable	Dimensions	Indicator	Code
Supply Chain Management Performance	Just In Time	Waiting time	SCM11
		Information Flow	SCM12
		Total shipping activity	SCM13
	Inventory Turn Over	Stock Control	SCM21
		Product distribution	SCM22
		Procurement of Supplies	SCM23
		FIFO Process	SCM24
	Customer Lead Time	Order Time	SCM31
		Processing Time	SCM32
		Delivery Duration	SCM33
	Delivery & Quality Performance	Delivery Scheduling	SCM41
		Delivery Time	SCM42
		Delivery Error	SCM43
		Delivery Guarantee	SCM44
	Inventory Management	Good forecasting and planning	SCM51
		Needs Planning	SCM52
		Integration with supplier	SCM53
	Total Logistic Cost	Logistics Cost Efficiency	SCM61
		Waste Process	SCM62
		Additional Rute	SCM63

Source: Li *et al* (2009)

Research Framework

Based on the theoretical basis used and relevant previous studies, the preparation of the research framework in this study can be seen in Figure 1 below.

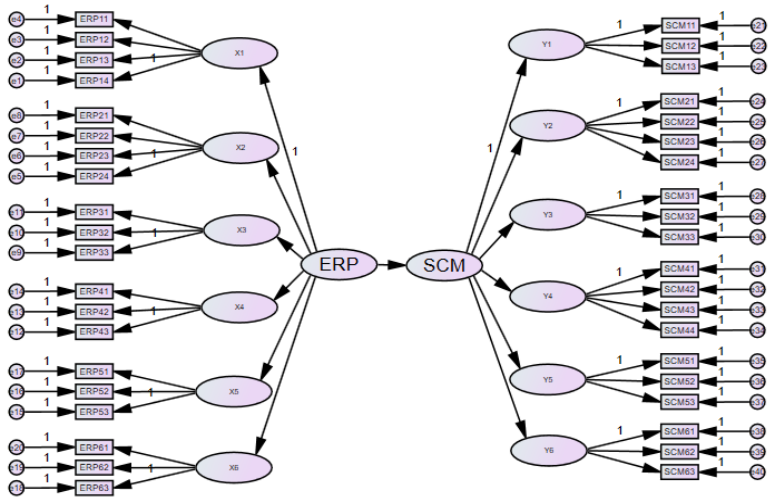

Figure 1 illustrates thatthe research framework consists of 2 variables, namely Enterprise Resource Planning and Supply Chain Management. ERP variable is measured by 20 indicators which are divided into 6 measurement dimensions, System Quality dimension is measured by four indicators (ERP11, ERP12, ERP13, ERP14), Information Quality dimension is measured by four indicators (ERP21, ERP22, ERP23, ERP24), Service Quality dimension measured by three indicators (ERP31, ERP32, ERP33), the Intention To Use dimension was measured by three indicators (ERP41, ERP42, ERP43), the User Satisfaction dimension was measured by three dimensions (ERP51, ERP52, ERP53), and the Net Benefit dimension was measured by three dimensions. indicators (ERP61, ERP62, ERP63)

The SCM variable is measured by 20 indicators which are divided into 6 measurement dimensions, the Just In Time dimension is measured by three indicators (SCM11, SCM12, SCM13), the Inventory Turn Over dimension is measured by four indicators (SCM21, SCM22, SCM23, SCM24), the Customer Lead dimension Time is measured by three indicators (SCM31, SCM32, SCM33), the Delivery and Quality Performance

dimensions are measured by four indicators (SCM41, SCM42, SCM43, SCM44), the Inventory Management dimension is measured by three dimensions (SCM51, SCM52, SCM53), and the Total dimension Logistic Cost is measured by three indicators (SCM61, SCM62, SCM63). Based on theresearch framework, the hypothesis built in this study is H1: Implementation of Enterprise Resource Planning (ERP) has a positive effect on Supply Chain Management (SCM) Performance.

III. METHODOLOGY

This type of research is causal associative using primary data taken by distributing questionnaires. The scale on the questionnaire is measured using a semantic differential scale, the use of this scale aims to measure the attitude of the respondents with the lowest point having a value of 1 to the highest point of 10 [2]. The sample of this study was taken from employees of PT. Citra NugerahKarya. Sampling using the purposive sampling method, the target respondents who are used as samples have been selected and determined, the selected sample is employees who use ERP in their work activities.The data analysis technique used in this study is Structural Equation Modeling (SEM), and data processing will be processed with the AMOS 23 application. The analysis stages are through Validity and Reliability Tests (Confirmatory Factor Analysis, Average Variance Extracted, Construct Reliability), Normality Test, Goodness of Fit Test and Hypothesis Testing.

IV. RESUL AND DISCUSSION

Questionnaires were distributed to 350 target respondents. but not all respondents gave a good response. only 335 questionnaires were filled out completely and validly. The data on the characteristics of the respondents are as listed in Table 4 below.

Table 4. Characteristic Data Responden

Characteristic of Respondents	Frequency	Percentage
Gender		
Man	332	99,10%
Women	3	0,90%
Age		
< 20 Years	12	3,58%
20 Up to < 25 Years	167	49,85%
25 Up to < 30 Years	84	25,07%
30 Up to < 35 Years	44	13,13%
≥ 35 years	28	8,36%
Position		
Operator	79	23,58%
Group Leader	143	42,69%
Foreman	68	20,30%
Supervisor	37	11,04%
Head of Departement	8	2,39%

Source: Data processing result (2021)

Validity and Realibility Test

The results of the Confirmatory Factor Analysis test output show the probability value of all construct dimensions obtaining a value of 0.001 and the standardized estimate loading value above 0,5[4]. In the Enterprise Resource Planning Implementation variable the loading standardized estimate value indicators ERP11 (0,804), ERP12 (0,870), ERP13 (0,866), ERP14 (0,864) can explain the Information Quality dimension. ERP21 (0,749), ERP22 (0,782), ERP23 (0,862), ERP24 (0,762) can explain the System Quality dimension. ERP31 (0,829), ERP32 (0,794), ERP33 (0,827) can explain the Service Quality dimension. ERP41 (0,759), ERP42 (0,817), ERP43 (0,625) can explain the Intention To Use dimension. ERP51(0,813), ERP52 (0,691), ERP53 (0,756) can explain the User Satisfaction dimension. ERP61 (0,809), ERP62 (0,612), ERP63 (0,749) can explain the Net Benefit dimension.

In the Supply Chain Management Performance variable the loading standardized estimate value indicators SCM11 (0,854), SCM12 (0,734), SCM 13 (0,771) can explain the Just in Time dimension. SCM21 (0,725), SCM22 (0,783), SCM23 (0,707), SCM24 (0,854) can explain the Inventory Turn Over dimension. SCM31 (0,595), SCM32 (0,685), SCM33 (0,862) can explain the Customer Lead Time dimension. SCM41 (0,731), SCM42 (0,797), SCM43 (0,676), SCM44 (0,684) can explain the Delivery Performance dimension.

SCM51 (0,940), SCM52 (0,874), SCM53 (0,514) can explain the Inventory Management dimension. SCM61 (0,719), SCM62 (0,726), SCM63 (0,867) can explain the Total Logistic Cost dimension.

Normaly Test

Analysis of multivariate normality in AMOS 23 was performed using the critical ratio(c.r)from multivatiate on kurtosis. If the value ofc.ris range between ± 2,58, it means that data is normaly distributed multivariate [14]. The result of normaly test show that the value of c.r for multivariate is 2,478 > 2,58. This means that the overall (multivariate) data distribution is normal. The outliner data was obtained by comparing the Mahalanobis distance value with the Chi-square table at significant 0,001. In thisresearch the Chi-square value of the table is 73,402. So the Mahalanobis d-square value more than 73,402 is stated as outliner data. The outliner test data result maximum d-square value is 60,127 this means that there is no data outlier.

A Goodness of Fit Test

The complete mode structure test result and model modifications obtained Goodness of fit data as show in Table 5 below.

Table 5. Goodness of Fit

Goodness of Fit	Acceptance Limits Required	Result after modifications of the model	Decision
CMIN/DF	≤ 2,00	1,659	Good Fit
GFI	0 – 1	0,860	Marginal Fit
AGFI	0 – 1	0,824	Marginal Fit
NFI	0 – 1	0,882	Marginal Fit
RFI	0 – 1	0,859	Marginal Fit
IFI	≥ 0,90	0,949	Good Fit
TLI	≥ 0,90	0,939	Good Fit
CFI	≥ 0,90	0,949	Good Fit
RMSEA	≥ 0,08	0,044	Good Fit

Source: Data processing result (2021)

Based on Table 5 above, it shows that CMIN/DF, IFI, TLI, CFI and RMSEA are good fit.While GFI, AGFI, NFI, RFI give results close to 1 (Marginal Fit). If one of the Goodness of Fit criteria has been met, the model can be considered feasible [8]. Overall, Goodness of Fit can be assessed based on at least 5 criteria being met [4]. So it can be concluded that the model as a whole can be said to be feasible and can be continued with hypothesis testing to find out how much influence between variables in the model.

Hypothesis Test

Figure 2 below is the output of the hypothesis test using the bootstrapping technique at AMOS 23. The formulation of the hypothesis built in this study is H1: Implementation of Enterprise Resource Planning (ERP) has a positive effect on Supply Chain Management (SCM) Performance. Bootstrap is a resampling procedure where the original sample is treated as a population. [4].

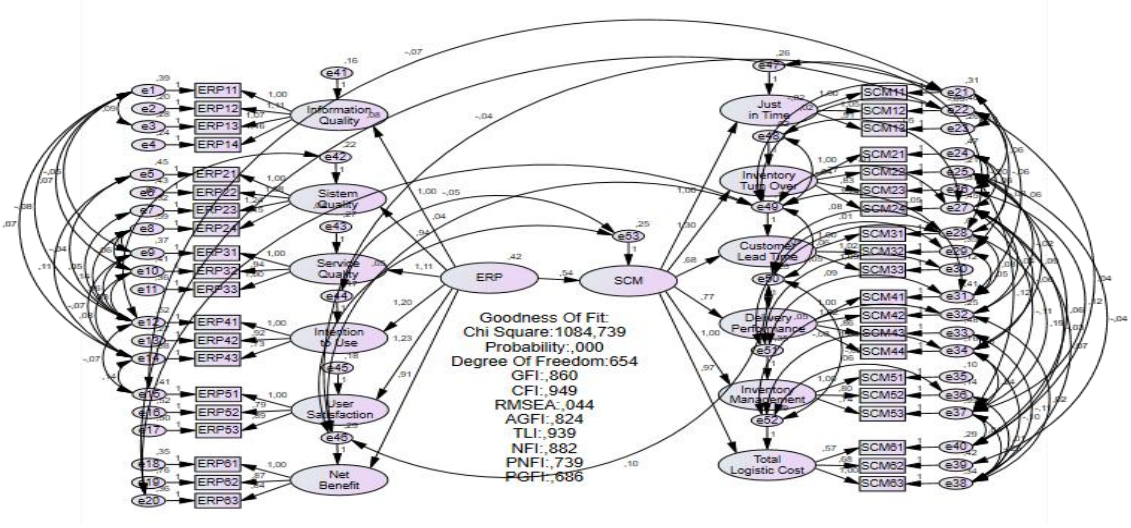

Figure 2 shows that the output of the hypothesis test results is, in hypothesis H1 ERP implementation has a positive effect on SCM performance, the results of data processing output to see this effect can be seen in Table 6 below.

Tabel 6. The Result of Hypotesis Test

			Estimate	S.E.	C.R.	P	Label	Std
SCM	<---	ERP	0,537	0,069	7,738	***	par_39	0,567
X1	<---	ERP	1,000					0,854
X2	<---	ERP	0,937	0,089	10,548	***	par_29	0,790
X3	<---	ERP	1,109	0,100	11,142	***	par_30	0,809
X4	<---	ERP	1,197	0,110	10,896	***	par_31	0,881
X5	<---	ERP	1,231	0,101	12,128	***	par_32	0,885
X6	<---	ERP	0,906	0,088	10,247	***	par_33	0,738
Y1	<---	SCM	1,000					0,769
Y2	<---	SCM	1,302	0,118	11,034	***	par_34	0,985
Y3	<---	SCM	0,684	0,104	6,580	***	par_35	0,785
Y4	<---	SCM	0,768	0,090	8,503	***	par_36	0,689
Y5	<---	SCM	0,997	0,094	10,662	***	par_37	0,719
Y6	<---	SCM	0,966	0,111	8,726	***	par_38	0,611
ERP11	<---	X1	1,000					0,772
ERP12	<---	X1	1,114	0,064	17,336	***	par_1	0,882
ERP13	<---	X1	1,070	0,055	19,561	***	par_2	0,838
ERP14	<---	X1	1,161	0,068	17,170	***	par_3	0,873
ERP21	<---	X2	1,000					0,751
ERP22	<---	X2	1,075	0,075	14,289	***	par_4	0,785
ERP23	<---	X2	1,240	0,080	15,479	***	par_5	0,859
ERP24	<---	X2	1,149	0,085	13,541	***	par_6	0,754
ERP31	<---	X3	1,000					0,824
ERP32	<---	X3	0,943	0,059	16,033	***	par_7	0,795

			Estimate	S.E.	C.R.	P	Label	Std
ERP33	<---	X3	1,003	0,060	16,723	***	par_8	0,829
ERP41	<---	X4	1,000					0,775
ERP42	<---	X4	0,919	0,061	15,045	***	par_9	0,840
ERP43	<---	X4	0,728	0,066	11,095	***	par_10	0,612
ERP51	<---	X5	1,000					0,816
ERP52	<---	X5	0,785	0,059	13,219	***	par_11	0,699
ERP53	<---	X5	0,890	0,063	14,085	***	par_12	0,750
ERP61	<---	X6	1,000					0,800
ERP62	<---	X6	0,867	0,083	10,477	***	par_13	0,620
ERP63	<---	X6	0,838	0,066	12,699	***	par_14	0,744
SCM11	<---	Y1	1,000					0,819
SCM12	<---	Y1	1,051	0,075	13,944	***	par_15	0,797
SCM13	<---	Y1	0,911	0,063	14,465	***	par_16	0,816
SCM21	<---	Y2	1,000					0,763
SCM22	<---	Y2	0,766	0,053	14,522	***	par_17	0,802
SCM23	<---	Y2	0,833	0,075	11,108	***	par_18	0,741
SCM24	<---	Y2	1,239	0,078	15,899	***	par_19	0,871
SCM31	<---	Y3	1,000					0,555
SCM32	<---	Y3	1,025	0,116	8,825	***	par_20	0,680
SCM33	<---	Y3	1,092	0,117	9,302	***	par_21	0,856
SCM41	<---	Y4	1,000					0,728
SCM42	<---	Y4	1,024	0,080	12,836	***	par_22	0,813
SCM43	<---	Y4	0,862	0,081	10,697	***	par_23	0,646
SCM44	<---	Y4	1,083	0,099	10,975	***	par_24	0,647
SCM51	<---	Y5	1,000					0,937
SCM52	<---	Y5	0,797	0,038	21,246	***	par_25	0,873
SCM53	<---	Y5	0,737	0,066	11,180	***	par_26	0,539
SCM63	<---	Y6	1,000					0,855
SCM62	<---	Y6	0,681	0,056	12,235	***	par_27	0,715
SCM61	<---	Y6	0,571	0,045	12,787	***	par_28	0,714

Source: Data processing result (2021)

Tabel 6 shows that the result of hypothesis test, The results of data processing prove that the hypothesis H1: Enterprise Resource Planning (ERP) has a positive effect on the performance of Supply Chain Management (SCM), which is acceptable, it can be seen by the loading standardized estimate value of 0.567. This means that each increase of one unit of Enterprise Resource Planning (ERP) can increase the performance of Supply Chain Management (SCM) by 0.567. The results of this study support previous research [3] which shows that the application of information and communication technology Enterprise Resource Planning affects the performance of Supply Chain Management.

All measurement indicators used to measure ERP variables have a loading standardized estimate value > 0.5, which means that all measurement indicators used can reflect the dimensions of the ERP variable. The strongest influence on the ERP variable is shown by the User Satisfaction dimension with a standardized estimate loading value of 0.885. and the weakest is the Net Benefit dimension with a loading standardized estimate value of 0.738 but both are representative in measuring the variable (ERP). Previous studies that are relevant to this research include those conducted who said that system quality, information quality, service

quality, intention to use, user satisfaction and net benefits affect the success of Enterprise Resource Planning implementation [15].

All measurement indicators used to measure SCM performance variables have a loading standardized estimate value > 0.5, which means that all measurement indicators used can reflect the dimensions of SCM performance variables. The strongest influence on the SCM performance variable is shown by the Inventory Turn Over dimension with a standardized estimate loading value of 0.985. and the weakest is the Total Logistic Cost dimension with a standardized estimate loading value of 0.611 but both represent in measuring SCM performance variables. Previous research that is relevant to this research is carried out by [6] which states that just in time, inventory turn over, customer lead time, delivery and quality performance, inventory management and total logistics cost have a positive effect on SCM performance.

V. CONCLUSION

Based on the results of this study, it can be concluded that the implementation of Enterprise Resource Planning (ERP) has a positive effect on the performance of Supply Chain Management (SCM) at PT. Citra Nugerah Karya. Each ERP unit can increase SCM performance by 0.567. The results of this study are in accordance with the company's goal of implementing ERP, namely improving operational activities in the company, one of which is supply chain management activities between factories.

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