



Requirement Engineering: Development of Manufacturing Information Systems Using a Role Based Goal Oriented Model

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Abstract. Information system development is required by business development. Prior to a system development, the system requirements are defined, including the roles and involvement of users or actors and the dependencies between actors in running a business. The manufacture information system is a system used in a factory to determine the manufacturing process to produce a product. The requirement engineering approach through an intentional perspective is a method that has emerged in the field of requirement engineering. This approach can explain the characteristics of an actor's behavior. The requirement engineering process is the first step conducted in the development of information systems to obtain a reliable information system. The Role Based Goal Oriented model is the instance of requirement engineering model that observed in this research.

Keywords: Requirement Engineering · Information System · Role Based Goal Model

1 Introduction

The development of information technology plays an important role in all types of activities. Both individuals and organizations, in this era rely on technology in every activity to increase the effectiveness and efficiency in achieving the results. In the business area, people need information about the data that is embedded in every existing business process so that they can calculate the company's future performance and can maximize profits and minimize losses. One of the business processes that can take advantage of information system technology is the manufacturing process. The manufacturing process is a method and technique for using existing resources (labor, machines, materials, and funds) to create the goods or service [1]. Every activity in the manufacturing process often involves many complex procedures that are carried out according to the needs of the goals to be achieved, this procedure or collection of activities is carried out by stakeholders who have various interests and unique needs that complement each other to achieve the goals of each manufacturing process.

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Based on the description, it is necessary to develop a manufacturing information system. In the information system development process, there is an important stage, namely Requirements Engineering, which is the first step in an information system development process that needs to be done to obtain a quality information system [2]. One of the requirements engineering methods is to use the Role Based.

Goal Oriented method. The author uses the Role Based Goal Oriented method in the requirement engineering stage to make it easier to see the complex procedures that exist in the production process through the actors involved, then these actors are defined in detail each of their needs through dependencies and sequential activities in the involved process using Strategic Dependency & Strategic Rational notation. These requirements can be arranged to complement one another so that it can become a collection of requirements and objectives for a complete production information system. The role modeling based on iStar is proven and able to determine the dependence between actors and the roles and positions of actors in each process are shown by strategic dependence. It also identifies what activities occur to each actor sequentially so that the construction sequence can be clearly seen for achieving goals in the internal process of the actors represented by a rationale strategy [3]. This method will be discussed in this paper to be applied to a case of the development of a Production Information System, a system that controls all production activities in the company to minimize the occurrence of deviations by irresponsible parties.

2 Methods

In this research the Role Based Goal Oriented method is applied. This method is used to model requirements in the development of manufacturing information systems. Role Based Goal Oriented is a requirement engineering method derived from the development of iStar modeling, this method defines dependencies between actors and the roles of actors in each running process as indicated by Strategic Dependency. In addition, the Role Based Goal Oriented method is also able to identify the activities that occur in each actor sequentially so that it can be seen clearly the sequence of work to achieve goals in the actor's internal processes as shown by the Strategic Rationale [4].

Following are the elements of the Role Based Goal Oriented Rationale [4].

1. Goals, defined as objectives to be achieved.
2. Resources (Resource), defined as the resources needed to achieve and complete goals and activities.
3. Activity, defined as a series of solutions or a series of business processes to achieve predetermined goals.
4. Actor is defined as a stakeholder involved in every process and sub-process that collaborates with each other in achieving / realizing their goals.

The adoption of the role concept of the RACI diagram in the Role Based Goal Oriented Model explains that each actor has different roles and responsibilities in every process in

a system so that each actor gets an appropriate role and responsibility. RACI itself means or stands for Responsible, Accountable, Consulted, and Informed [5]. The following are a description of the RACI chart assessment:

1. **Responsible:** A person or group of people who carry out an activity from a project or business process.
2. **Accountable:** A person or group of people who have authority and are responsible for deciding under certain conditions.
3. **Consulted:** A person or group of people who need feedback and opinions to complete an activity.
4. **Informed:** A person or group of people who have the right to know the results of an activity or decision.

3 Result and Discussion

The following are the analysis of the requirements of the general production process that shown in Table 1.

Table 1. PRODUCTION PROCESS GENERAL REQUIREMENTS ANALYSIS

No.	Problem Analysis	Requirement
1.	The exchange of information in the business process of the production process is very complex, but the current system flow is ineffective and inefficient due to the recorded information is placed manually in documents of a shared folder, this may cause errors in storing and accessing information due to lack of recording information systematically capability.	Creating a system design that can support the business process of production process systematically.
2.	The process of exchanging information using documents in shared folders makes the security level of the stored data low and very vulnerable to abuse.	Create authorization on the system to ensure the system can only be accessed by users who have access rights according to the needs of their respective roles
3.	Complex business processes are not supported by a system that can exchange information in real time, this is because the process of recording, storing, and calculating are done manually. So that there can be asynchronous information between the reality in the field and the data on the system due to the high process delay.	Build an integrated, automatic and realtime system hence the system is able to update information immediately whenever the data changes is happen, and automatically perform calculations that required for each event in each business process continuously.

Table 2. PRODUCTION INFORMATION SYSTEM DECOMPOSITION TABLE

Proses	Sub Proses	Goal
Job Entry (P01)		Support all activities in the process of creating job and job's issue
	Job Issue (P04)	Able to handle all activities in the process of compiling and recording the Issue of the Job
Job Receipt (P02)		Able to support all activities in the processing process from receiving work orders / jobs to recording the results of production processing.
Job Inspection (P03)		Able to support all activities in the inspection process ranging from receiving Job Receipt items, to recording quality control test results.

In order to make it easier to see the point of view of a detailed production process system requirement, the production information system is decomposed based on the main processes and related sub-processes arranged in Table 2.

After the decomposition process, the processes and sub processes that compose each other into a complete production process system are acquired. Then the process continued by determining the actors involved in each process and subprocess who cooperate with each other in achieving / realizing their goals. The collaboration carried out by the actors involved is described by the preparation of a strategic dependency which consists of identifying the type of dependency (which can be a goal, task or resource), along with the identification of the role of each actor using the RACI concept represented by symbols letters, namely: R = Responsible, A = Accountable, C = Consulted, I = Informed.

Strategic dependency is used as a formal record of identification of the dependency requirements and the roles of actors involved in the production process. This formal record can serve as a framework for objectives in building a system that can meet the needs of actors. In addition, strategic dependency can also be used as a reference in the process of testing the system that has been built, to ensure that every actor's requirements are met, or to ensure that the system being built is perfectly relevant to the requirements of actors that have been previously identified.

After composing a strategic dependency, the next step is to build a Strategic Rationale notation to identify the atomic internal activities of actors in performing a particular task or resource. The strategic rationale presents the activities of the actors in a sequential manner so that they exhibit the information through the point of view of the focused activities of each actor. It provides the completeness of information for the requirements in the development of a production system.

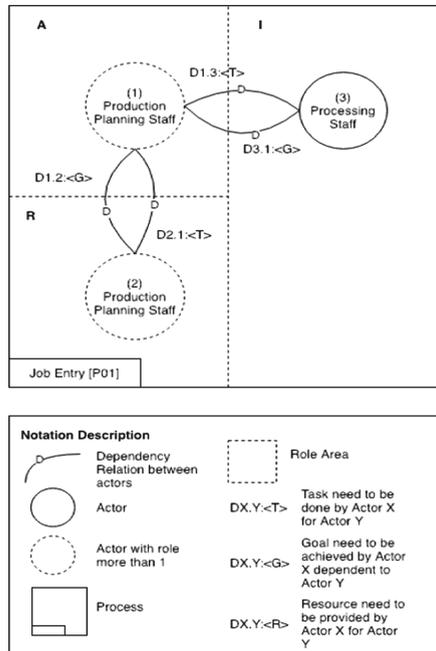


Fig. 1. Job Entry Strategic Dependency Process

The Strategic Dependency and Strategic Rationale notation for the production system are described as follows:

1. Job Entry Process [P01]

- a. Production planning staff is accountable to ensure that the job and the details of the related issues are made [G01] by other production planning staff who is responsible in making the job and the details of the related issues [T01] (D1.2-D2.1).
- b. Production planning staff is accountable in providing detailed Job information to processing staff [T02] who get informed about Job details from production planning staff [G02] (D1.3-D3.1) (Fig. 1).

2. Job Entry Process [P01]

- a. Production planning staff is accountable in obtaining Job details Issue that has been compiled [G03] by other production planning staff who is responsible in preparing Job details Issue [T03] (D1.2-D2.1).
- b. Production planning staff is responsible in specifying the allocation of information on raw materials from the warehouse [T04] to the inventory staff who is responsible in receiving detailed information on the allocation of raw materials of available Job [G04] (D2.3-D3.2) (Figs. 2, 3 and 4).

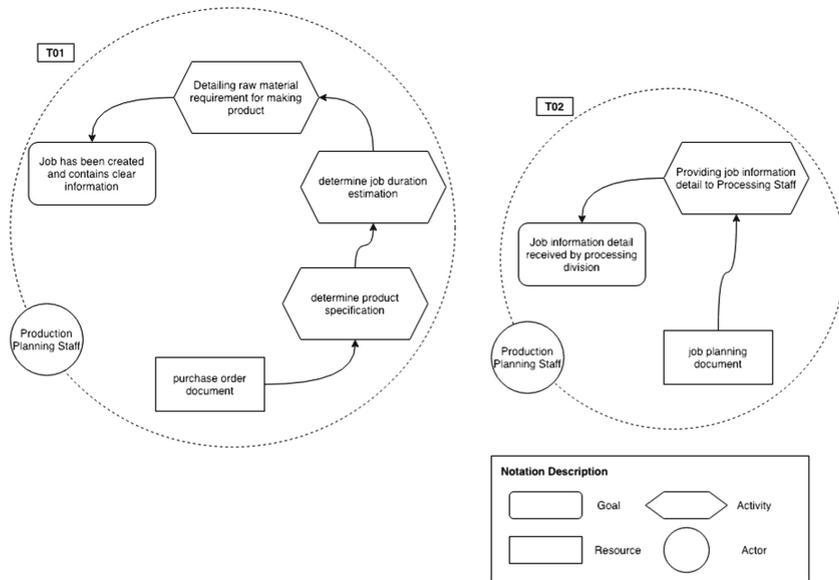


Fig. 2. Job Entry Strategic Rationale Notation

3. Job Receipt Process [P03]

- a. Processing staff is accountable in obtaining a record of the production results created [G05] by other processing staff who is responsible in recording the results of production received [T05] (D1.2-D2.1).
- b. Processing is responsible in providing records of production results to quality control staff [T06] who get informed about records of production results from processing staff [G06] (D2.3-D3.2) (Figs. 5, 6, 7 and 8).

4 Conclusion

Based on the discussion that has been described previously, it can be concluded, as follows:

1. The definition of general system requirements can be directly translated into the form of specific requirement that are directly associated with the rights of actors in accordance with the business processes that support the company’s production operations. So that it supports the system design process effectively and efficiently.
2. Requirement Engineering Role Based Goal Oriented method can ensure the rights of every actor involved in the production process is fulfilled.
3. Production process information systems minimize the data communication process in each related.
4. Production operational process, hence facilitating accessing information whenever needed

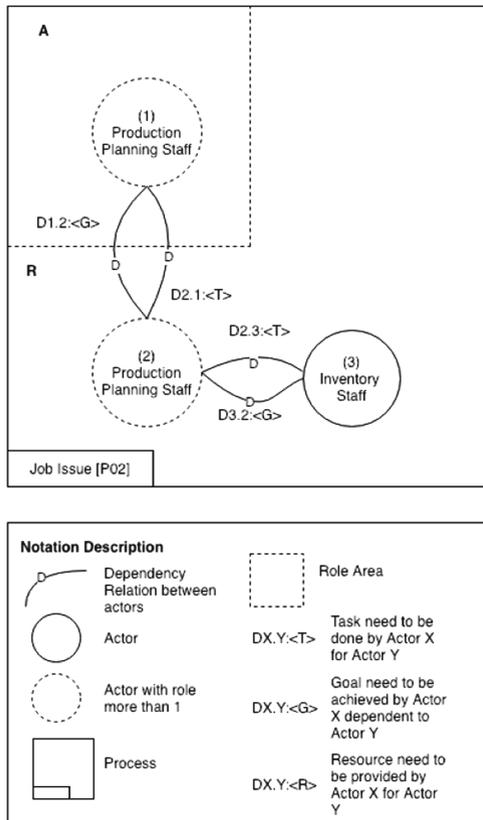


Fig. 3. Job Issue Strategic Dependency Process

5. Data related to the production process shall be accessed according to the roles of each actor, therefore increase security in presenting information from the production process.

Further research shall continue the results of these requirements by using the result as the basis for designing the next online sales system. Furthermore, the design results can be used to build the system until the system is complete and ready to be implemented.

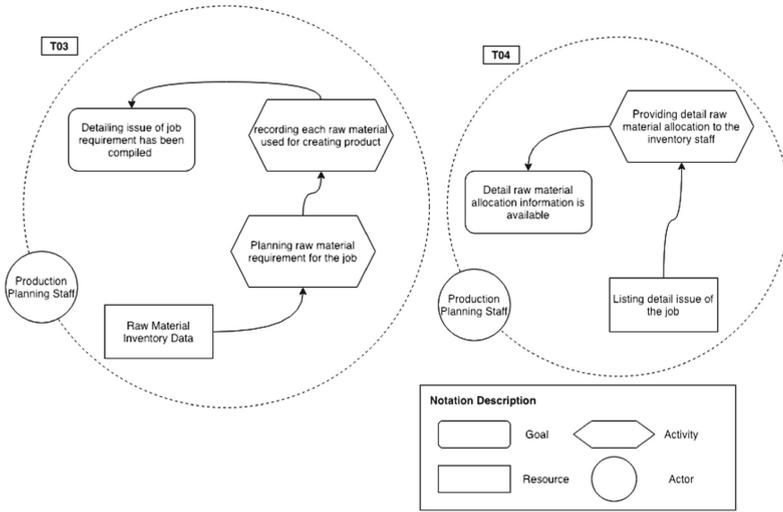


Fig. 4. Job Issue Strategic Rationale Notation

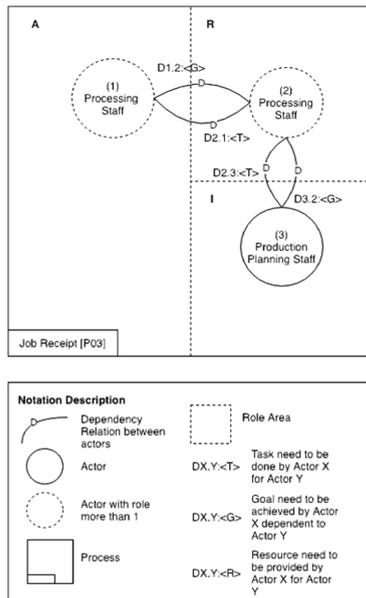


Fig. 5. Job Receipt Strategic Dependency Process

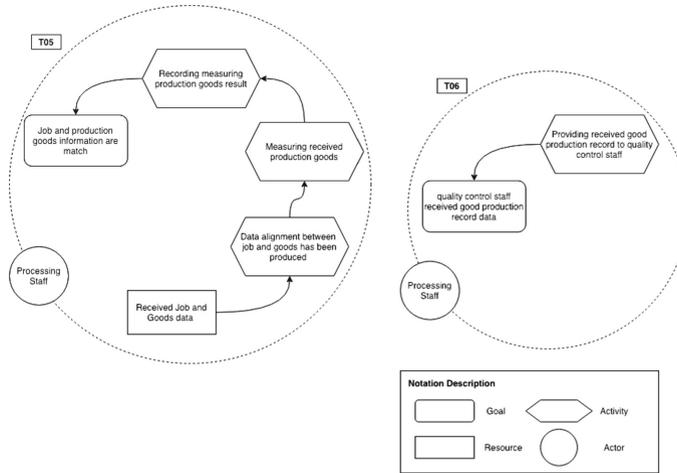


Fig. 6. Job Receipt Rationale Notation

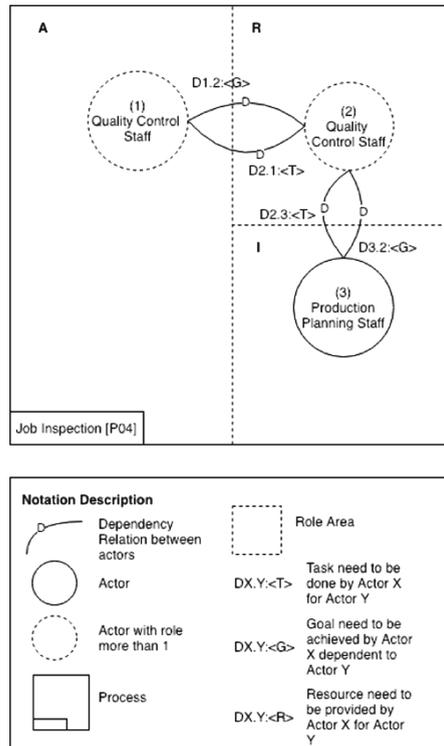


Fig. 7. Job Inspection Strategic Dependency Process

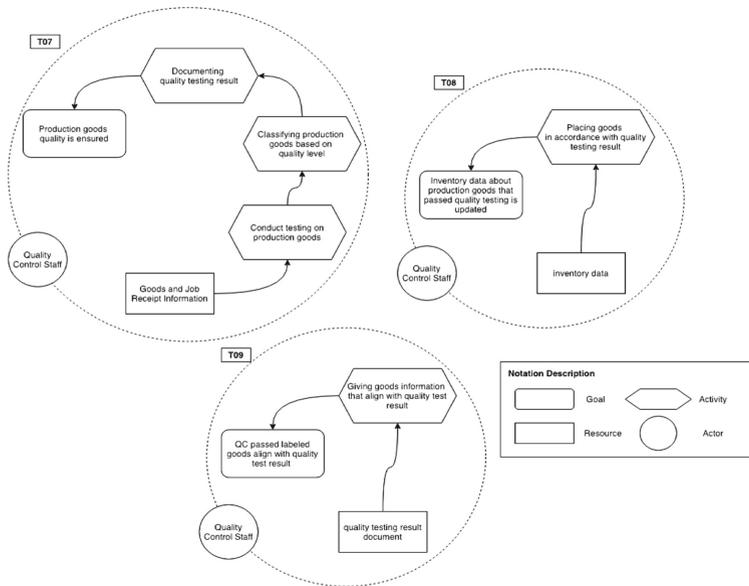


Fig. 8. Job Inspection Strategic Rationale Notation

References

1. Assauri, S.: Manajemen Produksi dan Operasi. Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia, Depok. (2011).
2. Adikara, F., Hendradjaya, B., & Sitohang, B.: Integration of Key Performance Indicators in Requirement Elicitation Process from Organization Goals. ICodSE, Bandung. (2013).
3. S. Sandfreni and K. Surendro: Requirements Engineering for Cloud Computing in University Using i*(iStar) Hierarchy Method. In: Information Science and Applications, pp. 85–890 (2015).
4. Sandfreni, & Surendro, K.: Requirements Engineering Model: Role Based Goal Oriented Model. ICDES. (2016).
5. Bernard, P.: IT Service Management based on ITIL 2011 Edition. Van Haren Publishing, Zaltbommel. (2014).

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