

**VENDOR ENGAGEMENT KAIZEN
FRAMEWORK INCORPORATING RISK AND
REWARD SHARING IN LEAN
MANUFACTURING PRACTICE**

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**VENDOR ENGAGEMENT KAIZEN
FRAMEWORK INCORPORATING RISK AND
REWARD SHARING IN LEAN
MANUFACTURING PRACTICE**

by

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LIST OF SYMBOLS

| | |
|----|---------------------|
| °C | Degree Celsius |
| G | Gravitational-force |
| W | Watts |

LIST OF ABBREVIATIONS

| | |
|-------------|---|
| AVL | Approved vendor list |
| CI | Continuous improvement |
| CNX | Constant-Noise-eXperimental |
| CT | Cycle time |
| DUT | Device under test |
| EAU | Estimated annual usage |
| EFQM | European Foundation for Quality Management |
| ESI | Early supplier involvement |
| FA | First article |
| FG | Finish goods |
| IP | Intellectual property |
| ISO | International organisation for standardisation |
| JIT | Just in time |
| LED | Light-emitting diode |
| MOQ | Minimum order quantities |
| NVA | Non-value-added |
| ODM | Original design manufacturer |
| OEM | Original equipment manufacturer |
| PDCA | Plan-Do-Check-Act |
| PM | Preventive maintenance |
| PO | Purchase order |
| PVP | Packaging validation procedure |
| QC | Quality Control |
| RFT | Request for tender |
| SMART | Smart-Measurable-Achievable-Realistic-Time-bound |
| TIMWOOD | Transportation, inventory, motion, waiting, overproduction, over processing and defects |
| VCA | Vendor contract agreement |
| VRRS-Kaizen | Vendor Risk and Reward Sharing – Kaizen |
| VSM | Value Stream Mapping |
| WIP | Work in progress |

**PENGLIBATAN VENDOR RANGKA KERJA KAIZEN UNTUK
MENGGABUNGI PERKONGSIAN RISIKO DAN GANJARAN DALAM
AMALAN PENGELUARAN KEJAT**

ABSTRAK

Pengeluaran kejut mensasarkan Kaizen dari segi kualiti, kos dan tempoh kitaran. Penyelesaian masalah yang mantap selalunya melibatkan pihak luar seperti vendor, khususnya dalam aspek penggunaan sumber dan pengetahuan teknologi. Semakan terhadap penerbitan “peer-review” semasa menunjukkan bahawa kajian akademik terhadap aktiviti sedemikian adalah terhad, terutamanya yang mempunyai unsur-unsur perkongsian risiko dan ganjaran yang jelas. Dalam premis ini, rangka kerja Perkongsian Risiko dan Ganjaran - Kaizen (VRRS-Kaizen) telah dicadangkan sebagai sistem preskriptif yang generik dan holistik bagi membimbing interaksi dengan vendor, dengan matlamat untuk memastikan amalan yang sistematik dan berkesan. Rancang-Laksana-Periksa-Tindakan menjadi asas kepada rangka kerja tersebut dan membentuk tahap-tahap pelaksanaan Kaizen. VRRS-Kaizen bermula dengan mengenalpasti keperluan untuk mendapatkan khidmat vendor bagi tujuan pembangunan tindakbalas oleh Pasukan Kaizen. Kaedah Kejut, pembuktian konsep, dan kaedah pemarkahan pelbagai kriteria telah digunakan untuk penilaian dalam rangka kerja berkenaan. Pengesahan rangka kerja pula dilakukan melalui tiga kajian kes di sebuah syarikat sistem pengukuran elektronik di Pulau Pinang. Skop kerja melibatkan penghapusan 100% kegagalan suhu dalaman yang tinggi bagi “peranti-di-bawah-ujian” (Kajian Kes Satu), pengurangan penggunaan elektrik sebanyak 60.9% serta pengurangan caj penyelenggaraan sebanyak 55.6% (Kajian Kes Dua), dan mitigasi caj pengangkutan yang tinggi untuk Pemasangan Pembungkusan 64A (Kajian Kes Tiga). Dengan perbezaan yang jelas antara setiap kes, setiap kes berjaya

menggunakan rangka kerja yang dibincangkan. Secara keseluruhan, pelaksanaan tersebut telah diterjemahkan ke dalam bentuk pulangan sebanyak RM 204,105.86 (antara 2017 hingga 2018), di mana 45.52% daripada jumlah itu telah dikongsi dengan vendor-vendor yang terlibat sebagai perkongsian ganjaran kewangan. Dengan itu, objektif kajian telah dicapai.

**VENDOR ENGAGEMENT KAIZEN FRAMEWORK INCORPORATING
RISK AND REWARD SHARING IN LEAN MANUFACTURING PRACTICE**

ABSTRACT

Lean manufacturing seeks Kaizen in terms of quality, cost and cycle time. A robust problem-solving often extends to external parties such as vendors, to draw in their unique technology resources and knowledge. The perusal of contemporary peer-reviewed literature reveals limited academic investigation onto such form of partnership; particularly vendor engagement having elements of properly defined risk and reward sharing. In this premise, Vendor Risk and Reward Sharing – Kaizen (VRRS-Kaizen) framework was proposed as a generic and holistic prescriptive system to guide personnel to duly deal with vendors. The objective of the framework is to ensure systematic and effective practice. Plan-Do-Check-Act underpins the framework and dichotomises the relevant stages of Kaizen. VRRS-Kaizen commences with the identification by Kaizen Team for the need of calling in vendors for countermeasure development. Lean tools, proof of concept and multi-criteria scoring methods were used for assessments in the framework. Framework verification was performed through three case studies at an electronic measurement system company in Penang. Their scopes involve 100% elimination of device under test high internal temperature failures (Case Study One), reduction of high workstation electricity by 60.9% and maintenance charges by 55.6% (Case Study Two) and mitigation of high freight charges of Packaging Assembly 64A by 24% (Case Study Three). Evidently different in nature, these three cases have been successfully deployed following the framework. In total, these were translated into RM 204,105.86 in return (between 2017 to 2018), of which 45.52% was shared with vendors as financial reward sharing. The research objectives have been achieved.

CHAPTER 1

INTRODUCTION

1.0 Overview

This chapter, which consists of five sections, introduces the development of a new management system based on Lean manufacturing, vendor engagement and risk and reward sharing to improve operational performance and efficiency. The first section discusses the research background and highlights the challenges faced by the existing manufacturing system, followed by the problem statement, project objectives and the scope of the research. The last section illustrates the thesis outline.

1.1 Research background

The manufacturing sector continues to play a vital role in a country's economy in today's globalised market. According to World Bank (2016), the manufacturing sector continuously adds value to the global economy. In connection, 64% of the global workforce working hours were spent on manufacturing-related activities (Chui et al., 2017). Upadhye et al. (2010) estimated that manufacturing productivity growth rate per year would increase; more specifically, India would grow by 5%, China by 7.31%, Singapore by 9.45% and Pakistan by 8.65%. In Malaysia, the manufacturing is forecasted to grow by 4.7% in 2019 (MoF, 2019), with Electrical and Electronics as the leading manufacturing sector making up 41.2% of the gross domestic product (Hays, 2015).

Customers in a globalised and competitive environment demand more product variety, greater quality and services with better reliability (Tamayo-Torres et al., 2014). Consumers go to great lengths to determine the value or products available

before making a purchase (Bhamu and Singh, 2014). Consequently, industrial players are challenged to improve their production process continuously to remain competitive as market leaders (Leong et al., 2019). Enterprises must be adaptable and continually seek new methods and technology to remain competitive. Hence, competitiveness and increasing demand to meet and exceed customer satisfaction drive organisational performance (Singh and Singh, 2018). Creating a sustainable value also ensures a good return over time and constant growth of an organisation and the establishment of relevant best practice, which in turn sets a benchmark for the industry.

One of the best practices is Lean manufacturing. The success of the Japanese automotive industries attracted the attention of Western researchers who sought to identify the secret of what they did to achieve manufacturing excellence. Krafcik (1998) would later coin the term Lean manufacturing to describe this marvel. Organisations recognise that a consistent and dedicated application of Lean manufacturing philosophy and strategies to streamline processes would lead to business excellence (Rahman et al., 2010). Since the introduction of Lean manufacturing, several well-known authors have explored the different tools and techniques pertaining to Lean manufacturing and its effect on operational performance and economic perspectives, particularly on costs, quality and cycle time (CT) (Negrão et al., 2017). More than 70% of organisations worldwide apply Lean manufacturing, and in recent years, this approach has grown in favour because its set of tools and techniques have a practical implementation in various kinds of businesses (Kafuku, 2019). Lean manufacturing makes manufacturing organisation more sustainable by eliminating non-value-added (NVA) activities. These NVA activities incur extra resources in the operations other than inputs, process and outputs.

However, not all business excellence can be developed with in-house resources. Espedal (2005) highlighted that the manufacturing pursuit for business

excellence must explore and exploit specialised skills and capabilities that need to be adopted within the organisation. Increasingly, countermeasures need to be developed collaboratively with external parties such as vendors. Countermeasures are action or solution taken to counteract the problem presented. Ample supporting evidence can be found in contemporary literature (as shown in Chapter 2). Vendors who are subject matter experts can be brought in to solve problems by providing countermeasures through involvement in material supply, services and technologies. These partnerships have yielded good outcome between organisations and vendors and improved the business excellence of the organisation (Perunović et al., 2012).

Formally, vendors are considered an entity external to an organisation and their main role is to supply either goods or services. Yasin et al. (1997) estimated that 75% of the production cost for goods and services originate from external sources. This extent can be contributed through a wide spectrum of vendor relationships ranging from traditional relationships to partnerships and alliances. The management of these organisations must determine the appropriate vendor partnership to pursue based on their level of operational complexity and market sophistication (Kshirsagar et al., 2014). This decision must be coupled with factors affecting vendor engagement for successful partnership.

1.2 Problem statement

Occasionally, countermeasures developed by in-house resources fail to address problems despite having initial success. Other contributing factors to the failures include the lack of resources and non-productive improvement plans developed that fail to meet the requirements for improvement (Taner et al., 2007). While Lean is meant to cater to all sizes, types and industries seeking to increase their competitive advantages, operations and profitability in the global market (Alkhoraif et al., 2019), the success of Lean initiatives varies largely, with reports in Pearce and Pons (2019) claiming 60% – 90% of improvement programs failing. The Lean practices are filled with challenges in terms of the application of the concept, adequacy of the Lean philosophy and systematic thinking across the manufacturing industry.

Bearing in mind these shortcomings and the lack of know-how, outsourcing problems beyond organisation resources and capabilities to competent vendors can reduce the risk of failure to the organisation. Outsourcing is the practice of hiring an external party outside of the organisation to perform services or create goods that were supposed to be performed by in-house resources (Chua et al., 2012). The integration of vendors (external party) is critical for manufacturers implementing Lean manufacturing (Pettersen, 2009). The integration creates a cost-efficient, responsive and flexible environment to meet the organisational needs, which is highly desired in Lean manufacturing and increases partnership with external vendors. Various literature highlights the advantages of outsourcing to vendors through formal governance, such as contracts and appointment of vendor liaisons to manage vendors according to the organisational needs (Heiskanen et al., 2008 and Puranam and Vanneste, 2009).

The current study calls for risk and reward sharing between organisation and vendors in Lean manufacturing. Vendors undertake the risk for their proposed countermeasures to gain greater reward sharing. Vendors with specialised skills, experience and resources could be integrated into an organisation to provide countermeasures in instances where in-house resources are lacking. This strategy spares the organisation's resources for other activities. Nevertheless, vendor integration with risk and reward sharing adds new levels of complexity into Kaizen deployment (Garvis et al., 2003; Kshirsagar et al., 2014). A systematic and rigorous engagement framework for vendor engagement is required. This research investigates and creates a balance between Lean manufacturing, vendor engagement and risk and reward sharing to address the limitations in contemporary literature.

1.3 Research objectives

The three objectives of this research are as follows:

- i. To develop a systematic Kaizen framework for vendor engagement incorporating risk and reward sharing in Lean manufacturing.

1.4 Scope of research

The framework includes vendor selection and a risk and reward sharing between the organisation and vendors. The partnership could be for product solutions, short-terms engagement, cost-saving projects. Throughout the research, several words will be used to generalise several terms, including organisation and vendor. The organisation is, by definition a group of people arranged with a particular purpose, such as a business or government department. This term will represent company, firm, industry or corporation participating in this research. Vendors by definition, is a person