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ADAPTIVE BUSINESS PROCESS OPTIMIZATION

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ABSTRACT
Effectiveness and efficiency is the core process to determine the successful of the business. It is important to research in satisfy process through the optimization & analysis technique. Moreover, to find the satisfying application according to appropriating case is challenging task. There many technique that can be considered for implementation of improvement process. This paper will introduce some modeling technique of Business Process Optimization which important in software development phase. The core requirement for developing the software must be match with optimization process with related business goal. A good Company needs to change the business process flow to increase efficiency and effectiveness. Therefore it needs to develop software that can meet the business goals through optimizing the current process. But sometimes it is challenging task because there are many literature that deal optimization process their each objective approach. This paper gives literature review to introduce some technique with the important model requirement can be adaptively applied into the software development according to their respective requirement.

INTRODUCTION
Business process becomes major interest for some company. The dynamic goals have an impact into the flow of process. Therefore they need the tools as the evaluation of the current process. Sometimes it difficult task to analyze business process in quantitative approach. There are still no establishments to develop the methodology that can be repeated in different case in structured

way. Each organization has their own way to achieve their business goal. There is many modeling technique, but there is still few discussion to cover the optimization technique found in literature. The result is developer still confuse to determine the best modeling technique according to system requirement that will be develop in software development phase.

This paper discuss the method to develop software that have a function for company to evaluate their process, then Make an initial change in their flow process into optimized one. The optimization method appropriately uses quantitative approach to evaluate performance of each process. Quantitative approach always dealing with quantitative or number then compare this value as proving method which is can be typically used along with the evolutionary algorithm. Therefore mathematical or formal modeling approach can be considered as the best optimization method which will be describes in the next chapter.

Organization is growing so well with the requirement. Software is not always able to adjust to these changes. Techniques are now more inclined towards static, where the software is only made for current conditions only. Adaptive software is required in order to compensate for such changes. Formal or mathematical method which will be describe in the chapter can be considered as alternative way to make the software could be adaptively change during the software development phase.

The paper is organized as follow. Section II introduce the most optimization model using mathematic or formal model and diagrammatic. Section III introduces the most parameter that can be used in the process modeling. Section IV identifies the discussion as evaluation of the process based on some literature. The last section present the all review of the approach.

OPTIMIZATION MODEL

The first come with Combination of each business process make the organizations have ability to communicate, interacts, and cooperates with other element [1]. This collaboration method introduce mapping between Petri Nets and Pi Calculus. Petri Nets divide complex business process into several process flows so it have strong mathematical foundation, rich analysis technique, and build with graphical representation then formalize this flow interaction with Pi Calculus into mathematical model. But this method not describes the optimization process and not considered specific concept of case, task, resource, etc. This specific concept plays an important rule of optimization process within the organization or company. Other author measure the business process optimization by using time, quality, service, service, cost, speed, and efficiency are importance as seven evaluation area [13]. This method use the formal model to effectively describe the enterprise into five aspects there are process, infrastructure, behavior, cooperation, information. The writer shows the optimization through simulation process by using software support tools. That software can generate total process evaluation value of process with their respective business feature and decision model and it is necessary for decision maker of the company to analyze,

evaluate, and optimize the current process. This method has a limitation were implemented in complex and large-scale enterprise system, because the simulation is based on queue theory and can be applied through schedule strategy on single level structure of whole organization.

The current business performance can be measured by determine other scenario in several element of company or organization by decompose business goals into several sub goals approach [2]. The advantage of this approach is it can be implemented by non-technical user, and optimization can reach each level of organization. But there is no quantitative approach instead by using formal modeling approach as measurement of current performance to avoid the complexity. The writer optimizes the current process by considering the different scenario which to be implemented. Diagrammatic approach used to describe each scenario which is described before, so the alternative solution through deletion, or creation of the current process as changing in its behavior.

FORMAL MODEL APPROACH IN BPO

Business process optimization can be done by changing into different business model differently according to their business goal [2]. Formal model defined the process to rigorous and precisely, this method use mathematic to analyze them, extract knowledge within them, the reason behind them. Formal method can promise the Consistency but sometimes there are too complex. The result is this model cannot be accept widely, this can be the reason that there are many authors[1,2,3,4,5,6,7,8] have the different method approach business process modeling trough mathematical model. Hence mathematical approach can only accessible by technical user. The organization need to hire more advance user in order to deal with this complexity. In term of optimization if the companies need to perform effective business process, they must change their process condition at the increasing rate.

There are many key term which can describe the characteristic of optimization. Resource of organization or company itself, scheduling or time relocation for specific process, spending cost, and etc can be considered as key term to determine this optimization characteristic. Business process can also define as collection of task which mapped with their process attribute (cost, duration, etc)[5]. In order to solve this complex optimization, evolutionary algorithms can be used to deal with such problem. Genetic algorithm can be used to optimize this entire collection task because of those advantages over traditional formal method [5]. This model can challenge those multiple task, more objective, and access more alternative task. Other author writes that analysis and evaluation of multi objective business process parameter through genetic algorithm can make a balanced and reasonable configuration for decision maker in company or organization. This method uses the quantitative approach through simulation of several parameters. The parameter refers to current process attribute then trough quantitative approach it can produce alternative process attribute.

There are many mathematic tools can be used to run the optimization process trough simulation model. The simulation through multi objective of business

process proves that there are relations in it within business process, then it will make the balance of optimal result [2]. The quantitative representation of business process can also describe by two methods it is both capturing the process design, calculating and evaluating the process attribute [3] trough simulation. There simulation play important rule to show the formal method can be run appropriately according to expected result.

PARAMETER REVIEW IN BUSINESS PROCESS
Quantitative approach through both formal mathematic and Optimization of business process to company which has many attribute that characterize the business process can inflict to make several methods as a balance solution [6]. In this term parameter can be divides into static and dynamic parameter configuration. This dynamic parameter can be retrieved from quantitative resource of company and can be considered as the main process attribute of optimization process such as cost, schedule, duration, etc.

Parameters in business model can be divided into two components according to their effect [6]:
1) Static configuration parameters
This type of component consists of attributes of elements like product, activity, resource allocation or the number availability of those resources.
2) Dynamic configuration parameters can be used for simulation and represent the dynamic characteristics of business process object. For example, the parameters limits running time of simulation and strategic simulation plan etc.

Today, people expect more from the existence of computer software than the past. Behavior and environment always changing at the organization, it also leads to improvement in some part of the software component. Those conditions create a challenge in complex environment. The complexity itself comes from three point of view [14] First, growth of the user. Now days, not only professional but also non specialist user uses software. Second, more system caused more interaction between them. Companies with homogeneous mainframes now have a variety of workstations, servers, and machines that run a variety of protocols. Third, there are many resources and targets. Changes in parameters are behind the source and destination itself. Programmers are accustomed to trading time with space. Now they also have to worry about bandwidth, security, money, revenue results, quality information, quantity and other factors and have to make the right trade for different users.

Together, these three dimensions make the work of designers more difficult. The designer cannot see all the circumstances in which the application will be used and therefore cannot always make the right design choices. Especially what parameters should appear there?

Naturally, changes in solutions resulting from environmental changes can be classified into two categories, preserving homeostasis and evolution [9]. Maintaining homeostasis means a tendency to stabilize stimuli which tend to interfere with their normal state. In other words, the system maintains

homeostasis to focus on stabilizing internal parameters rather than improving its own performance. Conversely, the evolution of the system generally leads to an improvement of the system. Evolution requires more time or money than maintaining homeostasis. This concept can be applied to the software domain. Adapting behaviors such as changing parameters and architectural adjustments such as restructuring services can be managed in different ways.

DISCUSSION

Sometimes it is hard to describe the complex system of organization. Business process which is part of the organization must be changed in their behaviors. This dynamic challenge needs a measurement as parameter with the current and optimized system because the optimized of business process must be must be different design than the actual one. Broy et al [14]. Describe that formal method can translate operational property of the system is useful to improve understanding the logic of system. Hence process model is belonging to complex information system will be defined as syntactic and semantic part as the basic description of given formalism given.

Broy et al[10]. also defined that the development phase play important role during software engineering process by formulating the basic semantic and then document the result. The development phase will consist documentation result during requirement fulfillments, implementation, and until actual implement level is reached. In this phase Developer need to do analysis and fill requirement to meet business optimization process means. This is how between formal method and software engineering can't be separated.

Organization development determine by the process cycle between them. Intelligent enterprise enables organization to change their characteristic toward continued adaptation process. It is challenging task were applied intelligent system as the tools to complement organization development trough business process intelligent. Both environment and behavior can be change along with dynamic development of organization. Hence there are need adaptive software as business process optimization to deal with this dynamic environment problem [11].

Formal methods have a very close linkage with adaptive software. This method plays an important role when the adaptation is needed with synthesize the program itself automatically. In addition, this method is also useful for determining what is appropriate behavior which must be exist within the software, according to the goal of software itself [9]. There are some methods that implement formal model as quantitative approach. Mathematical modal just a part of adaptive software development and of course there is need to combine with the next process. Examples of probabilistic networks (also known as Bayesian networks, network decisions, and influence diagram) is the way to describe the combination of the probability distribution as a model for graphic nodes (representing a random variable) and arcs (representing the dependency between variables). The algorithm is to determine the value of a variable, for dependencies qualitative and quantitative data, to measure the

sensitivity of the response data uncertainty, and calculate the value of information: the value of acquiring new information.

The most important difference between traditional software and adaptive software is linked to the assumption of a dynamic environment [9]. Traditional software assumes that a certain environment. When the ubiquitous and mobile computing environment is mature, the software must have a solution to achieve its objectives in an environment that changes dynamically rather than assuming a particular environment.
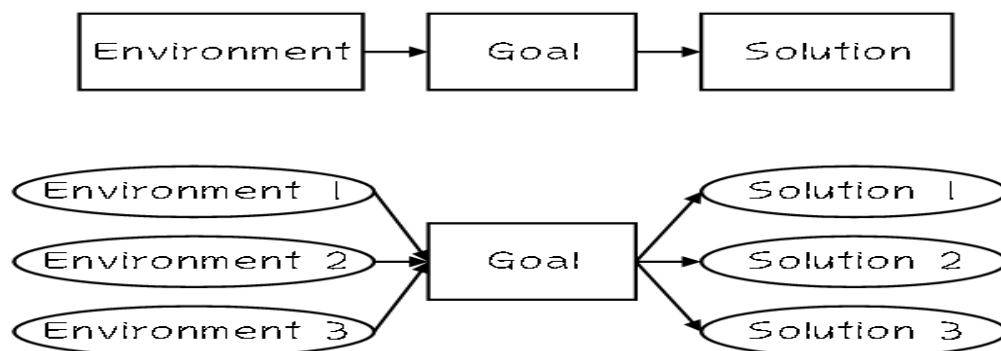

Figure 1. Relations among environment, goal, and solution in traditional software and adaptive software

There is considerable while design adaptive software, such as the environment which can be change dynamically, and interaction between software within environment itself [9]. The first and second problems can be overcome by designing adaptive service based software. Each service is designed to be a solution for a particular environment, and adaptive software selects appropriate services based on changing environments. This approach has two advantages. First, it reduces the complexity of problem solving because the system designer can use provider services instead of taking into account all environmental cases. Second because of the diversity of services from different providers, the ability of the system to adapt to different environments increases.

Other author [12] put adaptive in architecture level of software. The main elements of the software architecture are components, connectors and configurations. As the basis for adaptable software, the use of architectural models has a number of good properties: As an abstract model, software architecture can provide a global perspective on the system. Bigraph is used to validate architectural software policies during environmental changes.

CONCLUSION

The formal method can be considered as business optimization method because of that complexity to defined different business process across the organization. Software play an important role as a tools to help development of the organization, this development can dynamically change into different behavior and environment, hence software need to adapt along with it. Adaptive software enables those tools to change current process into

optimized one, by using mathematic model or formal method. The formal method has a complexity that requires building adaptive software. During the software phase mathematical model is belong into the development phase.

REFFERENCES

L. Zang, Y. Lu, and F. Xu, "Unified modelling and analysis of collaboration business process based on Petri nets and Pi calculus.pdf," vol. 4, 2010, pp. 303-317.

M. Aghdasi and S.E. Malihi, "Rule Based Business Process Optimization," Industrial Engineering, 2010, pp. 305-309.

K. Vergidis and A. Tiwari, "Business process design and attribute optimization within an evolutionary framework," Evolutionary Computation, 2008, pp. 668-675.

K. Vergidis, S. Member, A. Tiwari, and B. Majeed, "Business Process Analysis and Optimization: Beyond Reengineering," vol. 38, 2008, pp. 69-82.

K. Vergidis, A. Tiwari, and B. Mejeed, "Composite business processes An evolutionary multi-objective optimization approach," Evolutionary Computation, 2007, pp. 2672-2678.

B. Wang, L. Zhang, and Y. Tian, "Multi-objective Parameter Optimization Technology for Business Process Based on Genetic Algorithm," 2009, pp. 2-5.

Y. Zhou and Y. Chen, "Project-oriented business process performance optimization," in Proc. IEEE Int. Conf. Syst., Man Cybern, 2003, pp. 5pp4079-4084.

"Project-oriented Business Process Performance Optimization*," Performance Evaluation, 2003.

C. Yoo, W. Jung, D. Park, B. Lee, H. Kim, and C. Wu, "An Adaptive Software Framework based on Service Composition," Challenge, 2007, pp. 476-482.

M. Broy, "Mathematical Methods in System and Software Engineering *."

M. Castellanos, "Challenges in Business Process Optimization," Science, 2008, pp. 2008-2008.

Z. Chang, X. Mao, and Z. Qi, "Formal Analysis of Architectural Policies of Self-Adaptive Software by Bigraph," Defense, 2008, pp. 118-123.

Robertson, P., Schrobe, H., Laddaga, R.(2001). Self-Adaptive Software. UK. S

Norvig, P., Cohn, D. "Adaptive Software". Harlequin(California)