

## LEAN MANUFACTURING IMPLEMENTATION: DEVELOPING A QUALITATIVE RESEARCH DESIGN

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### ABSTRACT

*Lean manufacturing have been widely used by manufacturing companies worldwide. However, low rate of success towards lean manufacturing transformation in many countries had created a cause of concern. Change agent system is a crucial element in lean transition as most of the employees are not familiar with lean work environment, and requires a behavioural and mindset change due to the different expectation for performance and value. This study attempts to investigate the role of change agent in the successful implementation of lean manufacturing. Qualitative case study approach is chosen as it offers a more holistic perspective. Therefore, the aim of this paper is to discuss on developing the research design in answering the research questions. A manufacturing company was selected. The four different methods for gathering data: interviews, observation, documents and focus group will contribute towards the categorization and code development process. This enabled a precise analytic approach to the study, which is an induction of highly specified and valid constructs concerning the knowledge development and conveyance process.*

**Key words:** *case study, research design, lean manufacturing.*

### INTRODUCTION

Lean manufacturing is not a new concept. In the past decades, the concept has progressed from technical oriented to human oriented. The human elements in lean manufacturing share the destiny relations and team-work which include labour flexibility, multi-skill and greater responsibility in maintenance, quality improvement and personnel issues (Oliver, Delbridge, & Lowe, 1998).

Misunderstanding of the real concept and purpose of lean manufacturing is one of the main barriers of lean manufacturing implementation. Herron and Braiden (2007) and James (2006) suggest that the reason of this misunderstanding is due to cultural differences that occur during transition or translation of lean concept during the implementation. The misunderstanding on the concept leads to various major issues such as piecemeal adoption of lean tools and techniques (James, 2006), misapplication of lean tools (Herron & Braiden, 2007; Pavnaskar, Gershenson, & Jambekar, 2003), and lack of lean culture development that support the lean manufacturing in the organization (Jorgensen, et al., 2007).

The change to lean manufacturing system is a radical process and not an easy task (Ahlstrom & Karlsson, 1996; Smeds, 1994). In order to create the foundation for

lean manufacturing to take hold, a significant organisational change must occur within the organisation. According to Narang *et al.* (2008), the process of lean transition requires significant changes in the functions of the company.

In lean manufacturing system the lean process begin by having a change agent system. The process of change within an organisation is derived fundamentally from the ability of a set of individuals within that organisation to modify the behaviours (thoughts and actions) of others. Change agent system is a system to assist the translation of change process so that it could be understood by all people in the organization (Herron & Hicks, 2007; Real, Pralus, Pillet, & Guizzi, 2007). The system can be initiated either from internal cross-functional team or external consultant team. According to Real *et al.* (2007) , Bamber and Dale (2000), team building is the key factor for successful plans of action. For effective change, a strong team with a strong leader should be developed. Study on the role played by change agents in the transfer of lean manufacturing techniques discovers that without the support of management the lean transformation in a company will fail even though the change agent have the determination for effective intervention (Herron & Hicks, 2007). Real *et al.*(2007), Herron and Hick (2007) agreed that the support of consultant also contribute in initiating lean transformation. The main objective of this system is to spread the motivation and ensure the translation is understood by all people in the organisation for the change to lean manufacturing system. However, entirely depending on external consultant is not advisable for the long-term success of the organisation. Bamber and Dale (2000) found that as the consultant left the company, the effort to lean is faded away. This is because the lean activities were entirely driven by the consultants. Consequently, no fundamental change in mind-shift and commitment to lean is transferred to the employees if it is driven by the consultants.

There has been little scientific study and research done on the mechanism involved in the change agent system in lean manufacturing implementation and the effect of these mechanism have on existing manufacturing system. The role of change agent is crucial in lean transition. According to Stewart (2001), lean change agent must be sensitive to change issues. The reasons are most of the employees are not familiar with lean work environment, and it requires a behavioural and mindset change due to the different expectation for performance and value. Therefore, this study attempts to investigate the role of change agent in lean manufacturing system and how the team development could help the company in the successful lean manufacturing implementation. This paper primarily discusses the research method that the authors had designed in order to get the answers.

## **RESEARCH METHOD**

This study employed multi-case study design which contains more than a single case company as shown in Figure 1. The reasons of choosing to do multiple case study is the evidence from multiple case is often considered more compelling and robust as compared to single case study (Flick, 2002), and the replication logic can only be done in multiple cases. In addition, Bryman (2008) stated that multiple-case study is usually employed for comparison purposes. By investigating the distinguish characteristics of two or more cases, the contrast and similar findings could provided rich information on the research focus.

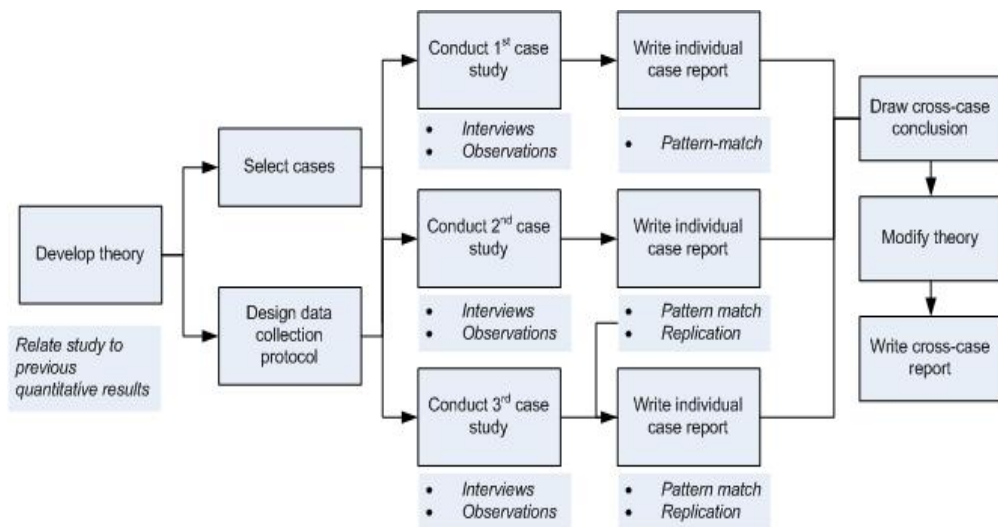


Figure 1: Multi-case study design

The data collection for this study will employ three different sources of evidence: documentation, interviews and direct observation. According to Yin (1993), a good case study should use multiple sources of evidence. If the entire evidence are used properly, they could assist to deal the problems of establishing the construct validity and reliability of the case study. In this study, the evidence of change agent system issues in lean manufacturing were collected using two different sources such as interview, direct observation and survey distribution. The advantages of multiple source of data collection techniques are: to address broader range of observational issues, the development of converging lines of inquiry and a process of triangulation (Yin, 1993). Therefore the finding or conclusion in the case study will be more convincing and accurate.

In this study, purposive sampling was applied. Purposive sampling is the participants were selected according to preselected criteria relevant to a particular research questions. Sample sizes, which may or may not be fixed prior to data collection, depend on the resources and time available, as well as the study's objectives. Purposive sample sizes are often determined on the basis of theoretical saturation, at the point in data collection when new data no longer bring additional insights to the research questions (Mack et.al, 2005). The case companies were selected based on their willingness to participate and successful experience in implementing lean initiatives. The authors prepared the data collection by first contacting each company to be studied to gain their cooperation, explained the purpose of the study, and recorded the key contact information. A semi-structured interview guide was developed upon a common case study protocol inferred from the review of literature, and quantitative survey done prior to the case study. To improve the research reliability, the same interview protocol was used to different interviewees for triangulation purposes. The need for triangulation arises from the ethical need to confirm the validity of the data obtained [15]. The interview subjects are questioned with regard to their actual experiences. The interviews were conducted for approximately two hours for each respondent. They involved key personnel in the company that are directly involved in the implementation of lean manufacturing.

## DISCUSSION

Case studies are designed to provide the researchers with the opportunity to investigate manufacturing companies that implementing lean manufacturing system in order to understand the roles of change agents. During these investigations, researchers and the company will discuss the issues and challenges in lean manufacturing implementation. The reasons are lean implementation involves changes in work environment, and it requires a behavioural and mindset change due to the different expectation for performance and value.

To ensure the success of data collection in this study, overall planning of the research program is needed as the study will conduct a series of case studies. For a consistent planning process, the authors decided to develop a basic case study protocol template. The aim of the template is to provide a common structure for the case study protocols and guidance on how to construct them. According to Yin (2003), a case study protocol should include: the overview of the case study project including objectives, issues and relevant findings about topic being investigated; field procedures; case study questions; and a guide for the case study report.

In this study, the case study protocol starts with Introduction which includes the research background and main research question. Next, the case study procedures and roles. Then, the data collection plan, which indicates the way of how to collect the data for the study. Figure 2 shows the participants involved in the case study. To get a thick and rich descriptions of the phenomenon happened during lean manufacturing implementation, the authors will conduct personal interviews, focus groups and survey distribution to all level throughout the company which involved lean champion/leader, lean team, workers and management team.

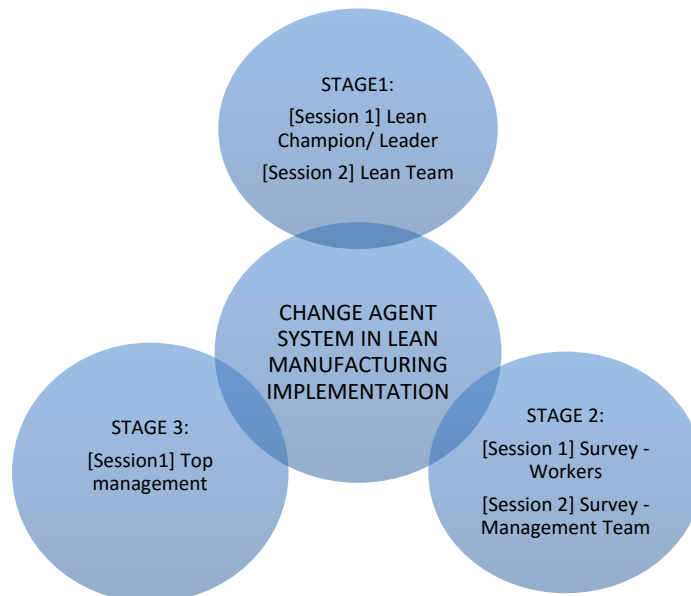


Figure 2: Participants involved in case study

Table 1 shows the detail of data collection plan to be conducted. The plan consists of potential respondents, tentative date and the data collection approach, which identify how the data to be collected. This approach also intended to validate the plan itself and issues that related to the context of the case study that might impact results.

Table 1: Data collection plan

| Stage | Respondent            | Date                            | No. Respondent | Data collection approach |
|-------|-----------------------|---------------------------------|----------------|--------------------------|
| 1     | Lean champion/leader  | 22 Aug 2013                     | 2              | Interview                |
|       | Lean team             |                                 | 3              |                          |
| 2     | Supervisors / Workers | 1-4 Oct 2013<br>(choose 1 date) | 100            | Survey                   |
|       | Management team       |                                 | 25             |                          |
|       | Supervisors/ Workers  | 4-8 Nov 2013<br>(choose 1 date) | 2-3            | Interview                |
| 3     | Top management        | 2-6 Dec 2013<br>(choose 1 date) | 1              | Interview                |

## CONCLUSION

This paper has introduced a template of a case study protocol that could help the discussion of case study research design adopted. The use of a protocol is important means of improving the rigour of case studies conducted. The template is developed for the first of a series of case studies. Unlike a classic quantitative research approach, a case study does not require sequential steps in data collection and analysis. The case study researchers need to begin analysis as soon as the data becomes available and to be prepared to change their data collection and analysis plans if necessary. This mean a case study protocol is likely to be frequently amended. Therefore, a more formal case study structure would provide an underpinning methodology that could improve the validity of the research conclusions.

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