Process Mining - Soundness Workflow Multi-organizations

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Abstract

The process mining multi-organizations does the extraction from the events log of each organization in a series of integrated workflow. To prove that the workflow of multiple organization cooperation is logic or soundness, it should be logical in multi-WF-net. The soundness of cooperation organization uses connector. This paper describes the colaboration model capacity sharing using case studies of clearing process in the banks.

Keywords
Process mining, multi-organizations, soundness, capacity sharing model

1. Introduction

Prosess mining is a new way of process improvement in various domain applications, which is posted and then provides information of the process that happened. Process mining is relatively a new discipline which the idea is to discover, monitor and improve real process not only assumption (Dustdar et al. 2011).

The process will be automated and stored in the event log and then is extracted to be model process. The Model process can be for *Conformance checking,* Social network or organizational mining, and case prediction. *Conformance checking* is to monitor the deviation by comparing logs with the model. Social network or organizational mining is to construct automatically become simulating model. Case prediction is to give recommendation based on historical. production process mining also to facilitate data analysis mining and modeling business process. For example using timestamp in events logs can show the occurrence of bottlenecks, service level, throughput times, and frequency.

Process mining can also be seen from different perspectives (van der Aalst 2000). Organizational perspective that focus on the information resource is invisible in the log. Usually the actors involved in Organizational perspective are people, systems, roles, and the department. The aim of this perspective is humanity's inter-connectedness organization in the distribution groups which runs the duties and responsibilities of the social networking or to show the organization (social network).

Case perspective is focusing on case properties. It can be distinguished into a case based on a path in the process or in line with what should be (originator working on it). The cases can also be distinguished based on the character values which are associated with the data. For example if a case is a replacement order, it is possible to know about its supplier and how much the order is. Every events has timestamps which can be discovered bottlenecks. Process mining can also measure service levels, monitor utilization of resources, and predict time process. Time perspective is focusing on time and the amount frequency of events. (van der Aalst 2012) identifies a profitable and highlighting some challenges and opportunities especially the cross-organizational. To integrate the process (QingtianZeng et al. 2013), there are four patterns which are defined to cross-organizational workflows. They are coordination by synchronizing various activities, coordination by exchanging messages, coordination by distributing resources, and coordination by doing abstract procedure.

The results of the mining process can be used as a reason why the process needs to be redesigned (about process) and to take a decision. The inside process that occurs in the process is to support the company's operations. For further explanation of the process mining can be seen in 0.

2. Literature Study

Collaboration Model, various models of organizations cooperation mentioned in (van der Aalst 2012) (van der Aalst 2000), consists of 5 models. (a) Form Capacity sharing is assumed to have the form of centralized control, where a sequence of cases is controlled by an organization across multiple organizations. The implementation of the work is distributed to other organizations to run it. For example Clearing Process on Bank Indonesia (BI) as a central bank for the purpose of various cross-flow transfer of funds.
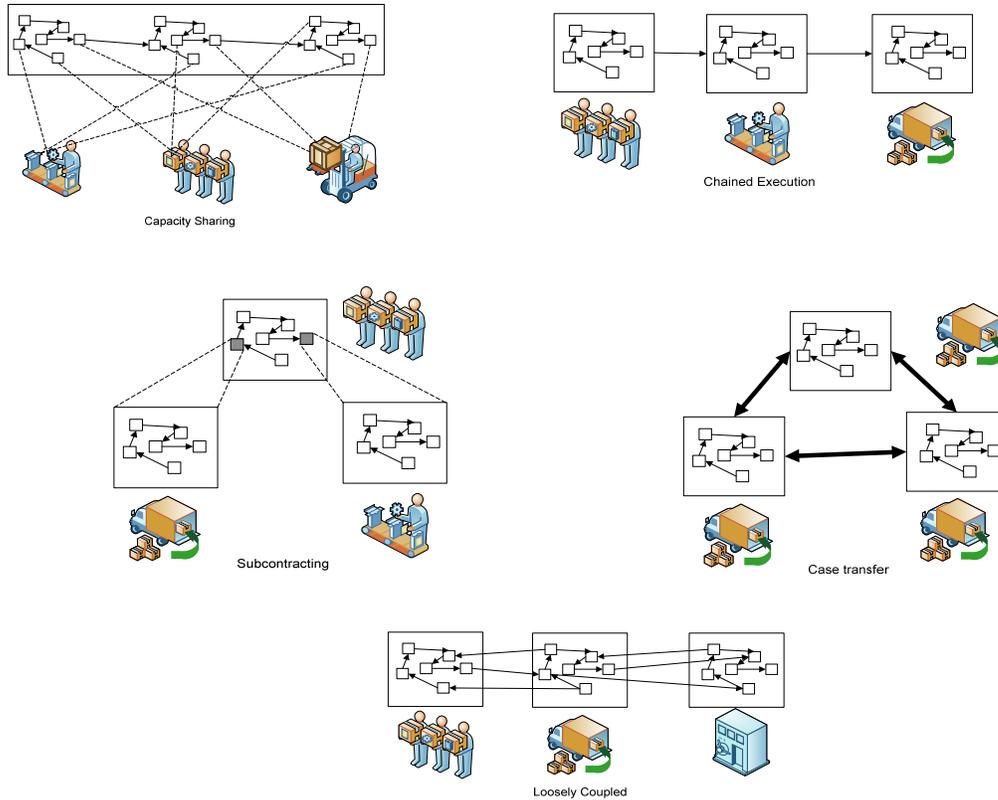

Figure 1. Various models of cooperative organizations 0

(b) Forms of *chained execution cooperation* is a process that are separated by sub-processes (disjoint sub-processes) where the proceedings are conducted by several organizations respectively. This cooperation requires a partner who starts a transfer order or a case until eventually all of the work can be completed. Contrary to capasity sharing, the work order management (workflow) is passed through organizations. (c) The next form of organizational cooperation is subcontracting. At this setting an organization is sub-contracting the subprocess to other organizations. We can see that subcontrating has two subprocess which are subcontracted and more atomic. Even It might be more complex and the control is on the hand of the contract giver. (d) The next organizational form of cooperation is the transfer case. At this cooperation process, every organization has the same job description. A case of instant process can be carried out by other organizations that work to maintain a balance in order to avoid workload (excess work). (e) The next form of collaboration organization is loosely coupled forms of cooperation which is a process of cut in sections that occur simultaneously. Moreover, in any implementation occurs at the local subprocess without having to know the sequence of the other processes. There is some sort of protocol that communicates and connects with other parts involved.

Some other examples of other companies or organizations cooperation are : Companies outsource (eg, cleaning service, security) and enterprise users, Bank Indonesia (BI) and inter-bank, insurance company, companies running ATM, Manufacturing Supplier and Seller Cooperation, IT Consultant, Holding company , leasing companies, vehicle manufacturers, distributors, Frenchaising food or hotel.

On (van der Aalst 2011) Definition (Soundness) If $N = (P, T, F, A, l)$ being a WF-net with input place i and output place o. N is sound or logical if only if: safeness: $(N, [i])$ is safe, ie no position place multiple tokens at the same time. Proper completion: for every marking $M \in [N, [i]\rangle, o \in M$ inside that $M = [o]$. Option to complete: for every marking $M \in [N, [i]\rangle, [o] \in [N, M\rangle$. Absence of dead parts: $(N, [i])$ there is no transition interrupted (eg for each $t \in T$, there is a firing sequence t that is possible).

Soundness or logical show on WF-net that can be applied to the analysis using tool WoPeD.

3. Research Method
In this study, a framework Figure 2 is made as a guide in doing research work with phases as follows:
1. Concept deepen cooperation model (van der Aalst 2012) the organization first
2. Create a model of cooperation, with the narrative form of business process collaboration
3. Create a petri net multi-source log like paper (QingtianZeng et al. 2013), observe what the indicator
4. How to generate event log of the Petri net
5. Distinguish between the event log and compare organization and cooperation between organizations
6. Then mining event logs between the various organizations
7. Create a plug-in to process mining cross organization

Expected contribution of this study is:
a. How to make, discovery multi organizational event log based on different organizational models.
b. Can analyze the performance of the various organizations concerned with bottlenecks, time delay, audit processes (eg, anomaly, fraud) multi-organization collaboration so that output can be better

How to work with tests performed:
1. Petri net that has been made correctly then the Matlab tools or PIPE for identity matrix
2. Then analyze the identity matrix of the various models of the organization (Sarno et al. 2013).
3. Expected there is a connection or relationship *dependencies matrix* identity is known (Sarno et al. 2013).
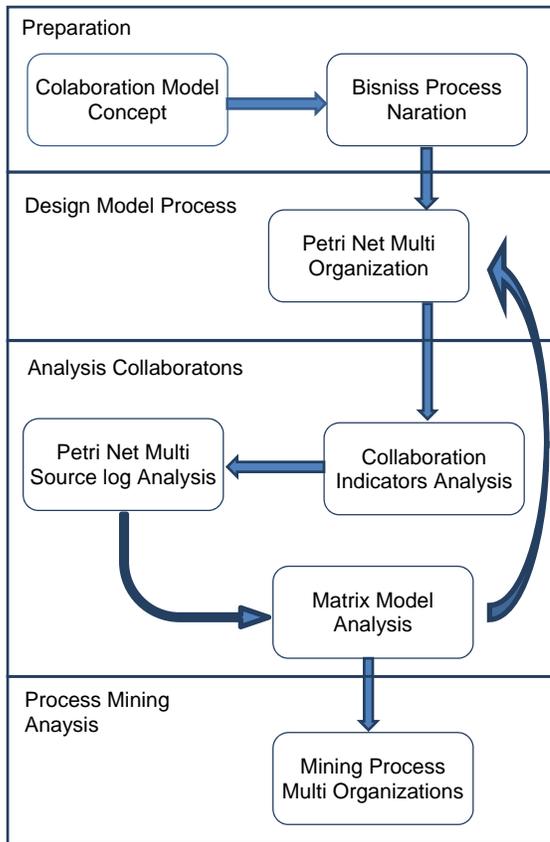4. Objectives to be known is the orchestration and choreography

Figure 2. Framework Process Mining Multi Organizations

3. Results and Analysis

In the early stages to test the researchers conducted on the model collaboration capasity sharing on a case study conducted on the processes of clearing banks.

Bank Indonesia (BI) as a clearing bank is a central controller that controls the sequence of the process of clearing, the clearing process that occurs distribute and run by between banks
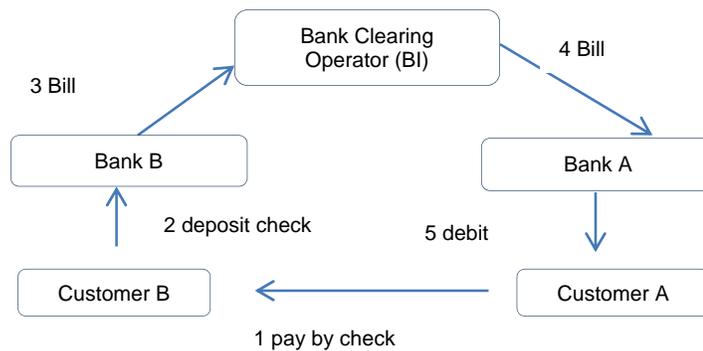

Figure 3. Scenario of processes clearing

The next stage is to modeling the Clearing Bank and the bank clearing transactions described collaboration manually that can be done by all three organizations namely Bank (A), Bank Clearing Operator BI (B), and Banks (C).

A1 Charge to B1
B1 have billed A1
B2 Charge to C1
C1 Receive bills B2
CO1 collaboration A1 and B1
CO2 collaboration B2 and C1

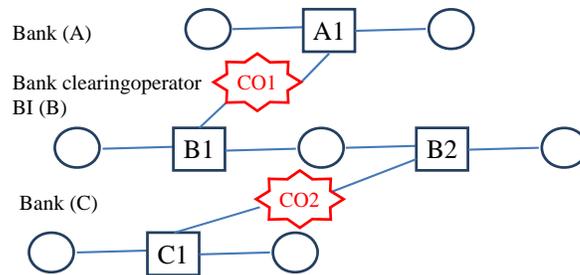

Figure 4. Three Banks CollaborationCapacity sharing Model

The next step is to design the model Colaboration on the tools used, first using YAWL 2.3 Final. Drawing the model can not be done because YAWL can not have the facility to describe the three organizations with Petri net models. Various means are used to design collaboration to three organizations, but has not been able to describe the collaboration. modeling can be done for the Bank (A) and end with a star, but for modeling star and end to the other organizations can not be done is shown in Figure 5. can only be done at the beginning so that when the configuration process design Petri net the other disappeared, remaining only the start and end on the first petri design.
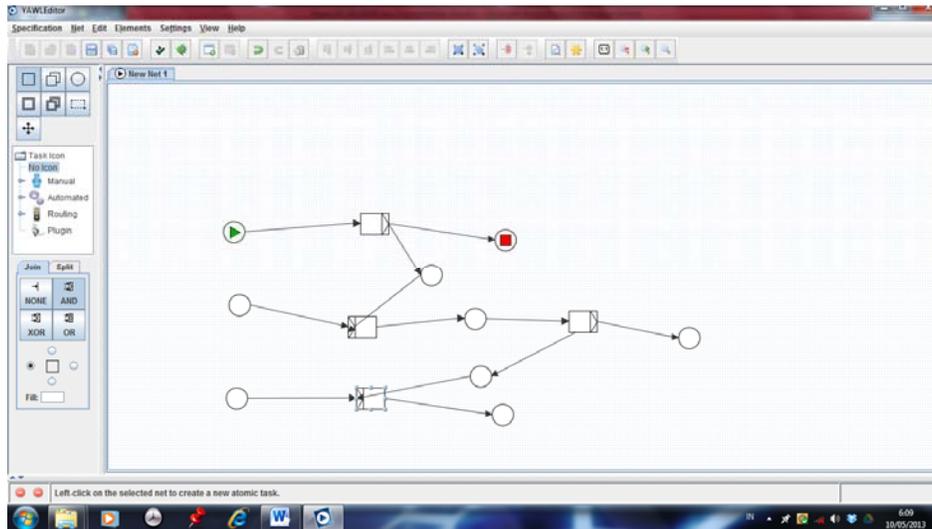

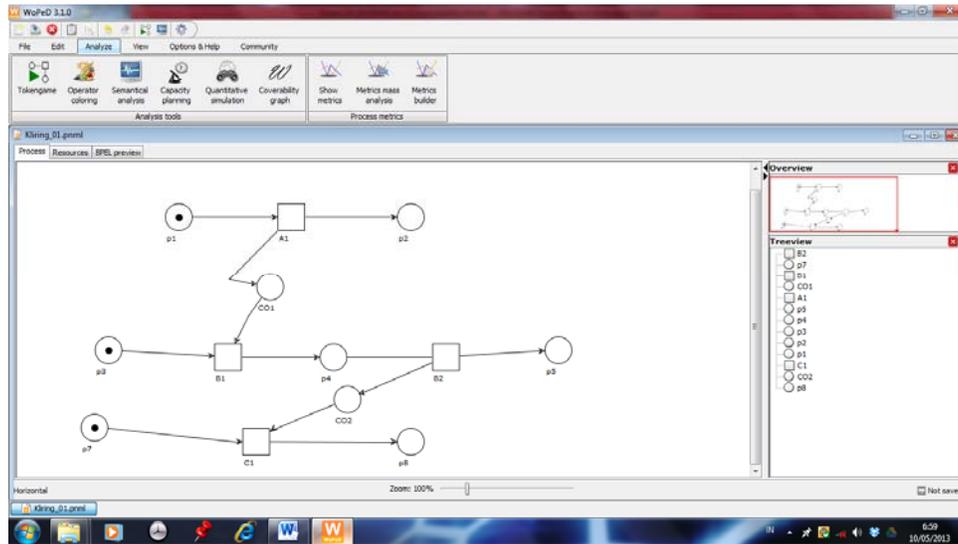Figure 5. Modeling using YAWL 2.3Final

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Figure 6. Modeling using WoPeD 3.1.0

The next step is to design the model Colaboration on the tools used, using Petri net Workflow Designer 3.1.0 WoPeD. WoPed is able to describe the three forms of Petri net and collaboration describe the three organizations. The first simulation analysis using game tokens that can show the three tokens of collaboration organization. Using sematical expert analysis section can be detected connected components of inter-organization that CO1 and CO2. And structural anaysis showed no problems. Soundness is showing start and end or source place numbered 3 and Sink place totaling 3 shows that all three models are integrated.

4. Conclusion

In conclusion, the model of capacity sharing on a case study conducted on the processes of clearing banks, can be done by using a tool showing results Soundness WoPeD analysis. Soundness result is needed for the next analysis of mining multi-organization process. The next development is detailing the activities that occur in the clearing process, therefore it will be known when other collaboration happened. It also describes other various models of collaboration multi organizations.

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Biography

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