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Human Aspect on Chain of Custody (CoC) System Performance

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Abstract. The tropical forests cover 24% of tropical land area. They are the most productive terrestrial ecosystems on earth with high priorities for biodiversity conservation. These forests store a substantial amount of carbon in biomass and soil, and they also regulate the transfer of carbon into the atmosphere as carbon dioxide (CO2). Indonesia is having the third tropical forest area in the world after Brazil and Congo. Over 50 years forest has been felled both legally as well as illegally. High rate of forest degradation resulted from unsustainable forest management, rampant illegal logging, forest area encroachment, conversion and natural disaster. All urges rapid improvement of management system of Indonesia's forest resources (Holmes, 2002). Forest certification is one tool that can support the achievement of sustainable forest management goal. Under current operation of join certification protocol between the Forest Stewardship Council (FSC) and the Indonesian Ecolabelling Institute (LEI) in Indonesia, forest management units must be able to show the required performance indicated in LEI criteria and indicator as well as FSC principles and criteria to attain certification of their products. The gap between current practices and performance required by forest certifications schemes is still enormous. The performance of forest certification system from LEI is determined very much by the human that is involved in the process of planning and operation. The name of certification system is chain of custody (CoC) certification. CoC operation involves activities such as tracing raw material from the forest to the factory, through shipping and manufacturing, to the final end product. In all of the above processes, the roles of human are critical, although the specific roles played from one process to another are different. In this paper we present an identification of human aspect and other factors that predominantly affect CoC system performance.

Keywords: human, chain of custody, sustainable, forest

1. INTRODUCTION

The forests of Southeast Asia conceived some of thewor ld's most precious and productive tropical forests, makin g unique ecosystems of high biodiversity contexture (Sc hulteand Schöne 2001; Smith 2001). Forest damage in Southeast Asia had resided at high levels, congesting to an annual deforestation rate of about 2.76 million ha or 1.3% of the region's forest area (FAO 2007). Forest in Indonesia merely the moist tropical forests experienced an annual damage of almost 1.9 million ha, correspond ding to an annual deforestation rate of some 2% (FAO

2007). Efforts to reduce the rate of forest destruction in Indonesia were made by establishing a timber certification system.

This certification system was often called with Chain of Custody certification system. Chain of Custody system was aimed to give clarification of timber mobilization system in an industry. The output of the system was Chain of Custody certification which more popular with Chain of Custody (CoC). The basic compilation principal of this system was on the mobilization of the timber starting from the form of trees that were still planted in the forest, felling, conversion, processed into a product, until the ready-to-ship products that could be traced accurately. The consumer of the product could get the information of the original forest of the timber used to make the product. The wood tracking system was based on two basic operations occurring to the timber which were the location of mutations and the shape changes of the wood. The entity used to identify mutation location and shape change was done by defining a movement node. Each node would record the operation happened to the wood. When there was a physical movement of the wood through several nodes, this system would record information that occured at each node that had been passed. This information was documented in the form of a certificate made based on a node point. Chain of Custody could only be granted if the nodes could be tracked from the certified source into the previous node and so on until an intermittent chain was obtained which explained that the origin of the forest product was from a certified forest management (Eco-label certified). The success of this certification process was dominantly influenced by the role of the people who were involved. The role of the people in manufacturing work system was influenced by ability and limitation factors in performing an activity. In the other hand, humans potentially made mistakes. Due to the importance of the CoC certification system for forest conservation in Indonesia, the study about the human aspect which dominantly affected the performance of this certification system needed to be done. The result obtained was expected to be used to help the management to create operating system governance based on the most dominant human aspects.

2. Literature Review

A literature review was conducted using various terms dealing with human aspect in operations perspective in relation to forestry and forestry management. This literature review can improve our concept on human role characteristic in operation forestry. Issues related to human factors are an important concern in business processes (Geary et al, 2006). The rate of productivity can be obstructed by human performance (Westerberg and shiriaev, 2013). Humans play a role in reducing cycle times of activity in the supply chain (Handfield and Bechtel, 2002). Various skills have been declared to affect system performance, including technical, maintenance, planning, cooperative,know-how, and machine control skills (Tervo et al., 2010; Gellerstedt, 2002). On another aspect memory, concentrations, decision making, rationale, scheme recognition, motor coordination, design capacity, logic judgment, and spatial perception are abilities that have been described as important for harvesting work (Tervo et al., 2010; Ovaskainen & Heikkila, 2007; Parise, 2004; Gellerstedt, 2002). Based on personnel aspect, types of skills needed in the supply chain personnel are technical, interpersonal, internal enterprice, external enterprice, and strategic business skills (Feisel et al, 2011; Dewa et al, 2012). Operator skill obviously has a prominent impact on operational outcome. One way working with human aspect of these parameters (i.e. skills and abilities) is through education and training (Alam et al, 2014; Ovaskainen et al., 2004)

3. Research Methodology

Identification process of human aspect in certification performance was done by observation and interview to the members of Indonesian Ecolabelling Institute (LEI). The members of Indonesian Ecolabelling Institute who were involved in this research were the doers of wood industry in Indonesia. The identification process of human aspect with role was done based on the business process that was needed in the certification process. In the next step, the method of root cause diagram was used to identify human aspect and the other dominant aspects. The identification results of human aspect and the other dominant aspects were analyzed to classify certainly related with human aspect.

4. Types of Operation

Chain of Custody certification process can be grouped into two parts which are data gathering process and decision-making process. The actors performing this operation involved the parties who were involved in the node. The procedures for the chain of custody certification implementation can be described in the figure 1.

The movement nodes used in this CoC system is based on transactions that occured along the forest route until the delivery of the finished product. In general the nodes can be grouped as follows:

1. Route 0 is a node starting from selecting trees, logging, until the lumber are ready to be sent out of the forest. The scope of operating activities that occur is limited while it is

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still in the forest.
2. Route I is the node in the range from forest to first buyer or main forest processing industry.
3. Route II is the node which is located in the industry system.

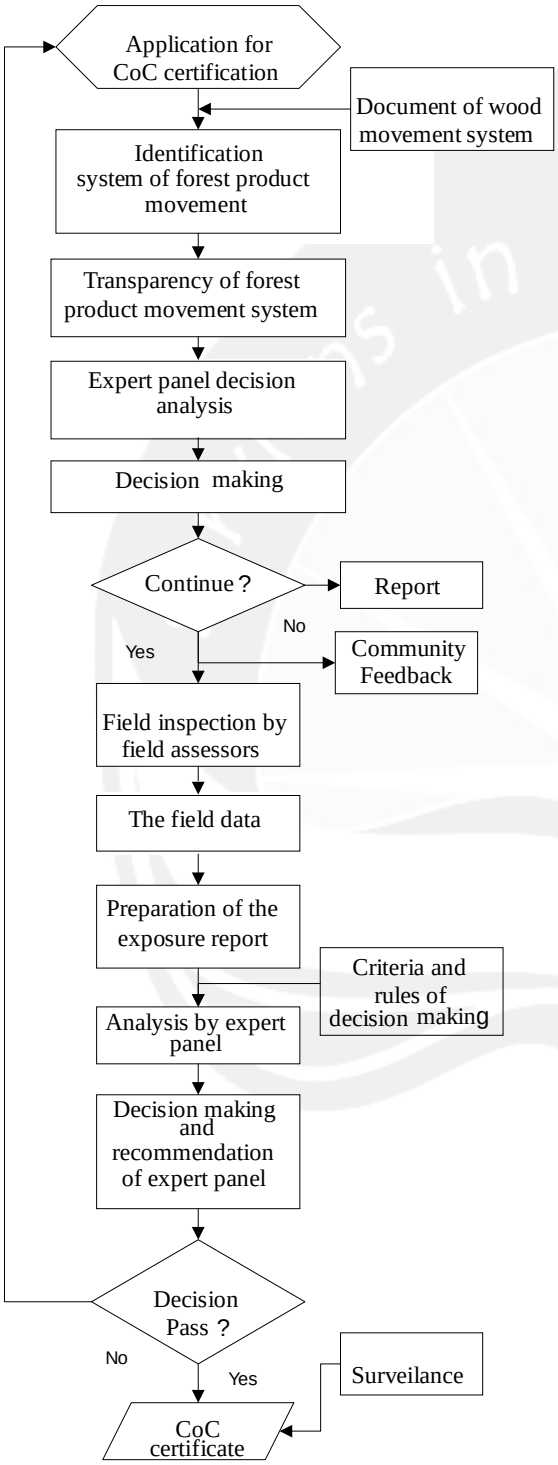

Figure 1: Flowchart the procedures for CoC certification.

4. Route III is the node which is located in the range between the industry to the final buyer or the ship.
The route 0 with the overall activity was classified into forest conservation management certification. That certificate was not part of the chain of custody certification. Chain of custody certification was done from the route I to route III. There was big chance of lumber manipulation at the route II, so chain-of-custody certification was needed to identify the lumber source as a raw material of the forest industry.

5. Procedure of CoC certification

The scope of the study of this research is the evaluation process on the route I. The scope of this route is node between forest and timber collection to first buyer. This first buyer is the entrance to the industrial scope. A common scheme that describes the scope of CoC evaluation on route 1 can be described as follows:
Information gathering and recording process began at a node where the timber location was stored in a storage area owned by an individual who had IPKTM (timber utilization permits) certification. Information gathering and recording process in the route 1 had three critical observation points: (1) observation point that lied between wooden furniture products and in-flow gate industry furniture, (2) observation point between suppliers with wood certified, and (3) observation point on timber, IPKTM.
Operation activities which were needed for information gathering and recording were:

1. Re-identification of the timber.
2. Create a system identification "environment" for example with coding color.
3. Creating a codification system (tagging) which is able to store the timber identity on the previous node.
4. Creating logging systems and physical signals on timber as it begins to be processed until assembling, so it has traceability properties.
5. Make records in the document at every form change in the timber.
6. Creating a specific code relating to the identity of the companies involved.

Desirable outputs in the process of CoC certification were:
1. The ability to present data, information and documents consistently and controlled
2. The ability to search related to the mechanism of uninterrupted forest product movement between the evaluations nodes
3. Quality assurance of information, identity details, and separation of raw materials

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6. Result and Analysis

6.1. Problem Identification and the Expected Output

Based on interview and observation results with the doers of the wood industry in Indonesia, the dominant problems that happened were: (1) the report of data processing result was less effective and efficient for the doers of the wood industry (2) the data accuracy between real condition and the noted condition in the report. The expected solutions from the doers of wood industry were: (1) the integrated report that was easy to understand and access (2) the information quality that was always updated and did not contain data redundancy.

6.2. Business Process Analysis

Identification process of human aspect in certification performance was done by collaborating the gap information between problem and the expected output with the needed business process in the certification process. Identification analysis of human aspect in this research was limited in the competency need and human ability in doing an operation. Cause-effect analysis method was used in collaborating gap and business process to identify human aspect that had role and the other dominant aspects if needed. Implementation result of cause-effect can be seen in table 2. Cause-Effect Analysis.

Table 2. Cause and Effect Analysis

No	Effects / Problems	Cause	Expected Output
1	The report of data processing result was less effective and efficient for the doers of the wood industry.	Human : Ability to analyze data Ability to process data with computer software The ability to store the data Ability to design the layout of data / information.	The integrated report that was easy to understand and access.
2	the data accuracy between real condition and the noted condition in the report.	Human : Ability to record data Ability to design data The ability to store the data Ability to organize data.	The information quality that was always updated and did not contain data redundancy.

Based on the observations and interviews there are other dominant aspects affecting performance achievement in the certification process, namely the physical facility aspects that help people to collect and manage the data and aspects of the physical environment occurring within the forest and timber management locations. The physical environment includes weather, lighting, temperature, and air humidity at the location of the wood is located.

7. Discussions

This research seeks to identify the human aspects that affect certification performance. Based on cause-effect analysis, the identification of human aspect are the ability to record data, design data, store data, organize data, analyze data, process data with computer software, and the ability to design the layout of data / information. Based on the character of the ability and the operations performed, the identified capabilities can be grouped into capabilities:
(1) data management, (2) skills to operate tools as software and hardware, and (3) analytical skills such as those related to analyzing data.

This classification is in accordance with the classification of human competencies identified in the scope of supply chain planning and operations (Dewa et al, 2012). The results of identification on cause-effect analysis indicate that there are other aspects that affect the achievement of certification performance that is the aspect of physical facility that helps human to collect and manage data also physical environment aspect such as weather, lighting, temperature and humidity.

This fact is consistent with the statement that human performance is influenced by the working environment (Geyer and Linner, 2005; Zheng et al., 2012) and equipment or machine (Mital and Pennathur, 2004; Fereidunian et al., 2007; Ghobakhloo et al., 2011). The results of identifications therefore address not only human skills, but also tools and the working environment. This study provides the direction that there are three aspects that need to be considered to manage the operational performance required in the certification process that is human aspect, equipment and physical work environment. The results of this identification are similar on the dominant aspects affecting supply chain performance (Dewa et al, 2017).

8. Conclusion

The dominant human aspect influencing this certification performance involved: the ability to plan

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the data formation, to record data, to save data, and to analyze data. The other dominant aspects that influenced were the tool and human external environment. This preliminary study will be continued on the 2nd and 3rd nodes, so that better identification of the human and other dominant aspects of the certification performance is obtained. The final result is expected to establish a management model of human aspect to improve certification performance.

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