

EVALUATION OF SYSTEMS AND INFORMATION TECHNOLOGY SERVICES TO IMPROVE THE OPERATIONAL PERFORMANCE OF COMPETITIVE COMPANIES

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ABSTRACT

The development of systems and information technology in the current era of globalization, so many companies take advantage of the contribution of the system and technology to make the company's business processes effective and efficient, however often the target planned by the company contained in the service level agreement, is very difficult to be fulfilled, while the characteristics of the problem are also not easy to know. Based on the problems that often occur in companies in utilizing and implementing systems and information technology, this article tries to discuss how to evaluate the system and information technology and find out what factors are the cause, then by knowing the causal factors can be built mathematical models that can be used to build simulations so that it can be used as a solution in dealing with problems that occur in the future. The method used in this study is the method of factor analysis and regression methods. The results obtained from this study are knowledge development service factors, service development processes and service outcomes and objectives that must be considered by the company, then a simulation model can be made that can be used as an alternative in building predictions to anticipate future problem handling.

Keywords: *Systems Evaluation, Operational Performance, Competitive Corporate, Factor Analysis*

1. INTRODUCTION

The one corporate is a subsidiary of Astra Group, a company in the transportation industry also has many Strategic Business Units (SBU) located in several different business line industries, TRAC located in Leasing and Rental industry for land transportation, Selog Group is located in transportation industry Logistic, Car88 which is in used car buying and selling industry, IBID which is engaged in auction, The corporate is engaged in public transportation Taxi and some others. All SBUs are shaded by Head Office that performs services process for all national branches, starting from Division of Corporate Financial Accounting and Tax commonly called CFAT, Legal, Human Resource, Procurement and some other division and the author will discuss the Division of

Corporate Information Systems and The familiar technology is called CIST.

CIST Division is fully responsible for the existing Information and Technology Information System in Corporate and all existing SBUs, starting from infrastructure procurement, application system usage, to service delivery from its daily operational way in head office and branch. In the service delivery process, CIST does not work only with its internal employees, but also works with some external parties in handling any problems that exist in the company, commonly called Outsource.

The decision to use outsourcing affects not only a small portion of the system that is handled by outsourcing, but also affects the large competitive position of the organization [1]. In the service delivery process, CIST uses a Service Level Agreement (SLA) measurement of the level of service provided, this also affects contracts made to

outsourced external providers to maintain performance against targets approved by the CIST directors.

Although CIST has internal employees but in providing its services CIST also works with other IT service providers [2]. IT service providers are also growing, offering as a provider of enterprise infrastructure, application development, maintenance, and supporting Enterprise Resource Planning (ERP) systems are also available in IT services. According to Brandas[3], Outsourcing has now become an important component in most businesses, The business environment is now very supportive in the development of service provider companies, the economic context that drives the development of the service provider business sector and looks very growing. Taking into account key business needs and increased cost effectiveness, the management of CIST's IT services in the use of external services or Outsourcing in order to improve the operational performance of the company.

The periodic process in the CIST division has arisen the question of management in the issue of whether the effectiveness of a number of costs incurred by the company for investment in the IT field is already effective on the performance of services generated in order to improve the company's operational performance in accordance with that expected by the company or not meet the target of the company. The comparison of the number of incoming helpdesk tickets with achievements based on the helpdesk report coming into the CIST division, from November 2015 to March 2016 as follows,

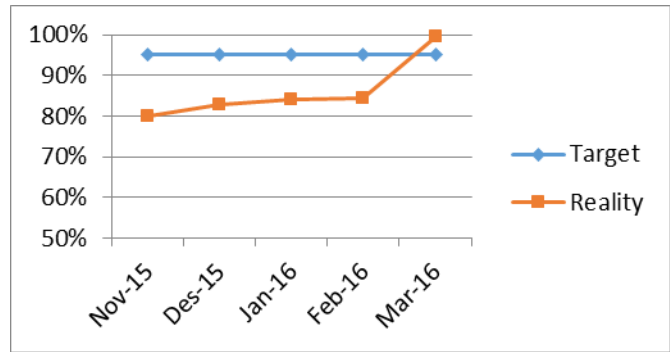


Figure 2: Achievement Resolution SLA periode Nov 2015 – Mar 2016 (Source: results of data obtained by the author)

2. METHODOLOGY

2.1. Information Technology Infrastructure Library (ITIL)

Service is an action, process, and performance. Service is a series of activities related to other activities that are normal but not necessarily.[4]

IT in an organization usually uses one or more IT Service Management (ITSM) to serve as a framework for managing IT services, the organization must be able to ensure that the framework used is aligned with business needs and can support the organization's objectives. [5]

Organizations now rely heavily on IT, organizational operations will not work without IT. All managers and employees in the business line are now required to learn about IT and understand about IT in their respective fields[6]

ITSM is also a part of science services that focus on IT operations, it can be concluded to be a series of processes that the organization has been running IT services in accordance with the agreed level that ITSM focuses on determining and delivering IT services as the support of the objectives of the organization. [7]

ITSM has been used by many different management frameworks and many organizations are using it as their IT service management framework. [8]

InformationTechnology Infrastructure Library (ITIL) is known as a management framework that presents good practice in ITSM, ITIL continues to grow from the year 1980 started from the UK government's efforts in creating documents how organizations approach in the management of services. Developed in 1990 documentation made

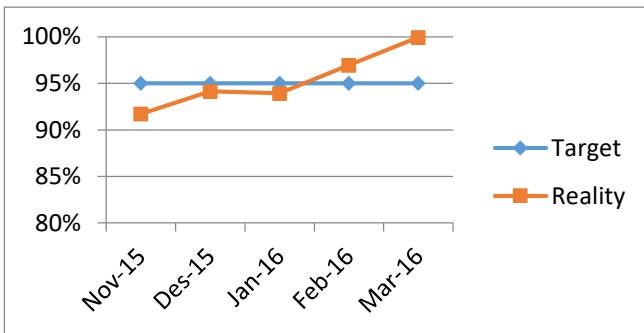


Figure 1: Achievement respond SLA periode Nov 2015 – Mar 2016 (Source: results of data obtained by the author)

about best practice for IT service management UK trade government launched ITIL products.[9]

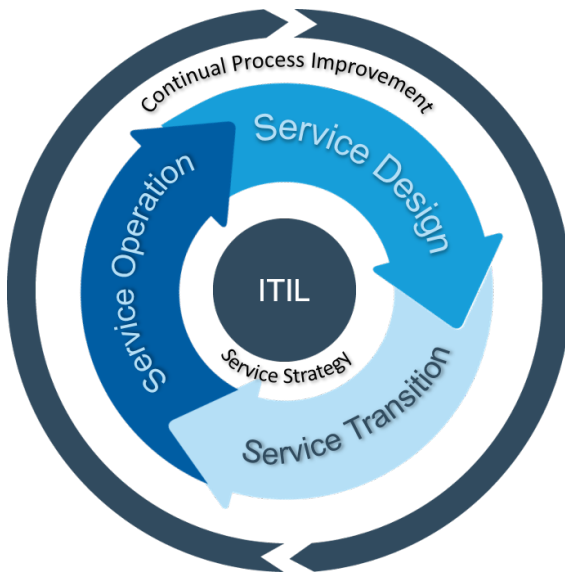


Figure 3: ITIL Lifecycle Model
Source: (Taylor, Sharon; Lloyd, Vernon; Rudd, 2007)

2.2 Factor analysis

Factor analysis is one of the analytical methods used to analyze the variables that are considered to be related to each other, so that the linkage can be elaborated and mapped or grouped by appropriate factors[10]

The purpose of factor analysis is to provide an overview or relationship of variants between some of the basic but unobserved variables, as a random quantity called factor. [11]

According to Sharma,[12] the purpose of factor analysis to be able to use the correlation matrix count is:

1. Identify and classify from the smallest amount of a common factor that has a correlation and correlation between the indicator variables.
2. Identify the rotation factor, the solution of the most logical factor.
3. Provides estimation of shape and loading structure, over unique variant of indicator.
4. Interpret from the general factors that exist.
5. Provide estimation of score factor.

2.3 Research Instrument Development Matrix

Table 1. Research instrument for Service Strategy

Factor	Indicator	Journal	Statement
Service Strategy	IT Budget (SS1)	(Probst & Buhl, 2012) Supplier Portfolio Management for IT Services Considering Diversification Effects	The company must allocate an appropriate budget in making investments that promise IT services
	Business Strategy (SS2)	(Ryu, H & Lee, J & Choi, B. 2015) Alignment Between Service Innovation Strategy and Business Strategy and Its Effect on Firm Performance: An Empirical Investigation	There is an influence between service performance and industry type in business strategy
	Service Portfolio (SS3)	(Zoric & Bræk, 2011) Scenario based techno-business analysis of service platforms and their service portfolios	The Service Portfolio allows analysis at the service development stage as a basis for investment decisions
	IT Strategy (SS4)	(Li-Hua & Lu, 2014) Technology strategy and sustainability of business: Empirical experiences from Chinese cases	The strategy for using information technology influences market needs and demands the delivery of IT services
	Knowledge Management (SS5)	(J Bairi, Manohar, & Kundu, 2011) A study of integrated KM in IT support services companies	IT services integrated with good KM will get more efficient results

Table 2. Research instrument for Service Design

Factor	Indicator	Journal	Statement
Service Design	Service Asset (SD1)	(Applications, Lecture, & Bodson, 2015) A decision support model to determine the critical success factors of asset management services	Can identify critical success factors for asset management services
	Service Level Agreement (SD2)	(Karthikeyan, Moorthy, & Ganesh, n.d.) Adaptive SLA enforcement for SOA Applications Using a Middleware	Service Level Agreement is a condition of Quality of Services that is commonly used as a measurement in the service environment

Testing and Validation Criteria (SD3)	(No & Jomeiri, 2014) Validation Tools in Software Testing Process: A Comparative Study	Testing and validation aims to reduce errors and cut maintenance costs
Process (SD4)	(Hsieh & Yuan, 2010) Modeling service experience design processes with customer expectation management: A system dynamics perspective	In the initial stages of the service delivery process the user will expect that there is responsive and fast handling
Technology (SD5)	(Nazimoglu & Özsen, 2010) Analysis of risk dynamics in information technology service delivery	Adopting technology for service delivery has a negative and positive response and will affect the good and bad of service providers

Table 3. Research instrument for Service Transition

Factor	Indicator	Journal	Statement
Service Transition	Known Error From Development (ST1)	(Huang, Guoqing, Xie, Pengfei, 2014) A Study on Internal Service Recovery Strategy Using CIT from the First Line Staff's Perspective	Errors are a frequent thing that must be managed as early as possible
	Testing and Validation Result (ST2)	(Grela, Sapiecha, & Strug, 2013) How validation can help in testing business processes orchestrating web services	In general testing is needed for all existing scenarios and is used to prove the results
	Change Authorization (ST3)	(Das, 2015) Centralized Authorization Service (CAuS) or Authorization as a Service A Conceptual Architecture	In the implementation of a system during the transition period it will affect several elements, one of which is a change in authorization

Socialization (ST4)	(Huzooree & Deviramdo, 2015) Review of Effective HRM Techniques in Agile S/W Project Management	Disseminate in the development period
Training (ST5)	(Kabaale, Kituyi, & Mbarika, 2014) Requirements Engineering Process Improvement Challenges faced by S/W SMEs in Uganda	From the results of the study recommending the training process in the transition period

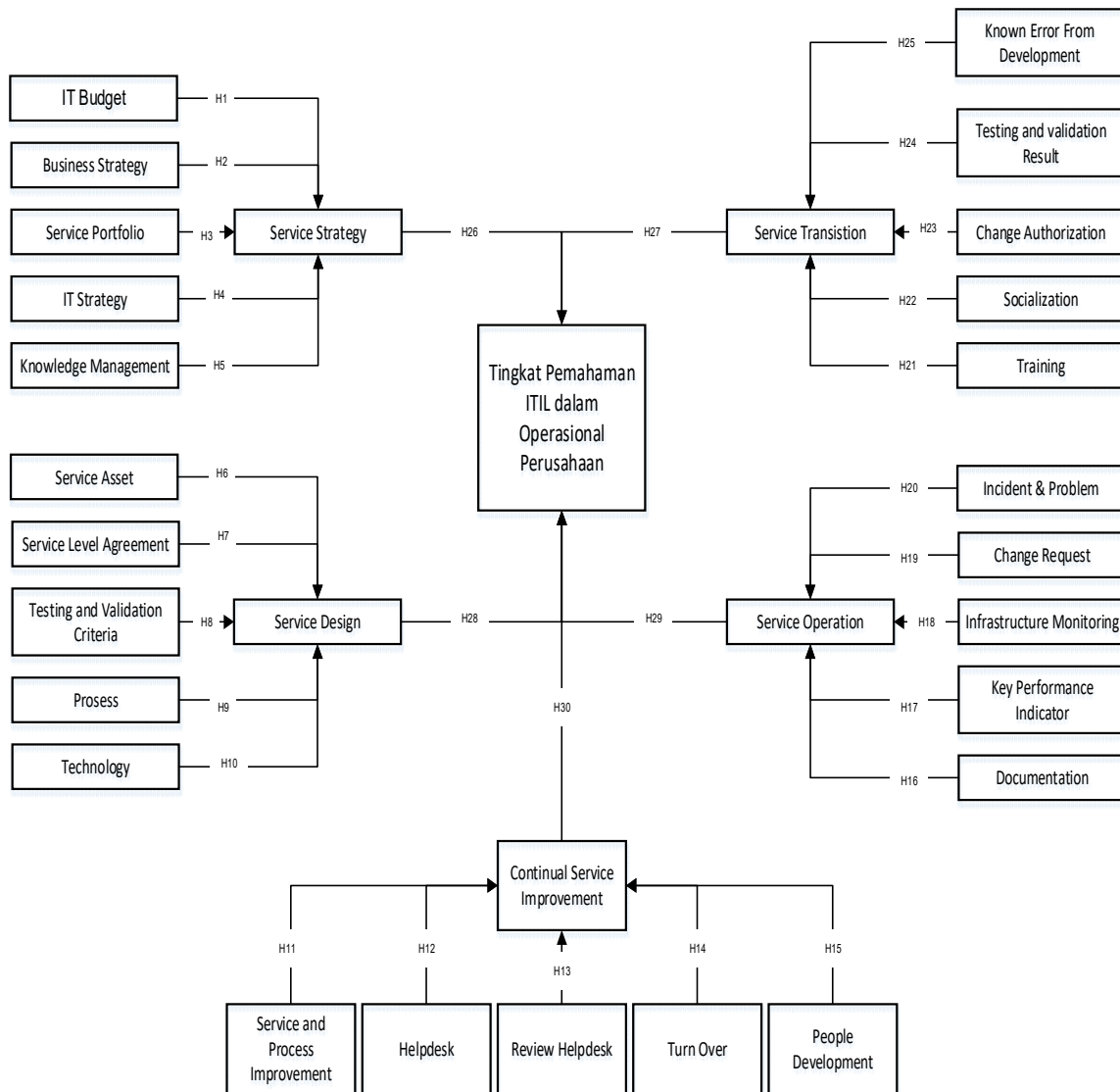
Table 4. Research instrument for Service Operation

Factor	Indicator	Journal	Statement
Service Operation	Incident & Problem (SO1)	(Talla, 2013) An Implementation of ITIL Guidelines for IT Support Process in a Service Organization	ITIL provides direction for evaluating service processes (incident, problem) for the needs of continuous improvement
	Change Request (SO2)	(Orta & Ruiz, 2014) A Simulation Approach to Decision Making in IT Service Strategy	Change Request, besides being needed in IT services, must also be assessed for its consequences
	Infrastructure Monitoring (SO3)	(Herrera-Quintero, Maciá-Pérez, Marcos-Jorquera, & Gilart-Iglesias, 2014) SOA-Based Model for Value-Added ITS Services Delivery	IT on the basis of Service Oriented Architecture introduces ways in evaluating IT services
	Key Performance Indicator (SO4)	(Suhairi & Gaol, 2012) Optimization Performance Measurement of Managed Service Division in ITIL Framework Using Statistical Process Control	As a measurement of the service delivery process and as a generalization of the job description of the staff's responsibilities
	Documentation (SO5)	(Rubin & Rubin, 2011) Supporting agile S/W development through active documentation	Operational processes tend to be adaptive rather than predictive, documentation aims to accelerate

			operational systems		Turn Over (SI4)	(Jayachandra Bairi & Murali Manohar, 2011) Critical success factors in gaining user customer satisfaction in outsourced IT services	Improving the ability of employees, maintaining the capabilities of employees, and exchanging capabilities are important elements in maintaining good IT service delivery
<p><i>Table 5. Research instrument for Continual Service Improvement</i></p>							
Factor	Indicator	Journal	Statement		People Development (SI5)	(Report & Collection, 2005) IT MANAGEMENT ISSUES: Leveraging ITIL to Better Manage Outsourcing Relationships	As an IT service provider the ability of individuals must be increased to reduce the number of problems that enter
Continual Service Improvement	Service and Process Improvement (SI1)	(Shrestha, Cater-Steel, Tan, & Toleman, 2012) A Method to Select IT Service Management Processes for Improvement	Improvement is a crucial factor in improving the quality of the organization's operations				
	Helpdesk (SI2)	(Stewart H.C. & Yuk-Hee, 2008) Improving service management in campus IT operations	The Helpdesk serves as incident management with an application that adjusts workflows with knowledge storage to deal with problems more effectively				
	Review Helpdesk (SI3)	(Resnick, Ugaz, & Burford, 2010) E-resource helpdesk into virtual reference: identifying core competencies	As a container grouping problems that occur and are used by internal teams as an evaluation of the problems that will occur				

2.4 Hypothesis

In this case study the authors build a model hypothesis evaluation using theory from ITIL where the author assesses the compatibility between operational conditions ITSM in companies with a cycle that is in ITIL theory, here is a description of the hypothesis model the author woke up to this study:



With reference to the picture then the hypothesis tested in this study are:

- H1: The IT Budget indicator has an influence on Service Strategy factor as the dependent variable.
- H2: The Business Strategy indicator has an influence on Service Strategy factor as dependent variable.
- H3: Service Portfolio indicator has an influence on Service Strategy factor as dependent variable.
- H4: The IT Strategy indicator has an influence on the Service Strategy factor as the dependent variable.
- H5: Knowledge Management indicators have an influence on Service Strategy factor as dependent variable.

- H6: The Service Asset indicator has an influence on the Service Design factor as a dependent variable.
- H7: The Service Level Agreement indicator has an influence on Service Design factor as dependent variable.
- H8: The Testing and Validation Indicator Criteria has an influence on the Service Design factor as a dependent variable.
- H9: The Process Indicator has an influence on the Service Design factor as the dependent variable.
- H10: The Technology Indicator has an influence on the Service Design factor as the dependent variable.
- H11: Service and Process Improvement indicators have an influence on the Continual Service Improvement factor as a dependent variable.

- H12: The Helpdesk indicator has an influence on the Continual Service Improvement factor as the dependent variable.
- H13: The Helpdesk Review indicator has an influence on the Continual Service Improvement factor as a dependent variable.
- H14: The Turn Over indicator has an influence on the Continual Service Improvement factor as the dependent variable.
- H15: Indicators of People Development have an influence on Continual Service Improvement factor as dependent variable.
- H16: The Documentation indicator has an influence on the Service Operation factor as a dependent variable.
- H17: Key Performance Indicator indicator has influence to Service Operation factor as dependent variable.
- H18: The Infrastructure Monitoring indicator has an influence on the Service Operation factor as the dependent variable.
- H19: The Change Request indicator has an influence on the Service Operation factor as a dependent variable.
- H20: Incident and Problem Indicator has an influence on Service Operation factor as dependent variable.
- H21: Training Indicators have an influence on the Service Transition factor as a dependent variable.
- H22: The Socialization indicator has an influence on the Service Transition factor as the dependent variable.
- H23: The Change Authorization indicator has an influence on the Service Transition factor as a dependent variable.
- H24: The Testing and Validation Result indicator has an influence on the Service Transition factor as the dependent variable.
- H25: The Known Error From Development indicator has an influence on the Service Transition factor as the dependent variable.
- H26: The Service Strategy factor has an influence on the level of ITIL's understanding of the company's operations as a dependent variable.
- H27: The Service Transition factor has an influence on the level of ITIL's understanding of the company's operations as a dependent variable.
- H28: The Service Design factor has an influence on the level of ITIL understanding in the operations of a company as a dependent variable.
- H29: Service Operation Factors have an influence on the level of ITIL understanding in the

operations of a company as a dependent variable.

- H30: The Continual Service Improvement factor has an influence on the level of ITIL's understanding of the company's operations as a dependent variable.

3. RESULTS AND DISCUSSION

The questionnaire case study on the evaluation of ITSM in the corporation was distributed to employees and outsourcce, based on sampling value with Purposive sampling technique of 192 people will be chosen randomly to represent the population. The distribution of questionnaire data is done manually in two ways, online and physically. With the results obtained back questionnaires are sufficient to meet the needs and filled in completely from each question given. from the results of data obtained for further research needs.

Reliability test serves to test an instrument. The instrument can be said to be consistent in assessing what is being measured. Reliability tests can help in ensuring consistency, and variable precision in research instruments. Cronbach's Alpha (α) is a reliability testing technique of a questionnaire most frequently used in a questionnaire using a likert scale. The variable status can be said to be reliable and acceptable if it gives the value of Cronbach's Alpha (α) > 0.7 if Cronbach's Alpha (α) > 0.8 is good and if Cronbach's Alpha (α) > 0.9 is said to be excellent .[13]

Table 6. Reliability Testing

Reliability Statistics	
Cronbach's Alpha	N of Items
0,960	25

From the results of reliability test of research variables that can be seen in table 6 shows the value of Cronbach's Alpha (α) of 25 variables is equal to 0.960 so that the instrument to be used in this study is reliable for each question - statement in each variable used in this study. [14] The KMO number indicates the relationship between each variable and serves as a measure of the problem level generated by the value of the variable [15]. The result of data processing by using SPSS application obtained by KMO from Bartlett's test as a feasible or not the factor analysis

is done, as shown in table 2 obtained KMO value of 0.936. If the value of KMO > 0.5 and significant (sig) or opportunity (p) < 0.05, then the variables analyzed in the factor analysis are feasible to be factored.[16]

Table 7: KMO And Bartlett's Test

	KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,936
	Approx. Chi-Suare	4094,327
Bartlett's Test of Sphericity	df	300
	Sig.	0

By looking at the value of anti-image correlation on the output results then it can be compared with the assessment of the value of MSA as follows:

1. MSA = 1, variables can be predicted without errors by other variables.
2. MSA > = 0.5, variables can still be predicted and can be analyzed further.
3. MSA < 0.5, variables are unpredictable and can not be analyzed further, or excluded from other variables.

The result of anti image correlation shows that the MSA value of all variables is in positions greater than 0.5 and less than 1, based on those results, those variables can be predicted and can be analyzed further.

The rotation process is done to the component matrix that has been formed from the previous process, that is fixed of number = 3, with the result is formed the new factors as follows:

1. The first factor is **Knowledge Deliverable Services** consists of variables:

- SO5: The operational process is more likely to be adaptive than predictive, the documentation aims at speeding up the operational system.
- ST5: From the results of the study recommends to conduct the training process during the transition period.
- SS5: IT services integrated with good KM will get more efficient results.
- SD2: Service Level Agreement is a requirement of Quality of Services commonly used as a measurement of service coverage.
- SO1: ITIL provides direction that organizations need to evaluate the service delivery process

(incident, problem) for sustainable improvement needs.

- SD1: Can identify Critical Success Factors for asset management services.
- SI4: Improving the ability of employees, maintaining the ability of employees, and exchanging skills is an important element in maintaining the delivery of good IT services.
- ST4: Conducting socialization during development.
- SO4: As a measure of the service delivery process and as a generalization job description job description of the staff.
- SI2: Helpdesk is assigned as incident management assisted with an application by customizing workflow with knowledge store to handle problems more effectively.
- SI3: As a grouping type of problem that occurs and is used by the internal team as an evaluation in addressing the problems that will occur
- SI5: As an IT provider the capabilities of an individual must be improved to reduce the number of incoming problems.

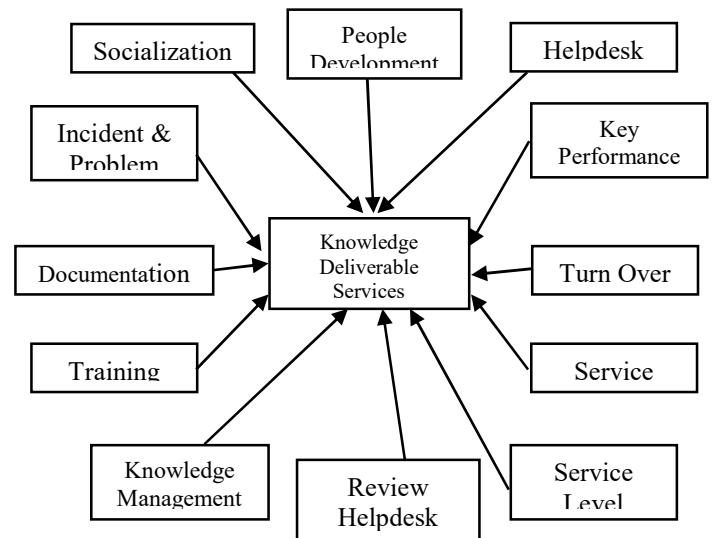


Figure. 4: New Factor, Knowledge Deliverable Services and Indicators

2. The second factor formed is **Process and Development Services**, consisting of variables:
 - SD4: In the early stages of service delivery process users will expect that responsive and fast response
 - SD5: Adopting technology for service delivery has a negative and positive response and will affect the good and bad of the service providers

- ST1: Error is something that often happens so it should be manageable as early as possible
- ST3: In the implementation of a system during the transition period will affect some elements of which one of them is a change of authorization
- ST2: In general testing is required for all existing scenarios and used to prove the results
- SS2: The influence between service performance and industry type in business strategy
- SO2: Change Request other than required in IT services should also be assessed against the consequences
- SS1: Companies must allocate appropriate budgets in making investments that promise IT services
- SO3: IT with SOA (Service Oriented Architecture) base introduces a way in the evaluation of IT services
- SI1: Improvement is a crucial factor in improving the quality of the organization's operations

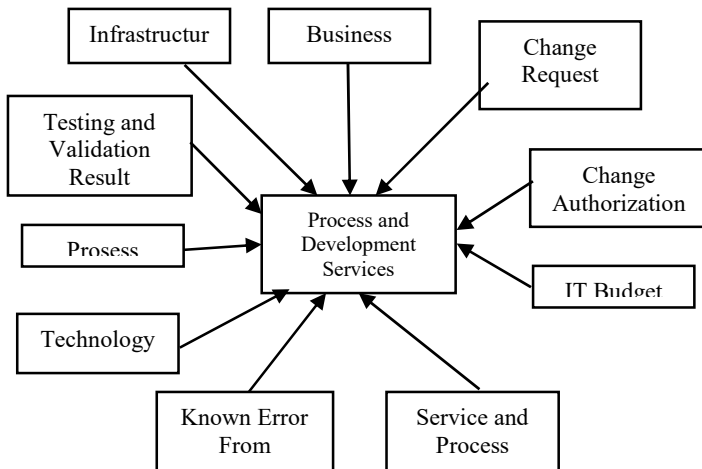


Figure. 5 Process and Development Services and Indicators

3. The second factor formed is **Goal and Result Services**, consisting of variables:

- SS4: The strategy of using information technology influences market needs and demands the delivery of IT services
- SS3: Service Portfolio allows performing analysis at the service development stage as a basis for investment decisions
- SD3: Testing and validation aims to reduce errors and cut maintenance costs and become important parameters during development and should be grouped and made scenarios.

Figure. 6: New Factor Process and Development Services and Indicators

In the next stage the value of factors and models that have been described above the author will continue to the evaluation phase of service system to improve the operational performance in the company. In the next step is to find the minimum and maximum value for each factor is formed above.

$$\begin{aligned}
 -2,842 &\leq X_1 \leq 1.905 \\
 -3.845 &\leq X_2 \leq 3.469 \\
 -3.948 &\leq X_3 \leq 2.299
 \end{aligned}$$

Based on the minimum and maximum value of each factor found, obtained the evaluation results can be seen in the following table.

Table 8: Evaluation About Understanding ITSM Respondents

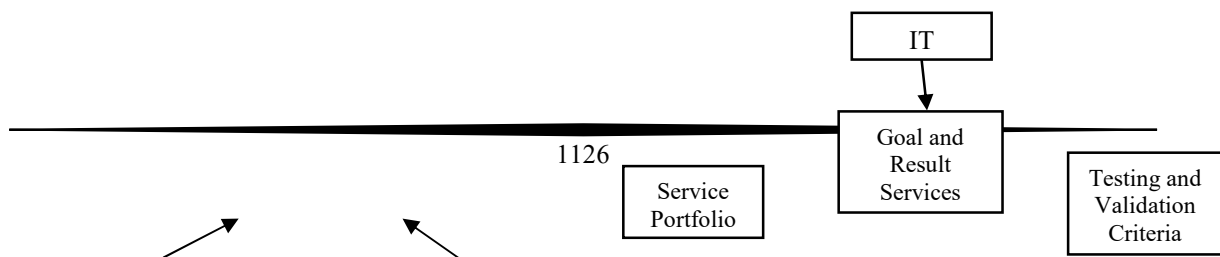
	Y	B ₀	X ₁	X ₂	X ₃
Current	5.906	5.906	0	0	0
Minimum	2.267	5.906	-	-	-
maximum	8.595	5.906	1.905	3.469	2.299

In table 8 can be seen the evaluation of the user's understanding of the existing service system:

Current conditions, no additions or reductions to new factors found so that the evaluation results only show the value of the results of the questionnaire received, the current conditions have a value understanding of the user to the service system worth 5,906 which can be concluded that the understanding of service users is currently on enough value.

Minimum conditions, all new factors found to be declining from the current state of that value are likely to occur if the company remains unaware of the importance of recognizing the current service system. at minimum conditions have a value of the user's understanding of the service system worth 2,267 which can be concluded that with that number the understanding of the users on the bad value.

Maximum conditions, all new factors found are improved from the current state. This may be achieved if the company knows the importance of the service system knowledge of the existing givers and users of the service. At maximum conditions



have a value of the user's understanding of the service system worth 8,595 which can be concluded that with the number is the understanding of the users on good value.

4. CONCLUSION

Results from randomly distributed questionnaire data processing to employees and outsource of corporation with the provision of having direct contacts on IT services, the following conclusions are obtained:

From the result of factor analysis conducted in the research found three new factors that influence the level of ITIL understanding in service operational system at the corporation that is Knowledge Deliverable Services, Process and Development Services, and Goal and Result Services.

Each factor that is found is formed on Indicators that have a direct correlation and will affect the level of understanding of ITIL in operational service system in Corporate.

The first factor is Knowledge Deliverable Services consisting of indicators of the importance of documentation, the procurement of training classes, the establishment of good knowledge management, the implementation of SLAs in every part of the service provider, the grouping of incidents and problems, asset services, good and adequate turnover, the existence of KPIs, helpdesk systems, the holding of helpdesk reviews and the development of individual capabilities.

In the second factor is formed Process and Development Services consisting of indicators of the importance of knowing the existing process, the technology used, the handling of errors as early as possible, changes in authorization, the importance of testing and validation results, business strategy applied, the change request, budgeted, monitoring of the infrastructure used, and improvement of service process.

The third factor is the Goal and Result Services which consists of an indicator of the importance of knowing the IT strategy applied in the company, the types of services provided and the testing and validation processes that are made in such a way that they are in accordance with the operating conditions.

Model of evaluation result which describe service system and information technology for

improvement of operational performance at the corporation :

$$Y = 5.906 + 0.492X_1 + 0.364X_2 + 0.213X_3$$

The model can be concluded that the value of service system and technology is influenced by the value of Knowledge Deliverable Services, Process and Development Services, and Goal and Result Services. If the value of Knowledge Deliverable Services, Process and Development Services, and Goal and Result Services provide a positive value then increasing understanding of existing service systems will improve existing operational performance.

However, if the value of Knowledge Deliverable Services, Process and Development Services, and Goal and Result Services provide a negative value then service decline will have an effect on the decrease in existing operational performance.

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