A Trail to Milieu Research Methodology for Application of Implementation Frameworks in Manufacturing Sector

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ABSTRACT

The profusely used tools of operational management research in lean manufacturing context include roadmap, conceptual model, implementation frameworks, descriptive planning and assessment checklist. Out of these, an implementation framework development in lean manufacturing sector is common, but faces quandary regarding its development, consolidation and validation – thereby confirming the requirement of availability of succinct platform that aids in research methodology development. The aim of this research is to attain a clear research context, achieved accordingly by detailed literature review study that would subsequently aid in developing a generic research methodology design framework. Concomitant to it, the four layers, the layers of research onion were discussed; followed by selection of appropriate methods for development of research methodology in order to arrive at implementation frameworks. It was observed that for the methodology development, the philosophy of pragmatism is highly suitable, followed by abductive logic, in case of technique, mixed mode research is best, whereas in strategy selection, case study strategy is the most suitable due to its multi-functional ability of in-depth operational study. In addition to that, the mixed-mode approach carries the ability of comparative qualitative and quantitative research through longitudinal and cross-sectional case study respectively. Furthermore, the data collection processes were discussed in relevance to the research objective, which culminated in the formation of a detailed research methodology which has been divided into three major stages of research context and approach, framework development and validation, resulting in attaining implementation framework through literature review, longitudinal case study and cross-sectional case study respectively. The major strength and contribution of this research study is the development of one concise research methodology that is considered as the paradigm shift and a clear innovation towards this field.

Keywords: Literature review; research methodology; operational management; implementation framework; lean manufacturing

INTRODUCTION

Nowadays, the philosophy of lean manufacturing is profusely employed in manufacturing industries because of its exceptional capability of waste detection (Martinez-Jurado & Moyano-Fuentes, 2014; Moyano-Fuentes & Sacristan-Diaz 2012; Sahwan, Ab Rahman, & Deros 2012; Susilawati, Tan, Bell, & Sarwar 2015; Xiu-xu & Lin-yan 2009), which is very helpful in differentiating between value added and non-value added activities in on-going operations (Hines, Holweg, & Rich 2004; Holweg 2007; Rose, Deros, & Rahman 2014; Wahab, Mukhtar, & Sulaiman 2013). Therefore, the highly competitive market trends demand the utilization of lean concepts in manufacturing sector to cope with various challenges. However, the implementation of lean is a challenging task (Rafique, Ab Rahman, Saibani, & Arsad 2017; Rafique, Ab Rahman, Saibani, Arsad, & Saadat 2016) and in order to meet those challenges, there are various start-ups available for research in operations management of manufacturing sector, which include roadmap, conceptual model, implementation frameworks, descriptive planning and assessment checklist. However, especially for the case of lean manufacturing, implementation framework is deemed the most suitable and frequently utilized, as suggested by many previous researchers (Jasti & Kodali 2015; N. V. K. Jasti & R. Kodali 2015; Jasti & Kodali 2016; Ogden & Fixsen 2015; Pearce, Pons & Neitzert 2018; Rafique et al. 2017). There are many implementation frameworks available in previous researches, but it is pertinent to develop a research methodology that helps in consolidating an implementation framework, in line with the requirement of competitive times. Hence, keeping this requirement in view, the purpose
of this research is to articulate the research methodology for implementation framework in lean manufacturing sector and in order to attain this, the authors have conducted a detailed literature study from the basics of tool to their utilization which further constitutes to the development of research methodology. The research milieu of this literature study starts with the discussion of the typical layers required to design the research methodology (Nesensohn, 2014; M. Saunders, Lewis & Thornhill 2009), which are research philosophies, logics, purposes, approaches, strategies and data collection techniques. This is followed by a detailed discussion regarding the selection and planning of the research methodology, eventually culminating in the organization of these research layers and tools; from where the research methodology needs to be selected.

A clear research context is one of the leading requirements in research world to achieve a robust research methodology. In order to achieve this task and to help the researchers, M. Saunders et al. (2009) and M. N. Saunders (2011) in their research study have introduced a research onion, which is considered as the bench mark to explain and design any research study (Srichuachom, 2015). Nesensohn (2014) in their research study further explained and clarifies the research onion to attain more positive pictures for the research world by dividing it into four distinctive layers. It has been summarized that a research onion consists of following layers which are research philosophies (ontology, epistemology), research logics (inductive, deductive), research purposes (exploratory, explanatory and descriptive research), research approaches (includes qualitative research, quantitative research and time horizons), research strategies (like survey, case study, phenomenology, ethnography) and lastly the research techniques (data techniques and procedures). Hence keeping these aspects in view, the authors have observed that to start the methodology development, the philosophy of pragmatism is highly suitable, followed by abductive logic, in case of technique, mixed mode research is best, whereas in strategy selection, case study strategy is the most suitable due to its multi-functional ability of in-depth operational study and the comparative qualitative and quantitative research through longitudinal and cross sectional case study respectively. Furthermore, the data collection process includes interviews, field observations and documentations through actual visits in case study. In order to design the research methodology, the remainder of article is structured as the next section is basically about the literature review of previously available researches that will be refered, afterwards methodology, then discussion and in last the conclusion of the research.

**RESULTS**

In line with the research objective, the authors utilized the research onion approach to choose the most apposite approaches and philosophies for methodology design. Since, Elnadi (2015) and (Nesensohn, 2014) checked spacing in their research study has followed a pattern that, after complete peeling of the research onion, it is strongly
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<td>Literature review</td>
<td>Literature review</td>
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It observed that there are many reasons that can lead the authors to consider mixed mode (Both qualitative and quantitative research) as the best suite. The reasons are in order to meet the research objectives, the ideology of topic seems to be calling for further explorations and validation that will lead to mixed mode research. The topic seems to require an actual life phenomenon and in-depth study in its natural settings, however, it has controlled environment of production operations and production output. For the case of implementation framework in lean, the mixed approach is more recommendable to detect and validate the new theory that involves both leading research approaches. The research requires full understanding of implementation of lean which require richer and broader in depth data that is more possible to collect through qualitative approach, however, as mentioned above, for validation and finalization of results, the statistical formed data is required to evaluate the rich numeric data through simulation modelling based on hypothesis.
Based on the designed research model, the authors have concluded that the mixed method design seems to be feasible in which primary core method will be qualitative and the supplementary components that is utilized for validation will be quantitate method. For the development and implementation of framework, the data collection will be started from the qualitative case study, in which data will be collected through field observations, documents and structured interview. According to the study of the Morse (2003) and Morse (2010), for implementation frameworks, the major core or primary data will be qualitative data through case study which is utilized to increase depth and to make research more richer and useful. While, the supplementary component will be the quantitative data attained through simulation modelling which will be sequentially paced to help the authors towards completion.

**SELECTION OF “CASE STUDY” AS A RESEARCH STRATEGY**

Since, after selecting the mixed approach as a research purpose, and keeping in view the research context and aim of this study, it observed that the best suitable research strategy that will fall in the rhythm would be case study strategy. Moreover, Elnadi (2015) the Robson and McCartan (2016) have mentioned in their studies that the case studies are more elicited towards the mixed and qualitative research. The leading reasons of selection of case study as a methodology are through the literature review it is very clear that, in the previous researchers, it has been commonly observed that the case study methodology is considered to be the most feasible in order to propose and validate the implementation frameworks which are new and unique like technology combined lean implementation framework (Rafique et al. 2017). Moreover, according to Yin (2013) in his study clearly mentioned that the case studies are feasible for the area of researches in which the previous research is very few (Elnadi, 2015). It has been observed that out of all the available strategies, only the case study carries the good ability to attain both the qualitative and quantitative data which further helps to get deepness and richness of information which is one of the leading requirement. The case study is also helpful to achieve the in-depth data and help researcher to understand the complexity, intricacy and involvedness of new processes. The case study seems feasible, as lean is something which involves implementation in operations (with or without trails) and the best strategy that can help to achieve implementation is the case study, because it carries the aptitude to scrutinize contemporary sets of events and trails. Since, the designing of framework has already been done so the next step is development through implementation that can be achieved successfully through case study (Neta et al. 2015) and considered the most suitable approach to propose. Now, there is no doubt that the selected approach is case study, so authors are strongly convinced to first select the right case study which is facing the same problem as that of research problem and willing to implement lean implementation framework in their operations to achieve improvements. Hence, keeping these valid reasons in view and as per discussion about the type of case studies previous which are longitudinal and multiple case studies, as the requirement is to develop and implement lean concept combined with any new tools, so the leading requirement of the research is the deep and detailed in depth study of operations and...
FIGURE 3. Proposed Research Methodology
authors are convinced with literature review and seconds the ideology to utilize longitudinal case study.

**SELECTION OF DATA COLLECTION TECHNIQUES**

As, the selected approach is case study, so in order to implement the conceptual framework on case study, the authors will implement the designed conceptual framework on the case study and the selected data collection techniques that will be utilized to study case study and to implement conceptual framework through interviews, documentations and observations. After the selection of research methods, in order attain clearer picture, it is feasible to first form the research model or research flow chart that will be helpful further to achieve the aims.

**DEVELOPMENT OF RESEARCH METHODOLOGY TO ATTAIN IMPLEMENTATION FRAMEWORK**

In accordance with the research objective, the authors have developed a framework that describes the research flow for developing an implementation framework. The framework is categorized into three categories, given as under:

1. Research Approach and Context
2. Framework development and implementation
3. Framework validations

The first stage of this research model or flow chart is inclusive of gaining the basic knowledge about the topic, understanding the topic, finding the gaps in the previous literature available and designing of conceptual implementation framework based on literature review. As mentioned in previous chapter, a systematic literature review has been conducted by utilizing online-computerized data bases databases like Emerald, Elsevier, Scopus, Springer, Taylor & Francis online, ISI web of science, IEEE explorer, Inderscience publishers and world scientific publishers that has provided numerous articles, related books, conference papers and a lot of well-reputed thesis. The details regarding the selection of methodology is already explained in detail in previous section in which a mixed mode methodology is selected and a case study approach will be utilized to implement the conceptual framework.

In the conceptual framework, the steps and phases selected through frameworks available in literature. This is the stage 2 of the research and can be considered as most important phase as it first involves the right selection of case study and will be studied and the conceptual implementation framework will be implemented on the case study. So, after satisfactory implementation of all phases, the final framework will be produced based on the corrections that seem to be required at the time of framework development that will be further validated in next phase.

In order to validate and to increase the generalizability of implementation in natural settings, the framework will be validated and implemented on other selected products that will be helpful to increase the rigor of the research in stage 3.

The major strength and contribution of this research methodology is the development of one concise research methodology that considered as the next generation to achieve more-leaner implementation frameworks and implicates a clear innovation towards the field of operations management. The study is highly beneficial in the understanding, management and clarification of the prominent paradigms required for development of research methodology for an implementation framework. Additionally, the consolidated nature of the study to provide all deliverables on a single platform will contribute towards the aid of academicians and practitioners working in this field.

**CONCLUSION**

With the advancement in the field of operations management, there is an onus on the researchers to develop precise and rigorous methods to propose an implementation framework that is one-fit-for-all. Through a literature review approach amalgamated with grounded theory, the authors have posited a framework that establishes a clear avenue of research methodology. It was observed that in operations management research, it is pertinent to employ the pragmatism philosophy which fits seamlessly with the abductive logic of research. Furthermore, an amalgam of qualitative and quantitative research is needed since the conceptual approach is translated to an implementation approach by its virtue. Consequently, a case study is required to implement and validate the framework. As it is further observed that the in-depth study and implementation and validation of framework in natural settings is required so the longitudinal case study is considered to be the most suitable option. Moreover, the data collection is proposed to be conducted through interviews, field observations and documentations through actual visits in case study. Subsequently, based on these selections, a detailed research methodology has been made which is divided into three stages that are research context and approach, framework development and implementation and framework validation. However, it must be kept in mind that the research is by no means exhaustive in nature and has areas for improvement; one proposition would be the integration of decision-making tools for the selection of right approach and logic. In future, the multicriteria decision making tools can be used for the selection of alternatives, that strengthen the decision.

**DECLARATION OF COMPETING INTEREST**

None.

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