Analysis of Enterprise Resource Planning (ERP) Implementation in Agribusiness Palm Oil Company

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Abstract-The purpose of this study were to investigate status of ERP implementation, investigate ERP formulation, and investigate factors that can be cause successful or unsuccessful ERP implementation on agribusiness palm oil company of Teladan Prima Group (TPG). The research was conducted at TPG in January-March 2016. The questionnaires were distributed to 118 respondents. The number of questionnaires returned and valid to be analyzed was 60. Questionnaire response rate was 50.85% The empirical data were analyzed using the Structural Equation Modelling- Partial Least Square (Smart PLS 2.0).The main findings of the empirical study were: (1) From quality, quantity, cost and speed of deming's (1986) point of view, the ERP implementation was below users expectation. (2) From process, semantic, syntactic, social, social, and pragmatic of Usmanij et al. (2012) point of view, the ERP implementation formulation was categorize as technology centered approach rather than human centered approach. (3) From investigation of Delone & Mclean (2003) and IT Balanced Scorecard (2001) point of view, the ERP implementation has not been successful in Information Quality (IQ), System Quality (SQ), Use (U), User Satisfaction (US), Corporate Contribution (CP), User Orientation (UO), Future Orientation (FO), and ERP Performance (KE) . The ERP implementation has successful partially for Service Quality (SV), Net Benefit (NB), and Operational Excellence (OE) . The present study is limited to the specific SAP R/3 modules of Finance Controlling (FICO), Material Management (MM), Plant Maintenance and Field Operation.The SAP R/3 implementation was go live for 2 years. This paper points out that ERP implementation should be based on user satisfaction and evaluation based on human centered approach. The business process are designed in accordance with the user requirement and conform to user satisfaction, net benefit and overall ERP performance. This paper purposes an enhanced conceptual framework that evaluate the success ERP implementation using integration model of Deming (1986) quality management, Usmanij et al. (2012) ERP formulation, Delone & Mclean (2003) and IT Balanced Scorecard (2001) system evaluation.

Index Terms -Enterprise Resource Planning, Delone & McLean, IT Balanced Scorecard, Structural Equation Modelling-Partial Least Square

Paper type Research paper

I. INTRODUCTION

In the rapid technology development recently, the growth of a company, one of them, depends on information system used. One way that can be done by a company in the use of information technology system is by implementing technology of Enterprise Resource Planning (ERP) . ERP has been developed as the means of integration, has purposes to integrate all corporate applications to data storage center in real time, and is easily to be accessed by all divisions that need those (Magal et al., 2012).
Telada Prima Group (TPG) is a private palm oil company in Indonesia. TPG committed to be a company that conducts environmentally friendly farm management and is conservation with the concept of Sustainable Palm Oil as well as becoming a company that can be proud of by its employees. To achieve the objective of efficient material distribution, TPG needs to design a system aiming to support material flow from initial supplier through several logistic processes to final customer. ERP is a computer-based system that conducts integration of related application program in all corporate functios (Aquilano et al., 2008).

The implementation of ERP on TPG is planned by management, and its implementation cooperates with IBM as a vendor. The implementation of ERP system was started in end of 2012 by using SAP R/3 to end of 2014. The consideration to apply ERP on the company is based as ERP was believed as the most effective system to support corporate business purpose regardless from obstacles of hardware, software, and human resource (Ng et al., 1998). However, there is no guarantee to adopt ERP successfully. Panorama Consulting in its research explained that the failure of ERP system implementation has increased 6% from 2013 to 2014 (Panorama Consulting, 2015). One of the reasons of failure is caused by design and implementation of ERP methodology that is not suitable because it is done by focusing on successful product development rather than focusing on successful system (Khosla et al., 2000; Usmanij et al., 2012).

ERP implementation on palm oil agribusiness company has many adjustments in business process from upstream to downstream. It is an interesting thing to be evaluated because the company has invested in using ERP system, and has expected improvement in business process, increased customer responses, and strategic business improvement (Li, 1999; Umble et al. 2003). Even though the growth in ERP system implementation occurs, some previous researches show the existence of dissatisfaction on ERP system.

Many implementations of ERP failed to give advantage expected by company (Holland et al., 1998; Bingi et al., 1999). ERP planning is done carefully to fulfill a better business strategic aim (Ng et al. 1998). The main problem of ERP that is centred technology product is most of technologies or business processes come from systemdesigner's perspective rather than user perspective (Khosla et.al., 2000). In this perspective, users are expected to adapt themselves with limitations and weaknesses of machine. Recently, there has been a shift from technology-centred approach to human-centred approach. In human-centred approach, technology or business process is designed to make user task more effective and satisfying with which adjustment needed by users.

This study analyzes ERP application in the perspective of human-centred approach. Its research steps are by making questionnaire, weighting questionnaire answers with descriptive analysis towards ERP implementation adapted from Deming (1986), descriptive analysis towards ERP implementation formulation adapted from Usmanij et al. (2006) and evaluation of ERP system implementation success by using integrating model of Delone & McLean (2003) as well as Balance Scorecard IT. The integrating model will analyze with structural equation modeling, which is Structural Equation Modelling-Partial Least Square (Hair et al., 2017; Ghozali et al., 2012).

The purpose of this study is to investigate status of ERP implementation in company, to investigate formulation of ERP implementation in company, and to investigate factors that become the cause of successful or unsuccessful of ERP system on TPG.

II.   LITERATURE REVIEW

2.1 Enterprise Resource Planning

ERP is a method for industry in seeking more efficient business process by integrating business process and running business electronically (Magal et al. 2012). ERP is also defined as information system automating business process related to operational aspect, corporate production and distribution.

ERP is integrated implementation that becomes information system framework in an organization, can be implemented at once or gradually. Implementation of ERP must be supported by process of Business Process Reengineering (BPR) that is right and coordinated well. BPR is a redesigning business process aiming to achieve improvement by considering cost, quality, speed, and best service (Magal et al. 2012).

2.2 ERP Critical Success Factor

To make ERP system achieve its purpose, a critical success factor is made, that is expected to guide company in achieving it. There are some methods and field studies to determine critical success factor, so its result is varied in accordance with industry characters and its study periode (Soja, 2006) . Basically Critical success factor of ERP is determined by two approaches which are strategic approach and tactical approach (Holland et al., 1998). Both approaches must go in accordance with well-prepared and balance planning. If there is failure in one approach, it can be certainly that company will find difficulty in getting profit from ERP system or even having loss.

Strategic approach is success factor from corporate internal preparation added by the effect of legacy system replacement (Holland et al., 1998) . In tactical approach of Critical Success Factor, company emphasizes more on the third party as a vendor of freelance consultant. This third party is considered important because they combine corporate vision mission and business process with feature and module suitability in ERP (Jilovec, 2005).

2.3 ERP Characteristics

ERP system has characteristic as a software package, integration towards most of business process, conducting corporate majority transaction, and data centre (Wallace et al., 2001). In general, ERP system usually is installed by ERP vendor party. ERP software is provided in the form of package with some modules in accordance with business plan that has been done. As a system integrated with some of business processes in company, ERP must be able to connect each modul consisting various business processes, so each production process can be integrated and controlled.

2.4 Stages of ERP Implementation Process

ERP implementation process consists of stages of strategic plan, corporate readiness plan, vendor selection preparation, implementation plan, implementation, and post implementation (Cornellius, 2008).
Strategic plan stage is the most important stage because some studies are conducted on how important ERP to affect the entire corporate process. In this stage, BPR (Business Process Reengineering) is also done, so an integration between existing module in software and existing business process.

Vendor selection is done based on characteristics of corporate business and initial plan about ERP in the company. Vendor having good reputation usually has achieved sertification from publisher software. ERP implementation must be planned well. Schedule and human resources are elements related to this planning periode. This stage usually takes one to two years, depending on ERP complexity that will be implemented. Software ERP implementation is done by installer party with coordination of IT internal division and corporate management. In this stage, the one that is the focus of activity is management or IT internal division. Mistakes often occur because implementation is given fully to vendor. Post implementation is a assisting periode given by vendor to maximize ERP implementation.
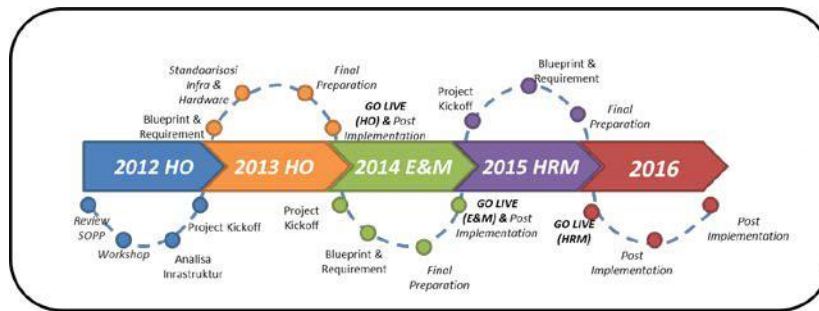
Figure 1. Timeline Project ERP System on TPG

2.5 ERP Implementation on Teladan Prima Group

Implementation of ERP on TPG is planned by management and its implementation then cooperates with IBM party as vendor. TPG conducts ERP system implementation for 2 years. ERP system implementation that was started in end of 2012 to end of 2014 uses ERP system which is SAP R/3 Enterprise Central Component 6.0. ERP system implementation now has achieved the last stage and in the stage of post implementation and support.

ERP modul that has been implemented in TPG until the beginning of 2016 among others are (1) Finance & Controlling, (2) Material Management, (3) Payroll & Field Operation, and (4) Plant Maintenance & Budgeting. Each ERP modul has different function and specific user.

Finance module function is aimed to provide continuously on corporate profitability. Finance Module also measures corporate financial performance, based on both internal and external transaction data. Function of controlling module is capital investment controlling, corporate financial activity controlling, payment monitoring and planning, as well as supporting activity supply and use in each area of cost and profit controlling based on all corporate activities.

Material management module function relates to supply process, master data (material & vendor), supply management, material evaluation, material need planning, invoice verification, and others.

Payroll & Field Operation module function covers site activity of plantation and factory (posting payroll, VRA log, nursery, field statistic, material, weightbridge, grading, mill production, and laboratory) that has been illustrated by plantation business process.

Plant Maintenance (PM) is module covering activities such as inspection, measuring, and determining actual condition of an equipment/machine, preventive maintenance for measuring and maintaining ideal condition of an equipment/machine, improvement for measuring and reconditioning ideal condition of an equipment/machine, and steps needed to be taken by using maintenance planning. Plant Maintenance consists of Management of Technical Objects submodule (master data of equipment/machine), maintenance processing (maintaining process and workorder) and preventive maintenance (maintainance planning).

2.6 ERP Evaluation Methodology

Technology-centred approach is ERP evaluation based on only technology. Business process is designed in accordance with system performance, and users must adapt themselves with weaknesses and limitations of the system (Usmanij et al., *2012*). Problem from this technology-centred approach is that ERP is built based on perspective of system designer only (Khosla*et al.* 2000), so it tends to be stiff, inflexible for users and is usually less successful.

Human-centred approach is ERP evaluation based on synergy approach between human and system (Usmanij et al., *2012*). Human -centred approach is business process designed for making user task more effective and satisfying, in accordance with what needed by users. Some human-centred approach methods are as the followings:

a. *Delone and McLean Analysis*
    Analyzing the success of information system from five perspectives, which are system quality, information quality, user satisfaction, system user, system effect on organization and company.
b. *Balanced scorecard*
    Measuring corporate performance with balanced scale from four perspectives (finance, customer, internal business and learning and growth). (Edwards, 2008)
c. *IT Balanced Scorecard*
    Evaluating a relationship between IT system performance and corporate performance from four perspectives (corporate contribution, user orientation, operational advantage and future orientation) (Hunton et al., 2003).

TPG tries to increase additional value and competitiveness to achieve maximum productivity. One step applied to achieve it is ERP implementation (information system). ERP implementation has high risk. Therefore, ERP implementation study is done on TPG. The success of ERP implementation can support the increase of corporate productivity and the failure of ERP implementation causes the decrease of corporate inefficiency. Concisely, initial model and conceptual framework of the study is presented on Figure 2.

III. STUDY METHODOLOGY

This study was conducted at TPG in January – March 2016. Questionnaires distributed to respondents are 118 questionnaires. The number of returned and valid questionnaires to analyzed is 60. Thus, the questionnaire response rate is 50.85%, that consists of employees using ERP system in head office, regional office, and plantation. Respondent majority is male, 25 – 34 years old, having experience working in plantation, with staff structural position to head of division and consisting of plantation division, engineering, business support, and finance.

This study uses descriptive approach consisting from descriptive analysis on ERP implementation adapted from Deming (1986), and descriptive analysis on ERP implementation formulation adapted from Usmanij et al. (2006). Success evaluation of ERP system implementation is then conducted by using intergration approach model of Delone & McLean (2003) as well as IT Balanced Scorecard (Van Grembergen, 2001).

3.1 Descriptive Analysis

In this study, two kinds of descriptive analysis are done, which are descriptive analysis of ERP implementation and descriptive analysis of ERP implementation formulation. Descriptive analysis of ERP implementation is done by looking at implementation status (Go Live) of ERP system that is guided on aspects of quality, quantity, cost, and speed (Deming, 1986). Quality aspect is related to the success of system transaction process. Quantity aspect is related to the suitability of system transaction number in one periode of time. Cost aspect focuses on cost saving and its effect for company. Speed aspect covers in system performance.

Descriptive analysis of ERP implementation formulation is done with purpose to investigate whether ERP system that has been implemented leads to technology-centred approach or human-centred approach that is guided to aspects of process, syntactic, semantic, social, and pragmatic (Usmanij, 2012).

Process aspect is related to flexibility of ERP system to receive types of user needs variations. Syntactic aspect focuses on compability of system integration and suitability of system in the past. Semantic aspect covers in suitability business process with user experience in system in the past. Social aspect is related to agreement all stakeholders and business process culture. Pragmatic aspect aims to measure achievement of objective and simplification of business process.
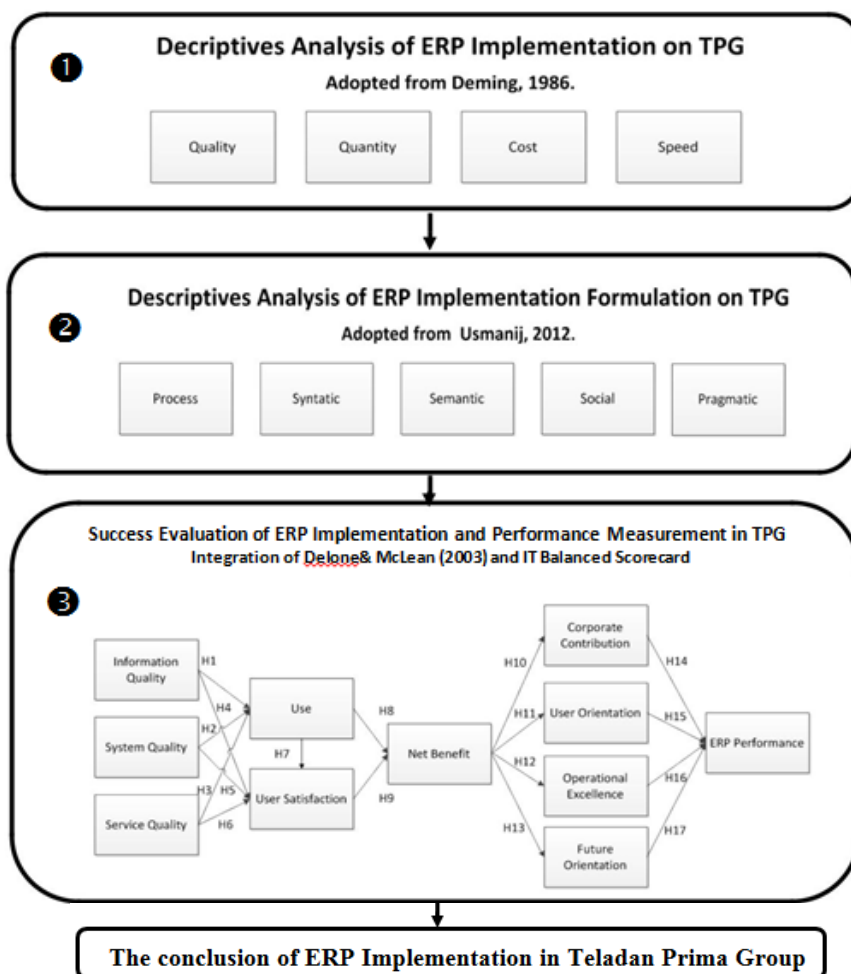

Figure 2. Conceptual Framework.

3.2 Integration of DeLone & McLean and IT Balanced Scorecard

In the process of ERP analysis, the previous study used integration of Delone & McLean (2003) and BSC (Kaplan et al., 1996), while in this study uses integration of Delone & McLean, IT BSC (Van Grembergen, 2001) and variable of ERP performance (information system). Indicator of ERP performance variable is referred to the previous study (Grembergen et al., 2000; Etges et al., 2006).

The relationship of IT BSC is integrated to Delone & McLean (2003) because it is used to measure corporate effectiveness toward ERP system, and then, the writer wants to disclose its effect on ERP performance. The combination of this analysis is because ERP effect measurement does not only evaluate an IT system, but more on the effect generated in company.

Tabel 1. Integration of Delone & McLean and IT Balanced Scorecard Matrix Indicators

Variabels	Indicator	Definition	Adapted From
Information Quality	Informative	Displays necessary information at the right time	Bailey et al. 1999
	Easy to understand	Displays all the information needed	
	Revelance	Information shown to have a data connection	
	Timeliness	Users can immediately grasp the meaning of the information displayed	
System Quality	*Functionality*	The system can adapt to business processes (batch)	Delone & McLean, 2003 dan Alshibly, 2011
	Adaptation	Requests the user to change the display, reports, and business processes are met	
	Response time	The system is used with a responsive, transactional, and generate reports	
	System performance	The probability of success in running the system function	
Service Quality	Problem solving	The system provides errors alerts	Chang et al. 2009 dan Richards, 1998
	Response	System provides notification on a work process / task	
	Security	Each task completed in a timely manner	
	Empathy	The system provides a timeline / dashboard / job alerts of each user	
User Satisfaction	Easy to use	Users do not experience difficulties in using the system	Usmanij, 2012 dan Seddon et al.1992
	Effective	Automated jobs	
	Expectation	Functional of the system according to user desires	
	Satisfaction	Possible hampering small businesses	
Use	Frequency	Users use the system every day	Balaban et al. 2013 dan Rai et al. 2002
	Depend	Users are strongly require the system to help / do work	
	Independent	Work can be carried alone smoothly	
	Knowledge	Users determine the functional / business process systems well	
Net Benefit	Impact	Results of user work faster and more accurately	Alshibly, 2011 dan Tansley et al. 2001
	Aim	Increase revenue, lower variable costs, and save costs	
	Cost	Save costs in terms of time, money and energy	
	Value	Knowledge systems	
Corporate Contribution	Strategic Alignment	Optimize, integrate, and invest in information systems	Van Grembergen, 2001
	Business process	Decision-making more effective and efficient integration of various function	
	Cost control	Monitor the activity, the purpose of using cost effective and efficient	
	Synergies	Integration with non-ERP system running well, and creating new solutions	
User Orientation	Change	The agreement in the application of the system blueprint has been agreed.	Van Grembergen, 2001 dan Kumar et al. 2012
	Service level agreement	Responsible for the system according to the agreement	
	Hope	System uncomplicated, resolve issues, and appropriate	
	Business process automation	Business processes with a computerized system runs effectively and efficiently	
Operational Excellence	Infrastructure	Programs maintenance of infrastructure work effectively	Etges, 2006 dan Tapanainen, 2012
	Flexibility	The system can respond to business changes constantly reviewed	
	Delivery system	The system increases user productivity, provide information and services	
	Access information	Handling performance problems by system	
Future Orientation	Training	Training system is operating effectively and efficiently	Van Grembergen, 2001
	Skill	User satisfaction of the support that has been given a team of IT ERP	
	Business Partnership	Users understand the flow of a business that is translated in the system.	
	Research	Evaluation of infrastructure systems and system performance.	
ERP Performence	Business process	Monitor activity, make improvements, the intended use of cost effective.	Van Grembergen, 2001
	Service Level Agreement	Responsible for the system according to the agreement.	
	Flexibility	Business processes with a computerized system runs effectively and efficiently	
	Research	Evaluation of infrastructure systems and system performance.	

IV. RESULT AND DISCUSSION

4.1 Descriptive Analysis of ERP Implementation on TPG

Descriptive analysis of ERP implementation meant in this study is to measure perception of ERP system user reviewed from aspects of quality, quantity, cost, and speed (Deming, 1986).
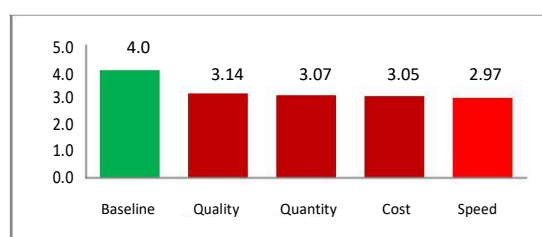

Figure3. Average Value Descriptive Analysis of ERP Implementation

Problem of quality aspect is that some respondents did not succeed conducting transaction because of bugs in the system that is necessary to have improvement, and problems related to network. Problem of quantity aspect is that some numbers of input and output transactions are not in accordance with one period of time because users do not make transaction mistakes. Problem of cost aspect is because users feel the working activity is more than the previous system. Problem of speed aspect is because ERP system does not run on time, because the system that is integrated to various platforms is considered has not worked optimally. Based on the result of aspect average score, summary that can be concluded is that users have not felt the effect of ERP system for company in overall (Chen et al., 2009; Mishra et al., 2010; Lu et al., 2007; Plan et al., 2007; Deming, 1986).

4.2 Descriptive Analysis of ERP Implementation Formulation on TPG

Descriptive analysis of ERP implementation formulation meant in this study is to measure perception of ERP system users viewed from aspects of process, syntatic, semantic, social, and pragmatic (Usmanij et al., 2006). Figure 4 shows aspects of Usmanij et al. (2012), that there is no value that reaches 4, only reaches ± 3 that is neutral score from the scale of 1 – 5 (Riduwan, 2007). Score 4 is used as baseline indicating that system implementation gives significant improvement (score is above average) and is close to human-centred approach. However, according to analysis result and respondent explanation, they show the result that is no significant.

Problem of process aspect is that not all user desires can be fulfilled by ERP system. Problem of syntaticaspect is that business process of ERP system has not fully integrated well and in accordance with system in the past. Problem of semantic aspect is that business process of ERP system has not fully been in accordance with user experience in the system in the past. Problem of social aspect is that business process of ERP system has not been fully agreed by all stakeholders and compatible with the culture of corporate business process. Problem of pragmatic aspect is that business process of ERP system has not been fully understood by user to conduct simplification of business process. Based on the average score result of each aspect, it is concluded that system use is mandatory, and ERP implementation formulation in TPG uses technology-centred approach.
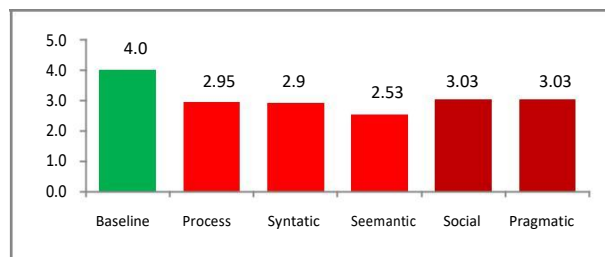

Figure4. Average Value Descriptive Analysis of ERP Implementation Formulation

4.3 Success Evaluation of ERP Implementation and Performance Measurement in TPG

Because ERP implementation generally is considered fail from perspective of user who operates it, then, it is necessary to conduct analysis of ERP implementation formulation validating ERP implementation as a process that is technology-centred approach.

Tabel 2. Path Coefficient and T Statistics

Hypothesis	Construct	Line Coefficient	R^2	T Statistics	Description
H1	Information Quality -> Use	0.34		1.601568	Not Significant
H2	System Quality -> Use	-0.03	0.38	0.162465	Not Significant
H3	Service Quality -> Use	0.37		*2.226098	Significant
H4	Information Quality -> User Satisfaction	0.24		*2.054945	Significant
H5	System Quality -> User Satisfaction	0.42	0.75	*3.986095	Significant
H6	Service Quality -> User Satisfaction	0.31		*2.452098	Significant
H7	Use -> User Satisfaction	0.02		0.174979	Not Significant
H8	Use -> Net Benefit	0.29	0.67	*2.792121	Significant
H9	User Satisfaction -> Net Benefit	0.63		*6.744143	Significant
H10	Net Benefit -> Corporate Contribution	0.64	0.40	*8.229838	Significant
H11	Net Benefit -> User Orientation	0.72	0.51	*11.20052	Significant
H12	Net Benefit -> Operational Excellence	0.56	0.31	*6.80306	Significant
H13	Net Benefit -> Future Orientation	0.24	0.06	*2.080395	Significant
H14	Corporate Contribution -> ERP Performance	0.12		0.747915	Not Significant
H15	User Orientation -> ERP Performance	0.08	0.66	0.654346	Not Significant
H16	Operational Excellence -> ERP Performance	0.62		*4.588264	Significant
H17	Future Orientation -> ERP Performance	0.10		0.871613	Not Significant

Sharpening ERP implementation success analysis and its performance measurement is done by Smart -PLS that is divided into 17 hypotheses (Tabel 2). Based on the estimation result of outer model, it can be concluded that the model has fulfilled requirements of convergent validity, discriminant validity, and composite realiability that are quite good. Structural model evaluation (Inner Model) is done by using Bootstrapping method in SmartPLS, then, it is obtained path coefficien weight (path coefficients/β), and T-statistic value. With this technique, the writer is able to rate statistic significance of study model by testing hypothesis of each relationship path. Tabel 2 and Figure 5 show coefficient for each path and T-statistic value at the value of
α=5% that is obtained from output result of SmartPLS.

Success evaluation testing of ERP implementation and performance measurement shows that net benefit (NB) is not affected significantly by some construct relationships of information quality (IQ), system quality (SQ), user (U), and user satisfaction (US), but it is affected significantly by service quality (SV). It shows that ERP implementation in TPG has not succeeded in information quality, system quality, user, and user satisfaction.

Meanwhile, ERP performance (EP) is not affected significantly by constructs of corporate contribution (CP), user orientation (UO), and future orientation (FO). It shows that ERP performance in TPG has not been in accordance with user expectation in terms of corporate contribution, user orientation and future orientation.
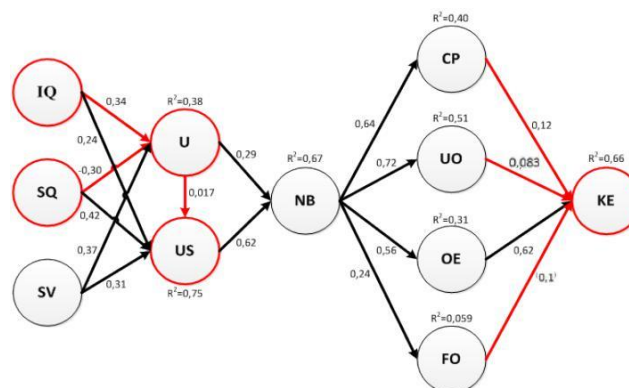

Figure 5. Structural Model Results

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Overall, ERP has not succeeded to be implemented from the perspective of its user. ERP formulation is technology-centred approach, meaning that business process uses framework/system perspective and is not developed based on user needs. ERP implementation has not been effective from perspective of its user. It can be seen from analysis result stating that net advantage is only affected by service quality, and ERP performance is only affected significantly by operational advantage.

5.2 Recommendations

The next research is suggested to take sample that is represents each level of position (top down management), so it results variable of IT Balanced Scorecard that affects ERP performance. Meanwhile, ERP implementation advantage should be determined in short term, medium term and long term. According to this study, it concludes that ERP system implementation in TPG that has been running for < 2 years (shor term), it has not been felt or seen in short term. Therefore, it is necessary to have evaluation and measurement of ERP system performance after Go Live > 3 years.

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