Finding the Originality of Research on the Application of Lean Manufacturing (LM) With The Development of Systematic Literature Review (SLR) and K Chart

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Abstract

The purpose of this paper is to demonstrate the ability of researchers to develop a Systematic Literature Review (SLR) framework by adding the K chart framework as a new structured, systematic, and visualized approach to conducting literature reviews. The author verified the new SLR framework through lean manufacturing (LM) implementation case study. This methodology uses a literature review that relates to the application of Lean manufacturing. The main tools used to compile the literature review are the Systematic Literature Review (SLR) and the K chart. This research procedure is a combination of the SLR implementation steps with the K-Chart development steps. The new SLR is verified by applying it to a case study of LM implementation. The new SLR can be applied to case studies of LM implementation. This research also describes the new SLR framework as a new structured, systematic, and visualized approach. Finally, a series of research originality was obtained through previous research that has been published with the search keyword lean manufacturing implementation. This paper provides an alternative new visual tool for decision-makers in the manufacturing industry regarding the implementation of LM. The visual aids are easy for management and workers to understand and help manufacturing organizations improve LM implementation success. This study demonstrates the potential of finding gaps in the LM implementation research presented for further development of the LM methodology. LM with the aim of the manufacturing industry, the results of this study are expected to positively influence the success of LM implementation. Implementing LM can be an effective solution to help manufacturers achieve organizational goals. The main value of this paper lies in the proposed new SLR framework based on the development of the SLR by adding a K chart framework to address the visual demands of complex literature reviews.

Keywords
Lean Manufacturing, SLR, K-Chart, Originality

1. Introduction

Quality research articles are measured based on the contributions made. A good article shows the reader the position of the research and the up-to-date literature review. Nevertheless, the difficulty of knowing the position of the research and contributing to it still occurs and is a big challenge for every researcher.

Researchers have used various literature review methodologies to determine the research position. Systematic literature review (LSR) is one of the most widely used methodologies in conducting literature reviews. LSR is used for leanness assessment of organizational performance (Sangwa & Sangwan, 2018), knowing research gaps in lean
manufacturing (Psomas & Antony, 2019b), lean for airport services (Syltevik et al., 2018), knowing research gaps in lean manufacturing (Psomas & Antony, 2019a), lean and green (Garza-Reyes, 2015).

The systematic review methodology was used to conduct the literature review because of previous research's clear, scientific, and reproducible analysis process (Suárez-Barraza et al., 2012; Tranfield et al., 2003). Several studies have proposed methodologies for conducting a systematic literature review. The proposed systematic review guidelines proposed by Tranfield et al. (2003) have been used by researchers and are considered the most appropriate (Alkhoraif et al., 2019; Garza-Reyes, 2015; Psomas & Antony, 2019a; Seuring & Gold, 2012).

An important stage of the literature review is to present the results of the literature review. LSR as a methodology does not specify a particular way to present the results of the literature review. The K-Chart is present as a chart to present the results of the literature review. K-Charts are used to plan and monitor research activities (Abdullah et al., 2006), lean implementation (Zaheer et al., 2020), and finding novelty of research (Cahyo, 2020). The number of studies that use the K-Charts to present the results of a literature review is very small. The same thing happens to articles that use SLR and K-Charts at the same time.

This paper aims to develop a Systematic Literature Review (SLR) framework by combining it with the K-Chart framework as a new structured, systematic and visual approach to literature review. The main value of this paper lies in the proposed new SLR framework.

1.1 Systematic Literature Review

The main purpose of a systematic literature review is to find literature that follows the research objectives. The SLR is run through 3 stages, as shown in Figure 1. The first stage is planning the review, the second stage is conducting a review, and the third stage is reporting and dissemination (Tranfield et al., 2003). In the first stage, identification of the need for review, preparation, and development of the review protocol was carried out. Research objectives, article search locations, publication period, and search criteria (inclusion and exclusion) were determined in the first stage. In the second stage, all search results were filtered and checked for suitability with the research focus. In the last stage, the study results are presented in narrative and descriptive form and used in practice.

![Figure 1. Stages of a systematic review (Tranfield et al., 2003)](image-url)
1.2 K-Chart
The structure of the K-chart is shown in Figure 2. General Scope of Study is the title of the K-Chart that we created. The first layer is the general issue. General issues can be divided into several sub-issues as needed. The next layer is the methodology layer. This layer is a way to get data and or the method used. The last layer is the result layer. The resulting layer is divided into performance parameters (PP) and design parameters (DP). The bold (or colored) lines on each item and the lines connecting them indicate the items part of the study. The items in bold are the main studies, while the other items are intended for literature review. Items with dotted lines indicate items that are prioritized in the study.

Figure 2. Struktur K-chart (Abdullah et al., 2006)

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![K-Chart Diagram]

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Figure 3. SLM procedure (Cahyo, 2020)
1.3 Systematic Literature Mapping (SLM)

Systematic Literature Mapping is a combined research procedure from implementing the SLR with the steps of developing a K-Chart (Cahyo, 2020). The steps of the SLM procedure are:

1. Plan the review.
2. Create a conceptual K-chart
3. Conducting a review.
4. Create a new K-Chart (K-Chart 2.0) based on the results of the literature review. K-Chart 2.0 is the original K-Chart with supporting references on each layer.
5. Checking the condition whether it is necessary to add criteria to the chart.
6. If yes, then proceed to process two, and if not, then the SLM procedure is complete.

The research objectives to finding the originality of research on the application of lean manufacturing (LM) are presented in the following series of research questions:

Q1 How to adopt SLR and K-Chart methodologies to generate new SLRs based on practical and scientific perspectives?
Q2 How to apply the new SLR to a case study of lean manufacturing (LM) application?
Q3 What is the originality of research on the application of lean manufacturing?

This paper is structured as follows; section 1 discusses the introduction, section 2 the research methodology, section 3 results, section 4 case studies and discussion, and section 5 conclusions and recommendations.

2. Research methodology

This study uses a literature review as a data collection procedure. The data available in the literature was reviewed to obtain previous findings. This study aims to propose a new SLR framework by combining SLR and K-Chart methodologies. The article search was carried out using the UGM library discovery search. This search page searches for articles based on online databases subscribed to by Gadjah Mada University (UGM), totaling more than 50 databases consisting of electronic journals and electronic books. The search keywords were K-chart and Systematic Literature. The search results are displayed in Figure 3.

Framework development is made by specifying articles that are the main references for researchers related to SLR and K-Chart, re-examining the stages of the framework to find out potential improvements, and adjusting the real conditions encountered in conducting a literature review.

3. Result

Figure 4 shows the outcomes of the article search. The article search results obtained 21 references consisting of 16 journal articles, four conference proceedings, and one book review.

![Figure 4. Article search results](image)

The search results are then checked for relevance to the research objectives. The results of checking relevance obtained two relevant articles and 1 article using SLR and K-Chart in conducting a literature review. Henceforth, the research
objectives are achieved by evaluating related articles and developing them based on the widely used SLR and K-Chart proposals. The articles are entitled Finding Novelty of Research with Systematic Literature Mapping (SLM) (Cahyo, 2020), Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review (Tranfield et al., 2003), dan K-chart: a tool for research planning and monitoring (Abdullah et al., 2006).

Table 1. Comparison of literature review stages

<table>
<thead>
<tr>
<th>SLR (Tranfield et al., 2003)</th>
<th>K-Chart (Abdullah et al., 2006)</th>
<th>SLM (Cahyo, 2020)</th>
<th>New literature review stages (SLR 2.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I: Planning the review</td>
<td>Planning the review</td>
<td>Planning the review</td>
<td>Develop initial K-Chart</td>
</tr>
<tr>
<td>Phase 0: Identification for the need for a review</td>
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<td>Phase 1: Preparation of a proposal for the review</td>
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<tr>
<td>Phase 2: Development of a review protocol</td>
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</tr>
<tr>
<td>Stage II: Conducting a review</td>
<td>Conducting a review based on the layer in K-Chart</td>
<td>Conducting a review</td>
<td>Conducting a review</td>
</tr>
<tr>
<td>Phase 3: Identification of research</td>
<td></td>
<td></td>
<td>Perform searches, evaluate search results, Evaluating search criteria, Data synthesis</td>
</tr>
<tr>
<td>Phase 4: Selection of studies</td>
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<tr>
<td>Phase 5: Study quality assessment</td>
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<tr>
<td>Phase 6: Data extraction and monitoring progress</td>
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<tr>
<td>Phase 7: Data synthesis</td>
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</tr>
<tr>
<td>Stage III: Reporting and dissemination</td>
<td>K-Chart</td>
<td>Presenting the result of the literature review into K-Chart 2.0</td>
<td>Revised K-Chart</td>
</tr>
<tr>
<td>Phase 8: The report and recommendation</td>
<td></td>
<td>Reporting and dissemination</td>
<td></td>
</tr>
<tr>
<td>Phase 9: Getting evidence into practice</td>
<td></td>
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</tbody>
</table>

Table 1 shows the comparison of literature review stages between SLRs proposed by Tranfield et al. (2003), K-Chart proposed by Abdullah et al. (2006), the SLM proposed by Cahyo (2020), and the new literature review stages proposed in this study. SLR offers three stages and is divided into 9 phases. K-Chart is a tool for research planning and monitoring. The K-Chart as a tool is positioned at stage III in the SLR procedure. Planning in the K-Chart is intended for planning research activities, not planning as a procedure in conducting a literature review. SLM has considered the SLR and K-Chart step-by-step procedures. SLM does not clearly show the details of the phase in the form of stages.

New literature review stages combine SLR and K-Chart. To differentiate with SLR proposed by Tranfield et al. (2003), the authors use SLR 2.0 as a differentiator. SLR 2.0 displays stages in the procedure. The difference between SLR 2.0 and SLM is that the initial K-Chart is made based on the conceptual design of the researcher. Initial K-Chart in the same case and made by different researchers are likely to produce different K-Charts because of the different concepts.
possessed by each researcher. The Initial K-Chart will then be enriched by synthesizing the articles reviewed and presented as Revised the K-Chart.

Figure 5 shows the proposed SLR procedure. The procedure starts with making an initial K-Chart based on the knowledge and experience possessed by the researcher. Next, the first and second steps of the SLR are executed. The last step of the SLR is done by adding activities to improve the K-Chart based on the results of the two previous SLR steps.

4. Case Studies and Discussion
A case study was created to verify the proposed new SLR procedure (SLR 2.0). The problem to be solved in this case study is finding the originality of research on lean manufacturing (LM) application. The first step is to create an initial K-Chart. The initial K-Chart is shown in Figure 6.

Some of the parameters used in the planning the review stage are shown in Table 2. The results of Conducting a review are shown in Figure 7. After conducting a review, a list of 17 articles was obtained. The list is then verified to
determine how many articles are relevant and irrelevant to the research objectives. Because all the articles are relevant to the research objectives, proceed to the next stage, namely the revised K-Chart, and reporting and dissemination.

![K-Chart Diagram]

**General Scope of Study**

**Factors influencing application of lean manufacturing (LM)**

**General Issue**

LM application

**Sub Issue 1**

LE

SMEs

ME

**Sub Issue 2**

Manufacturing

Service

**Methodology**

Interview

Survey

Theory

Experiment

**Result: Performance Parameter**

Quality

Cost

Delivery

**Result: Design Parameter**

Defects

Waiting

Inventory

Motion

Transportation

Overproduction

Over Processing

Figure 6. Initial K-Chart

**Table 2. Planning the review**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define research objectives</td>
<td>Finding the originality of research on the application of lean manufacturing (LM)</td>
</tr>
<tr>
<td>2. Article search locations</td>
<td>UGM library discovery search</td>
</tr>
<tr>
<td>3. Search criteria (inclusion and exclusion)</td>
<td>Search term: (Title Combined:(lean manufacturing SME)) AND (application) Publication date: 2015 to 2021 Content-type: Conference proceeding, Journal, e-journal, journal article Language: English Limit to: Item with full text online Exclude from the result: newspaper articles, book reviews, dissertations</td>
</tr>
</tbody>
</table>
Figure 7. Conducting a review

General Scope of Study
Factors influencing application of lean manufacturing (LM)

General Issue
LM application

Sub Issue 1
LE
SMEs
ME

Sub Issue 2
Manufacturing
Service

Methodology
Interview
Survey
Theory
Experiment

Result: Performance Parameter
Operational
Environmental

Result: Design Parameter
Culture
Implementation methodology
LM tools
HRM

Top management
Consultants
TQM

Figure 8. Revised K-Chart
Figure 8 shows the improved K-Chart. This changes at the result stage (performance and design parameters). Performance parameters change from quality, cost, and delivery to operational and environment. The design parameters changed to culture, implementation methodology, LM tools, HRM, top management, consultants, and TQM.

Table 3. Articles and contributions to K-Chart

<table>
<thead>
<tr>
<th>Artikel</th>
<th>Layer</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(Shokri et al., 2016) Methodology Survey Operational Culture</td>
<td></td>
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<tr>
<td>2.</td>
<td>(Knol et al., 2018) Methodology Survey Operational Top management</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>(Alaskari et al., 2016) Methodology Theory Operational Implementation methodology</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>(Afum et al., 2021) Methodology Survey Operational Culture</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>(Ramakrishnan et al., 2019) Methodology Survey Operational Consultants</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>(Lucherini &amp; Rapaccini, 2017) Methodology Experiment Operational Implementation methodology</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>(Alanya et al., 2020) Methodology Experiment Operational LM tools</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>(Dresch et al., 2019) Methodology Experiment Operational LM tools</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>(Mohammad &amp; Oduoza, 2019) Methodology Theory Operational Implementation methodology</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>(Thanki &amp; Thakkar, 2019) Methodology Survey Operational, environmental Implementation methodology</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>(Sodhi et al., 2020) Methodology Theory Operational Implementation methodology</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>(Abdallah et al., 2021) Methodology Survey Operational TQM</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>(Burawat, 2019) Methodology Survey Operational LM tools</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>(Rose et al., 2017) Methodology Survey Operational Implementation methodology</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>(Valente et al., 2019) Methodology Survey Operational LM tools</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>(Sahoo, 2020) Methodology Survey Operational LM tools</td>
<td></td>
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</tbody>
</table>
Table 3 shows the citation of each article and its contribution to the K-Chart. In this study, 17 studies contributed. Contributions are given to the layer methodology, performance, and design parameters.

5. Conclusions and Recommendations

From a practical perspective, this research has adopted the SLR methodology, and the K-Chart produces a new SLR referred to as SLR 2.0. From a scientific perspective, the literature review improves the K-Chart on the performance parameter and design parameter layers. The proposed new SLR procedure (SLR 2.0) strengthens the K-Chart produced by considering related articles and strengthens the SLR at the reporting and dissemination stage by providing a structured tool for research planning and monitoring. SLR 2.0 will help researchers find research updates. The case study shows the originality of research on applying lean manufacturing (LM) by linking each layer item into a research plan. LM application, SMEs, manufacturing, survey, operational, and implementation methodology is a combination of widely studied items. Performance and other design parameters provide opportunities for further research.

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References


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