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**Research Article**

# HOSPITAL SUPPLY CHAIN MANAGEMENT: APPLICATION IN WEST JAVA, INDONESIA

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**Abstract**

**Introduction**: Hospital supply chains are intricate systems that ensure the flow of products and services to keep patients satisfied. The aim of this exploratory study is to do a descriptive study of hospital supply chain management in West Java, Indonesia. It is important to conduct a descriptive study to find out the current condition of people, process, technology, and partner as important categories of maturity framework in hospital supply chain management. **Methods**: By using observation and semi-structured interview, the following steps from Business Process Management were undertaken: (i) process identification of current process related to people, process, technology, and partner in hospitals (ii) process discovery related to hospital supply chain management; (iii) process analysis related to maturity in hospitals; (iv) confirm the framework that leads changes from "as is – to be" process. **Results**: The result is maturity framework based on current condition in Indonesia Hospital Supply Chain Management. **Conclusions**: By identifying people, process, technology, and partners in hospitals, the hospital supply chain management system should improve, leading to system-wide results.

**Keywords:** Hospital supply chain management, People, process, Technology, and Partner, Maturity.

## INTRODUCTION

Hospital Supply Chain Management (HSCM) is one of the unexplored areas of management research in an emerging country such as Indonesia. Based on the literature review, the issue regarding HSCM can come from patient safety when there is inefficiency along the supply chain, such as high inventory and high logistic costs, low-quality services caused by drug shortages with or without disruption, limitation of technology, and maintain government compliance (Setiawati *et al.,* 2021). Hospital Supply Chain Management (HSCM) is a supply chain management that focuses on reducing hospital costs while improving hospital services. HSCM is the entire system in the hospital, from drugs or medical devices to patients with or without experience in the treatment process at the hospital, where the presence of technology aids in the integration of the entire process. The hospital's SCM increases efficiency in various ways (Volland, 2017). Continuous efficiency requires a road map or a framework. Previous research has already been researched regarding hospital supply chain management assessment for the supplier in a developed country (Switzerland). The assessment was called maturity (Mettler, 2011). In Mettler's research (2011) the variables used in hospital supply chain management consist of people, process, and technology. In this research, we consider a partner to be added to the framework(del Carmen León-Araujo *et al.,* 2019). People's maturity provides an overview of people's ability to learn and improve their skills. Process maturity refers to the extent to which a process is explicitly defined, managed, measured, and controlled. Technology refers to the degree to which technology has reached integration within the internal and external system. Partner refers to collaboration with actors who add value. Before assessing the maturity of hospital supply chain management, the description of people, process, technology, and partner need to be described.

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This research will prove the importance of partners in hospital supply chain management using a descriptive study in West Java, Indonesia. While previous research focused on the supplier, this research focused on hospitals. There is still little research regarding hospital supply chain management regarding people, process, technology, and partner in the emerging country, specifically Indonesia. Against this background, the main aim of this study is to do a descriptive study of HSCM in West Java, Indonesia, related to people, process, technology, and partner. The research used a case study resulting in descriptive studies of those aspects. The expected significant benefit of this case study is to find out the current condition of hospitals in West Java, Indonesia. The result of maturity based on the framework can be explored to reach the optimal result of HSCM.

## LITERATURE REVIEW

There is no research by adding partners as a variable related to descriptive studies in hospital supply chains. Specifically, this research used the framework related to people, process, and technology following Mettler (2011). According to Bowersox (2002), in supply chain management, demand integration necessitates that businesses have previously developed a set of comprehensive long-term agreements to strengthen relationships with specific customers and suppliers. Based on that, this research adds partners by considering the importance of collaboration in hospital supply chain management (del Carmen León-Araujo *et al.,* 2019). This is the research gap that this paper intends to address. Previous studies (Volland, 2017) agreed that SCM leads hospitals in cost and performance. Supply chain management leads to many efficiencies in many aspects. Mettler (2011) measures the maturity of suppliers in the Hospital supply chain. The metrics are used to describe people, processes, and technology. Maturity was an important gap in this study due to its role as a roadmap for the hospital to be modeled. Maturity models are tools used to assess the maturity capabilities of specific elements and then choose the

appropriate actions to bring the elements to a higher level of maturity. Conceptually, these represent stages of development of a capability at the qualitative or quantitative level of the element in development to assess their progress concerning the defined maturity levels. (Bvuchete *et al.,* 2018)provide an overview of the maturity model in Supply Chain Management. Using a comparative analysis related to the maturity model in the supply chain, the main maturity model design requirements before maturity can be documented consist of 1. Identify relevant problems to be resolved, 2. Comparing with existing SCM maturity models, 3, conducting a case study, lit review, surveys, and interviews as procedures for developing a maturity model, 4, consisting of a gradual process, 5. The testing and evaluation of the developed maturity model are based on the review of the maturity model in terms of its ability to satisfy all the design requirements and evaluate its usefulness and effectiveness of the maturity model.

The use of maturity allows organizations to assess organizational methods and processes according to management best practices (Carvalho *et al.,* 2017). Bvuchette et al. (2018) describe how maturity design requirements exist, but it is not complete from previous studies. (Pradabwong *et al.,* 2017) stated regarding maturity in business process management. Six core elements of business process management are believed to enhance organizational performance. It consists of strategic alignment, governance, methods, information technology, people, and culture. The relationship between maturity and business process management focuses on continuous improvement of the organization that needs to be assessed. Briefly, the six elements describe the golden triangle: people, process, and technology that become part of stages in maturity. This is significantly related to SCM as part of organization improvement. In contrast, (Lahti *et al.,* 2009)stated implicitly that partners can enhance the organization's maturity, which needs to be input in this research. Thus, hospitals will become inefficient if they do not achieve the highest maturity level to satisfy the targeted patient segments. Suppose there is a misalignment between what the specific hospital's supply chain does well and the needs of the desired customers/patients. In that case, the hospital will need to redesign the category of the maturity supply chain that consists of people, processes, technology, and partner to align with the competitive strategy or completely change the strategy.

## METHODS

Hospital Supply Chain Management (HSCM) concept is relatively novel, and its applicability has hardly been researched in an emerging country. Therefore, an exploratory research approach (Yin, 2003; Eisenhardt, 1989) is appropriate. Lack of rigor is a common criticism leveled at case study research papers. To address this criticism, we used Stuart et al. (2002)'s list of critical points to consider when conducting case studies in operations management. These are discussions of (1) the research's initial goal, (2) previous research in this and related areas, (3) the protocol used, (4) how the case firms were chosen, (5) what data was collected, (6) how the data were analyzed, and (7) how the findings were validated (Stuart *et al.,* 2002). First, this research aims to do a descriptive study of HSCM in West Java, Indonesia, related to people, process, technology, and partner. Second, hospital supply chain management is considered due to benefit and can encourage enhancing current performance during the chain.. A semi-structured interview and observation list are prepared for either hospital or an expert in that area. The semi-structured interviews meant learning more about the people, process, technology, and partner in HSCM and the expert's viewpoints. All respondents involved in the data collection process were able to answer the questions, and they also provided explanations. Fourth, case selection process, we followed our research interest. By choosing hospitals with different accreditation results (in the order of Dasar, Madya, Utama, and paripurna), this study assessed the level of people, process, technology, and partner from different hospitals in West Java, Indonesia. Fifth, data focused on hospitals' people, processes, technology, and partners. Sixth, data were collected and analyzed using business process management. Seventh, we validated our case findings by explicitly asking our respondents for feedback and comments on the prepared interview reports. This feedback resulted in confirmation and a better understanding of the various categories in people, process, technology, and partner.

Since this research used Business Process Management to go in-depth with descriptive studies of Hospital Supply Chain Management and the steps in methodology, using the methods of literature review, observation, and semi-structured interview, here are the steps:

1. Process Identification: descriptive studies of the current process in the area of people, process, technology, and partner in hospitals. The study protocol, including semi-structured interview questions, is shown in Appendix. The respondent of this research consists of six experts from different hospitals.
2. Process Discovery: discover which process that specifically highlighted in hospital supply chain management
3. Process Analysis: analyze the current result with the maturity of the hospital
4. Process Redesign: confirm the conceptual framework of hospital supply chain management and make it clear between "to – be and as is" process in the hospital

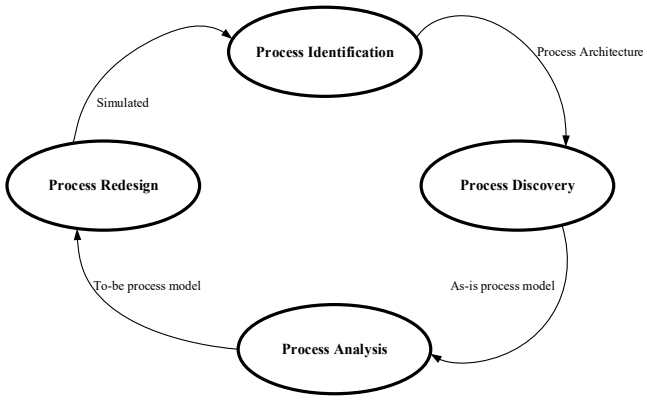


**Figure 1. Lifecycle of Business Process Management without Process implementation and monitoring (Adapted from Dumas *et al.*, 2013)**

## RESULTS AND DISCUSSION

This study was conducted in the West Java hospitals to respondent related to hospital supply chain management (Table 1).Interviews and observations were carried out for two months, namely March-April 2022.

**Table 1. Respondent Characteristics**

| No | Data Respondent | Working Experience (years) | Accreditation Status of hospital* |
|---|---|---|---|
| 1 | Consultant RS X | 12 | Paripurna |
| 2 | Procurement RS Y | 8 | Utama |
| 3 | Pharmacy & Procurement RS Z | 18 | Paripurna |
| 5 | doctor RS Z | 4 | Paripurna |
| 6 | Consultant | 5 | Madya |
| 7 | doctor RS A - Tingkat Dasar | 2 | Dasar |

*The order of accreditation in Indonesia from the highest: Paripurna, Utama, Madya, Dasar

**Table 2 Result of Interview and Observation**

| Categories | Respondent | Result of Interview | Result of Observation | Level in Maturity Framework |
|---|---|---|---|---|
| People | 1 | Training for each staff exists and is carried out periodically in accordance with the needs of staff development in the department with the recommendation of the head of each section (related to professional staff, must meet the SKP (Participation Credit Unit) within 5 years, 25 SKP must be fulfilled. Within one year at least follow 2 training with SKP 2 or 3 | There is a mapping of HR needs for each department. Regular training is held to obtain a certificate which is valid every 2 years for health workers. | Continuous Improvement |
| | 2 | There is no training internally or externally | high rate of employee turnover | Applied |
| | 3 | Every month there is a KPI, there is a target that must be achieved by each staff, if after the evaluation is not appropriate, it will be transferred according to its capabilities. | The assessment starts from the head of each related division, for example for the purchasing department: planning by the head, the staff carries out the realization, if the percentage of realization is achieved and the follow-up for empty medicines is met, the prospective staff meets expectations. How much is the purchase of goods according to the PKS, are there any purchases of drugs that are not in accordance with the PKS. For example, Drug A must buy at Distributor B with a % discount, there is already a list according to the MOU | Continuous Improvement |
| | 4 | Assessment of each individual is carried out by users, division heads, and directors. | There is internal training of more than 1 training (6-7 training). 1 time a month. Examples of basic training, handling OHS, training code black (bomb threat), red (fire), pink (child abduction), blue (medical emergency) etc. As of 2021, every training has a certificate that is valid for 2 years. Participants who take part in the training take turns. External training examples of risk management training, firefighters. External training has decreased significantly after the COVID-19 pandemic. The nature of external training is not routine. Training evaluation is conducted for internal training | Continuous Improvement |
| | 5 | There is regular training (TNA: Training Need Assessment) with the aim of updating and upgrading. | Every month medical personnel take turns taking part in internal training. Each month has a minimum of 20 hours of training per year (both internal and internal). | Shared |
| | 6 | Training is online and not mandatory during covid-19 | There is no target number of training and certificates that need to be owned | Applied |
| Process | 1 | The monitoring process is carried out by the head of each division periodically, new employees for 1 semester, old employees every 1 year through the pinerka book (performance assessment)<br>Standard measurement contains knowledge of employee regulations, vision and mission and values of service standards. for different professional appraisal criteria. The weight of the assessment between the general and the profession is as follows:<br>Less once : 1 - 3<br>Less : 4 - 5<br>Enough : 6 - 7<br>Good : 8 - 9<br>Very Good : 10 | - Develop guidelines for employee performance appraisal<br>- Develop evaluation elements for staff monitoring and evaluation<br>- Develop criteria for continuous professional practice evaluation<br>- Knowing the performance of clinical staff to be evaluated | Continuous Improvement |
| | 2 | There are no KPIs. | Processes that are monitored are those related to finance because they need the direct signature of the director | Defined |

| | | | | |
|---|---|---|---|---|
| | 3 | The basic criteria and requirements will be a reference for promotion and class. Adapted to educational background. The process to become the head of IFRS, there will be an assessment, from the relevant heads for each candidate. There is no direct appointment but all through assessment. The assessment process is facilitated by Learning Centre. Period as needed. For the formulary there will be an evaluation every 6 months and updated every 2 years. For example, during covid19 yesterday there was a delay in delivery, this was adjusted due to unexpected conditions | There are KPIs but there is still a bias between performance and the existing reality, because the technology system has not yet made an objective assessment. The objective assessment is only fingerprint attendance with fingerprints that cannot be represented by other people. Other assessments depend on the relationship between the rater and the assessed | Continuous Improvement |
| | 4 | Each shift has a record of patients received (including medical records) including the number of inpatients and outpatients available. After treatment, patients were also seen whether 48 hours later returned or not. Matching the ER diagnosis with the doctor in charge of the room. Children's doses are closely monitored by the pharmacy. The Head of Department always evaluates. Records are done manually and digitally. Every day after the completion of the daily shift there is an evaluation of all personnel. | There is a logbook to be the basis for advancing to a higher level or position | Measured |
| | 5 | There is a Policy related to remuneration. Individual performance indicators will make the individual move up a position. Differences in performance and work of each individual. | Departing from the Budget Plan, target conformity becomes an assessment for personnel and their respective departments (Improving the Quality of Patient Safety). | Measured |
| | 6 | There is morning report, and Wednesday clinic (knowledge update) | No KPI information. The boss must be of the army class. Order from highest to lowest for each division: army, police, general public. | Repeatable |
| Technology | 1 | Telehealth and Hospital Management Information Systems are used by all divisions in the hospital | Integrated Hospital Management Information System for all departments in the hospital | Fully Internal used |
| | 2 | Not all departments within the hospital have a hospital information system. | Departments that use management information systems are Finance, Pharmacy and Warehouse (Using Teramedic) | Internal IT used |
| | 3 | The whole process: Ordering, storage and distribution, checking drugs, patient data, doctors, and medical data | Integrated Hospital Management Information System for all departments in the hospital (Using medinfras) | Fully Internal used |
| | 4 | RS uses SAP. The reason for using technology to improve the accuracy of handling with a paperless system, speeding up patient treatment is because the data is computerized for all divisions. The hospital has another branch of the hospital that is in the same group so that it can be directly connected when patients from the hospital come and go in the same group at the hospital. | Using SAP for the whole process | Internal IT used |
| | 5 | Focus on billing systems. Divided into 2 major parts, namely Billing information system & Medical Information System | Each department has a system that is integrated with one another | Internal IT used |
| | 6 | Due to frequent data loss, the transition from manual to technology has already begun in early 2022 | Manual shifting of old systems to new systems with technology from third parties | Internal IT used |
| Partner | 1 | Close partners of health services in supply chain related hospitals<br>- patients and families as customers<br>- government officials related to the health sector (Health Department, professional associations, etc.)<br>- Medical device vendors<br>- General vendors related to hospital facilities and infrastructure | MOU (Memorandum of understanding) | Collaboration |
| | 2 | Purchases are made for short terms by choosing the cheapest price at that time so there is no collaboration | There is no MOU | Internal External |
| | 3 | Through a Cooperation Agreement with each vendor with an agreed discount | MOU | Collaboration |
| | 4 | The hospital is part of a large group of pharmaceutical companies, so the main partner for all medicines is long-term | MOU | Collaboration |
| | 5 | Agreements with long-term suppliers | MOU | Collaboration |
| | 6 | The hospital is a hospital owned by the army so the closest partner is the one with the nature of government | Exclusive for members of the military and police | Internal External |

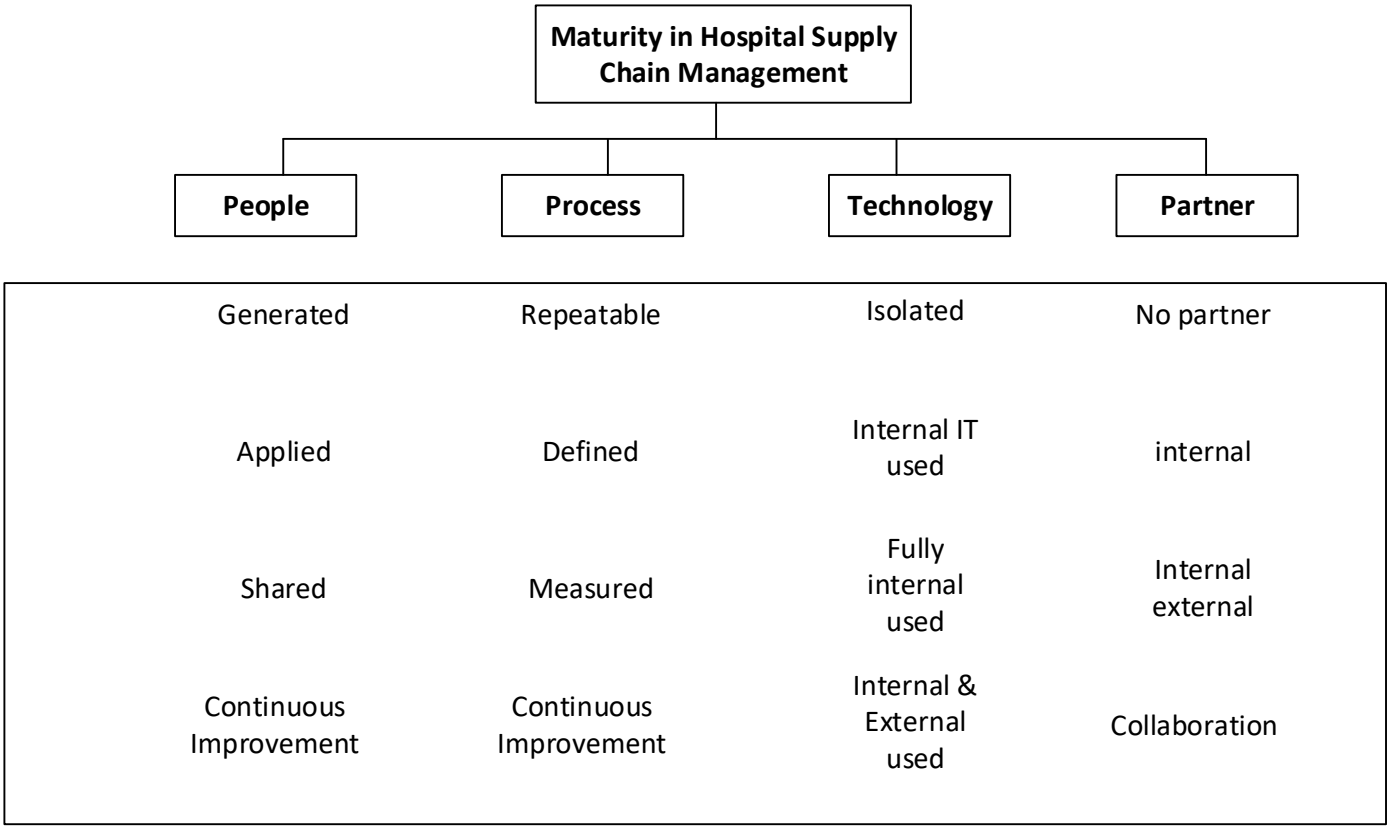


**Figure 2. Maturity level framework of HSCM**

**Table 3. Levelling in Maturity of HSCM**

| Component | Levelling | Definition |
|---|---|---|
| People (an overview of people's ability to learn and improve their skills) | Generated | The job desk has not been defined (no job desk and have not been trained) |
| | Applied | There is already a job desk applied |
| | Shared | The job desk has been implemented and then distributed in internal and or external training (certified). |
| | Continuous Improvement | The results of the internal training that have been carried out are Analyzed to be evaluated to lead to continuous improvement |
| Process (refers to the extent to which a process is explicitly defined, managed, measured, and controlled) | Repeatable | The work is done repeatedly without any monitoring |
| | Defined | monitoring process already exists for the process dimension and has been defined. |
| | Measured | The monitoring process has been defined and measured (there are KPIs) for related processes |
| | Continuous Improvement | The existing KPIs are evaluated for continuous improvement |
| Technology (refers to the degree to which a technology has reached integration within internal and external system) | Isolated | Hospital has not used information systems within the hospital |
| | Internal IT used | IT in hospitals already exists per division or department but has not been integrated into one hospital |
| | Fully internal used | There is already an integrated information system in one hospital |
| | Internal & External used | The use of information systems is full within the hospital and has coordinated with external parties to the hospital |
| Partner (refers to collaboration with actors who add value) | No Partner | The hospital has no partner within and with external partner |
| | Internal partner | The hospital has internal partner |
| | Internal & External partner | The hospital has internal and external partner |
| | Collaboration | The hospital has collaboration – dominantly with long-term partner |

Table 2presents the summary of the results of interviews and observations that have been carried out. Based on the results of interviews and observations, this study confirms the maturity level framework of hospital supply chain management in Figure 2.Figure 2 shows the importance of partners in hospital supply chain management. The results of the six respondents with different hospitals in West Java showed that hospitals in West Java did not meet the final maturity criteria based on the framework and leveling criteria in Table 3. The low collaboration with suppliers and the high level of subjectivity in the assessment need to be improved at the related hospital.
Table 3 Levelling in Maturity of HSCM

## Conclusion

This paper has taken the findings of exploratory research into sources consisting of hospitals observation and in-depth interviews, developed a maturity framework in people, process, technology, and partner for analysis, providing the basis of a model (Figure 2) to explain the result of the scope and positioning related hospitals in terms of maturity. It concludes that first, people, process, technology, and partner in West Java hospitals are described. Second, based on the framework, the maturity level is not yet at the highest level (continuous improvement). Third, the six existing respondents

confirmed the maturity level framework of Hospital Supply Chain Management. The importance of adding partners to hospital supply chain management is a novelty in this study.

**Limitation and Further Research**

While this study provided some insights into the hospital supply chain, it did have some limitations. First, the sample size is small, with only six participants (for each hospital and expert). Because of the small sample size, it was impossible to draw reliable conclusions about specific hospital types. Second, the number of organizations is limited. In this study, hospitals were located in or near large cities rather than in rural areas. Our current sample size prevents us from reliably distinguishing between hospital types. A more thorough investigation should include a more significant number of participants and a more comprehensive range of different sizes and types of organizations. This research would enable us to conclude various organizations and supply chains. Finally, this research was qualitative and inductive. This research has provided a foundation upon which to build a more empirical research study, perhaps using survey-based research, to gain additional insight into the best practices and performance of the hospital supply chain. It is also possible to draw and make simulations regarding those categories since the hospital is very risky to do the action research.

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