

**FACTORS AFFECTING PROJECT MANAGEMENT OF JIG AND
FIXTURE MANUFACTURERS IN SOUTH JOHOR, MALAYSIA**

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ABSTRACT

The economic growth in Malaysia has a number of benefits for downstream industries including jig and fixture manufacturers. The nature of jig and fixture manufacturer as small manufacturer enterprise (SME) with relatively less resource less focus on the importance of factors that affecting project management. Therefore, this research aims to identify the important factors that affect jig and fixture project management and to assess the degree of project management performance in a jig and fixture manufacturer, with the focus on South Johor region. In addition, the research also aims to obtain the correlation between factors affecting project management and project management performance, as well as to develop a prediction model for project management performance. In line with this, a quantitative approach was chosen with the population consisted of all jig and fixture manufacturers in South Johor, Malaysia. Simple random probability sampling was used to include 53 jig and fixture manufacturers. Data were collected through self administered questionnaires. Descriptive analysis, correlation analysis, and regression analysis was used. Findings from the study revealed that factor that perceived as important by respondents are human factor, followed by financial, organizational, technological supply chain relationship and physical factor. In term correlation, all factors were positively correlated with project management performance except human factor where regression model suggested that two strongest predictor are technological and supply chain relationship factor. Finding from the study suggested that factor that perceived as the most important is not correlated with project management performance, and the two strong predictors were perceived at medium important level. As such, further study could be conducted to study the implementation of those factors to identify the top of importance level, the effectiveness of the implementation, the focus level of the implementation and at once analyze the challenges and problem thus obtains the remedial strategies.

ABSTRAK

Pertumbuhan ekonomi di Malaysia mempunyai beberapa manfaat kepada industri hiliran termasuklah pengeluar 'jig' dan 'fixture'. Sifat pengeluar 'jig' dan 'fixture' sebagai perusahaan pengeluar kecil (PKS) dengan kekurangan sumber serta kurang memberi tumpuan terhadap faktor-faktor penting yang mempengaruhi pengurusan projek. Oleh itu, kajian ini bertujuan untuk mengenal pasti faktor-faktor penting yang memberi kesan kepada pengurusan projek 'jig' dan 'fixture' serta menilai tahap prestasi pengurusan projek terhadap pengeluar 'jig' dan 'fixture' di Selatan Johor, Malaysia. Di samping itu, kajian ini juga bertujuan untuk mendapatkan korelasi antara faktor-faktor yang mempengaruhi pengurusan projek dengan prestasi pengurusan projek, dan juga bertujuan untuk membina model ramalan prestasi pengurusan projek. Selaras dengan ini, pendekatan kuantitatif telah dipilih dengan penduduk terdiri daripada semua pengeluar 'jig' dan 'fixture' di Selatan Johor, Malaysia. 'Simple random probability sampling' telah digunakan untuk memasukkan 53 pengeluar 'jig' dan 'fixture'. Data dikumpulkan melalui soal selidik isi sendiri. Analisis deskriptif, analisis korelasi, dan analisis regresi telah digunakan. Dapatan kajian menunjukkan bahawa faktor yang dilihat sebagai penting oleh responden adalah faktor manusia, diikuti oleh kewangan, organisasi, teknologi hubungan rantaian bekalan dan faktor fizikal. Dari segi korelasi, semua faktor-faktor mempunyai korelasi yang positif terhadap prestasi pengurusan projek kecuali faktor manusia di mana model regresi mencadangkan bahawa dua peramal terkuat adalah teknologi dan bekalan faktor hubungan rantai. Dapatan kajian ini mencadangkan bahawa faktor yang dilihat sebagai yang paling penting adalah tidak berkait rapat dengan prestasi pengurusan projek, manakala kedua-dua ramalan yang kukuh telah dilihat di peringkat sederhana penting. Oleh itu, kajian lanjut boleh dijalankan untuk mengkaji pelaksanaan faktor-faktor bagi mengenal pasti bahagian tahap kepentingan, keberkesanan pelaksanaan, tahap pelaksanaan dibuat sekaligus menganalisis cabaran-cabaran dan masalah seterusnya mendapatkan strategi pemulihan.

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LIST OF ABBREVIATIONS

FMM	-	Federation of Malaysian Manufacturers
HCI	-	Human Computer Interaction
MIDA	-	Malaysian Investment Development Authority
NC	-	Numerical Control
PLC	-	Programmable Logic Control
PMBOK	-	Project Management Body of Knowledge
SME	-	Small Medium Enterprise
SMM	-	Suruhanjaya Syarikat Malaysia
SPSS	-	Statistical Package for the Social Sciences
WIEF	-	World Islamic Economic Forum

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Project management is a growing field used increasingly by businesses of all sizes across manufacturing and assembly (Erno-Kjohede, 2000). Manufacturing and assembly industries are continuously upgrading their products quality and processes efficiency in order to sustain competitive advantage within their respective arena (Elmaraghy, Algeddawy, Azab, & Elmaraghy, 2011). The pace of change will continue to accelerate, as such, manufacturing and assembly industrials tend to outsource some low end and low value-added activities. This move is to free-up internal resource in order to focus on high value-added activities, such as new product development and continuous improvement program. In conjunction with this, jig and fixture design and fabrication jobs are among activities that are commonly outsourced by manufacturing and assembly industries in South Johor, Malaysia (Chen, 2011).

Jig and fixture is a tool used to align, assemble, clamp, hold, test and calibrate components and sub-assemblies across all levels of manufacturing and assembly process to maintain products quality and production efficiency (Dekker, 1989). However, numerous designs and applications of jig and fixture manipulated

the complexity of managing jig and fixture design and fabrication project (Hannu, 1991). A study done by prior research revealed that jig and fixture fabricators are less focused on project management due to the complicated nature associated with jig and fixture project (Jain, Triantis, & Liu, 2011). Therefore, the paper aims to review the important elements of jig and fixture project management, with the ultimate aim to develop a conceptual framework for jig and fixture project management in South Johor, Malaysia.

1.2 Background of Research

Nowadays, manufacturing industry plays an important role compared to the last century. It starts with the occurrence of technological and socioeconomic transformation in the Western states in the eighteenth to nineteenth century. According to Elmaraghy *et al.*(2011), manufacturing industry refers to industries involved in manufacturing and processing of items and go through either creation of new product or value addition. Due to the development of manufacturing industry, many new machine tools, high performance cutting tools and modern manufacturing process are introduced in order to allow the process of manufacturing to run smoothly (Böllinghaus *et al.*, 2009).

Manufacturing industries are divided into several categories such as engineering industries, electronics industries, chemical industries, energy industries, textile industries, food and beverage industries, metalworking industries, plastic industries, transport and telecom industries. Elmaraghy *et al.* (2011) found that, manufacturers have continuously upgrading their products, processes and technologies simply to defend their position in the marketplace, and the pace of change will continue to accelerate due to the development and transformational application of new technology. According to Dekker (1989), manufacturing relies on

tools including jig and fixture to maintain quality and production efficiency and they are used to align, assemble, clamp, hold, test and calibrate components and sub-assemblies at all levels of the manufacturing process. This encourages the jig and fixture manufacturers to provide functional jig and fixture to help big manufacturers to produce good parts with low cost and high quality where they are used to facilitate production work in the industry.

According to Hannu (1991), there are different reasons that affect jig and fixture manufacturing performance such as financial lacking, economic conditions, absence of motivation, inadequate management and leadership, inappropriate employees, poor relations and coordination, control, monitor or decision making system, inadequate infrastructure or facility, cultural problems and inadequate supply chain management system, which are all elements of project management. Basically, jig and fixture manufacturers develop their organization in job shop operation whereby they only need small sized organization and provide a few numbers of manpower especially engineers. According to Jain (2011), job shop manufacturer does not concern skills in managing project either in designing, planning or control phase. Due to this reason, jig and fixture manufacturers decide to form the organization with a few main departments only such as sales department, engineering department and production department.

Various factors which affecting project management that are considered as strategies have been introduced which include financial, human, organizational, physical, technological and supply chain relationship (Doloi, Sawhney, Iyer, & Rentala, 2012; Garbharran, Govender, & Msani, 2012; Mathur, 2012). Prior study on project management had revealed that proper project management can achieve its project goals and objectives (Erno-Kjohlhede, 2000). In addition, various project management performances had been determined by prior research such as measurement of customer satisfaction, cost effectiveness, timeliness and quality. Once the projects are completed within the given time frame, with good quality, and

the cost also falls within the allocated budget, this will reflect customer satisfaction (Luu, Kim, & Huynh, 2008).

Prior researches on project management studies emerged such as Barclay & Osei-Bryson, 2010; Hameri, 2011; Hannu, 1991; Jain, Triantis, & Liu, 2011; and Parker & Skitmore, 2005. However, there are no paradigm has emerged so far that is underlying the research and conceptualization of factor affecting jig and fixture project management performance or jig and fixture project management performance. Hence, this study aim to identify the important level of factors that affecting project management in jig and fixture manufacturer with the ultimate objective to develop a project management framework for jig and fixture manufacturer.

Jig and fixture is part of fabricated metal product manufacturing where it transforms metal into intermediate or end products, other than machinery, computers and electronics, metal furniture or treat metals and metal formed products fabricated elsewhere (Richard, 2012). Based on World Islam Economic Forum Foundation (2012), fabricated metal product that consist of jig and fixture manufacturer have been emerge in South Johor, Malaysia. Additionally, South Johor, Malaysia is a new industrial areas that been identified to meet demands for the economic growth of South Johor Economic Region (Ramli & Akmal, 2006). Ramli & Akmal (2006) believes that the most of the manufacturer including jig and fixture manufacturer are interested to develop their business at South Johor, Malaysia due to the physical plan proposals for physical development at South Johor, Malaysia which includes plans for infrastructure, utilities, transportations, greeneries and public amenities.

1.3 Problem Statement

Previous researches such as Belassi & Tukul (1996); Mir & Pinnington, (2013); Pinto & Mantel (1990) emphasized that the factors affecting and the failure in project management performance are the cause of any project failure. Consalter & Boehs (2004) found that jig and fixture project has failed in term of the performance. Furthermore, due to the rapid development of new technology, some of the factor affecting and the evaluation of performance measurements are not applicable to specific industry especially to the jig and fixture industry. This is because project failure depends on the implementation process and the life cycle occupied by the project (Pinto & Mantel, 1990). The changes of implementation process and life cycle can affect the project management performance and the way project manager manage projects (Belassi & Tukul, 1996). Thus, affect the important affecting factors.

The impact of changes at the affecting factors might change also the project performance at any manufacturer including jig and fixture manufacturer. However, review on research done by prior researches such as Barclay & Osei-Bryson (2010); Hameri (2011); Hannu (1991); Jain *et al.*, (2011); Parker & Skitmore (2005) and others showed that the studies on jig and fixture manufacturing relating to project management were mentioned in separated topics or subtopics. According to Belassi & Tukul (1996), project manager have their own perception in considering the performance measurement as their important objective. Therefore, project manager need to distinguish the factor affecting the project and how to measure them. There are many jig and fixture project fail due to time performance, cost performance or other performance indicators (Munns & Bjeirmi, 1996). The researcher conducted the short interview during distribution of questionnaire. The data collected from the interview session to the managers at each jig and fixture manufacturer in South Johor, Malaysia. Most of the projects they cope with are finished with poor performance because of obstacles by customer, resource constraint, modification works, incomplete information or delay receiving information. However, there are no

evident to show that the level of performance of jig and fixture manufacturer is at the poor or excellent level since some managers in jig and fixture manufacturer do not find the value in providing input or writing a review when the project performance does not get a raise.

It has been found that project management performance of manufacturer might vary according to the factor affecting project management. According to Atkinson (1999); Berglund & Karlton (2007); Enshassi, Mohamed & Abushaban (2009); Hoegl, Gibbert, & Mazursky (2008); Hulst, Mulder, & Soete (1991); Kejuo (2012); Okoh (1991); Patanakul & Milosevic (2009), project management performance of any manufacturer are depend on the factors affecting including financial, human, organizational, physical, etc since it is the strategic asset to drive the project performance to become impressive. Accordingly, the contingency relationship found in prior research need to be examined to determine whether it also influence to the jig and fixture manufacturer or not since study on this area have not been conducted yet.

As stated previously, low project management performance in the jig and fixture manufacturer has been a long standing problem. Before designing and implementing any intervention to improve jig and fixture project management performance, it is important to develop an effective model to predict jig and fixture project performance so the jig and fixture manufacturer can know how well or how poorly the project performance will perform.

In South Johor, Malaysia, failure of jig and fixture project management performance has been shown up through different perspective. Ramli & Akmal (2006) emphasized that there are important issues related to factors affecting and failure in performance in the South Johor, Malaysia which are political, economic and cultural (Ramli & Akmal, 2006). Jig and fixture manufacturer in South Johor,

Malaysia might involve in this issues since South Johor, Malaysia is known as South Johor Economic Region with comprehensive development plan.

1.4 Aim of the Study

This research aims to identify the important level of factors that affect jig and fixture project management in South Johor, Malaysia. In addition, the project also aims to evaluate the jig and fixture project management performance in South Johor, Malaysia. Other than that, this research also aims to examine the correlation between factors that affecting jig and fixture project management with jig and fixture project management performance, as well as to predict jig and fixture project management performance bases on factors that affecting jig and fixture project management.

1.5 Research Objectives

To achieve the intended goal, the following research objectives have been developed:

- 1.5.1 To identify the perceived important level of factors that affecting and fixture project management within jig and fixture manufacturer in South Johor, Malaysia
- 1.5.2 To evaluate the perceived jig and fixture project management performance level within jig and fixture manufacturer in South Johor, Malaysia
- 1.5.3 To examine the correlation between factors that affecting and fixture project management performance with jig and fixture project management performance within jig and fixture manufacturer in South Johor, Malaysia

- 1.5.4 To predict jig and fixture project management performance within jig and fixture manufacturer in South Johor, Malaysia

1.6 Research Questions

This research is primarily conducted to answer the following research questions:

- 1.6.1 What are the perceived important level of factors that affecting jig and fixture project management within jig and fixture manufacturer in South Johor, Malaysia?
- 1.6.2 What are the perceived jig and fixture project management performance level within jig and fixture manufacturer in South Johor, Malaysia?
- 1.6.3 What is the correlation between factors that affect and fixture project management performance and jig and fixture project management performance within jig and fixture manufacturer in South Johor, Malaysia?
- 1.6.4 How can jig and fixture project management performance within jig and fixture manufacturer in South Johor, Malaysia be best predicted?

1.7 Significance of the Research

This information could be used by the whole level of the project management department in jigs and fixtures manufacturing industry to produce an effective project management in terms of scheduling or rescheduling whenever a project enters the firms.

Also, it can be envisaged that the result of this research would help to create awareness against the importance of project management and to enhance the level of performance in jigs and fixtures manufacturing industry. Finally, the findings of the research would provide evidence for further research work.

1.8 Scope of Research

The researcher has decided to use jigs and fixture manufacturing industry in the South Johor, Malaysia as a benchmark to ascertain the factors that contribute to managing the project and evaluate the level of performance. South Johor, Malaysia is selected because it represents an economic development that has grown rapidly over the past several years (World Islam Economic Forum Foundation, 2012).

World Islam Economic Forum Foundation (2012) stated that South Johor, Malaysia has a strategic location that is in proximity to some of the world's most rapidly growing and significant economies. From the report of 8th World Islamic Economic Forum (WIEF) Johor Bahru Malaysia 2012, there are five core sectors of industry in Johor, Malaysia which are basic metal industry which contribute about RM7.3 billion, followed by electrical and electronics about RM1.2 billion, petrochemical products about RM912 million, food industry about RM888 million, chemical and chemical products about RM338 million and fabricated metal industry about RM346 million. The five main industrial locations in Johor, Malaysia that have been invested were Tanjung Langsat, Pasir Gudang, Tanjung Agas, Johor Bahru and Kluang (Trends, 2012). The jig and fixture manufacturer are one of the most invested industries in Johor Bahru. This is clearly shown in the table below:

Table 1.1: Approved Manufacturing Projects in Johor by Industry, January – October 2011 (World Islam Economic Forum Foundation, 2012)

Industry	#	Employment	Domestic Investment (RM)	Foreign Investment (RM)	Total Investment (RM)
Basic Metal Products	2	75	5,751,900	26,745,265	32,497,165
Chemical & Chemical Products	12	591	81,363,767	408,586,766	489,950,533
Electronics & Electrical Products	27	10,387	50,846,508	831,008,953	881,855,461
Fabricated Metal & Products	22	1,835	169,945,629	467,890,892	637,836,521
Food Manufacturing	19	2,172	173,334,216	1,323,629,771	1,496,963,987
Furniture & Fixtures	20	2,245	93,467,598	0	93,467,598
Machinery Manufacturing	17	1,478	73,685,625	63,389,446	137,075,071
Nonmetallic Mineral	4	471	7,050,321	78,482,280	85,532,601
Others	4	751	27,830,000	59,700,334	87,530,334
Paper, Printing & Publishing	7	247	12,329,076	16,674,536	29,003,612
Plastic Products	8	359	106,126,544	28,907,134	135,033,678
Rubber Products	1	300	55,608,000	4,392,000	60,000,000
Scientific & Measuring Equipment	2	103	0	130,450,000	130,450,000
Textiles & Textile Products	1	263	1,011,450	19,217,550	20,229,000
Transport Equipment	7	463	2,329,425,958	58,555,340	2,387,981,298
Wood & Wood Products	4	304	14,651,811	9,978,983	24,630,794
Total	157	22,044	3,202,428,403	3,527,609,250	6,730,037,653

1.9 Limitations of Research

In conducting this research, two limitations have been identified. First, the research was conducted in South Johor, Malaysia as a result of convenience due to distance, time period and resources. The research focuses on industries that act as suppliers for jigs and fixtures. Each level of the department will be examined to discover the factors of project management. However, risk management, communication management, logistics and other external environment factors such as policy, law and their competitors is outside the scope of this research.

Secondly, the reliability and accuracy of the answers given by the respondents rely upon the instrument used (Creswell, 2002). The researcher has used a set of questionnaire as the instrument for data collection.

1.10 Operational Definitions

The operational definitions of terms used throughout this research are provided to clarify the context of this research.

Project Management	A practice that concerns itself with starting, planning and completing temporary goals undertaken to create an outcome, product or result. In order to meet the project requirements, knowledge, skills, tools and techniques will be implemented to project activities.
Jigs and Fixtures	A special purpose tool used to facilitate production either in machining, assembling and inspection operations.

Jigs and Fixtures Manufacturer	Any natural or legal person who is responsible for designing and manufacturing a jig and fixture with a view to placing it into on the manufacturing industry market under his own name or trademark.
Important factors	Refer to the combination of important facts that are required in order to accomplish one or more desirable project goals. They are viewed as variables that have a direct impact on the effectiveness of a project.
Performance indicator	A specific criteria/standards/guidelines or achieves results with state goals or plan to be measured which can show the degree to which a jig and fixture development intervention or a development partner operates.

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