International Journal of Business & Applied Sciences
Vol. 9 No. 1, pp. 13-21 (2020)
ISSN: 2165-8072 (Online); 2471-8858 (Print)

Impact of Operations Management Practices On Firm Performance: An Empirical Analysis at Vietnam's Mechanical Firms

Anh Minh Dao, Bruce Walker, Cindy Strickler

This paper examines the impact of Operations Management (OM) practices on firm performance in Vietnam's mechanical enterprises, since OM practices, such as Just-in-time (JIT), quality management (QM) and infrastructures practices are seen as procedures or solutions to improve the efficiency of manufacturing firms. All questions were answered using a 5-point Likert scale. The data collected was analyzed using SPSS 20.0. The statistical methods used are descriptive statistics, reliability analysis and regression analysis for hypothesis testing. The findings present, firstly, the extent of operations management practices implemented in Vietnam's mechanical enterprises is fairly high; secondly, the impact of these practices on firm performance was positive. Equipment layout and supplier quality management are positively and significantly related to financial performance; whereas equipment layout, JIT delivery by supplier, Kanban, cleanliness and organization, and information and feedback are positively and significantly related to non-financial performance. This result suggests to mechanical enterprises in Vietnam that they should employ these practices to maintain and improve performance as well as to gain competitive advantages.

Key words: operations management practices, firm performance, Vietnam, mechanical firms

Introduction

In recent years, to respond to competitive pressures of lower costs, companies have implemented better operational procedures that have improved product quality, on time delivery, increased responsiveness, and higher customer satisfaction. Operations Management has extensively explored the potential of paradigms, initiatives and practices. Among them, just-in-time (JIT) and quality management (QM) are often used and referred to as components of "World-class manufacturing" (Flynn et al.1995, Sakakibara et al. 1997, Cua et al. 2006, Matsui 2007, Battistoni et al. 2013). The philosophy of JIT strives to eliminate waste by simplifying production processes, leading to reduced setup times, controlled material flows, and an emphasis on preventative maintenance, all of which then help to reduce and eliminate inventories and utilize resources more efficiently (Kannan and Tan, 2005). At the same time, the QM approach calls for developing and implementing a more inclusive corporate culture, in which customer focus, continuous improvement, employee involvement and data based decision - making are deployed. This approach focuses on quality at every single stage in production processes in order to improve product quality and improve customer satisfaction. Together with JIT and QM, infrastructure practices are considered as supporting factors that create an environment to achieve these above practices more effectively and contribute to better firm performance as a whole.

The mechanical industry is considered one of the most essential manufacturing industries in Vietnam. It plays an important role in the country's progress toward modernization and industrialization. It encompasses the manufacturing of machinery, mechanical components and spare parts for vehicles and other transportation, components for the electrical and electronic industry, etc. Today there are many challenges in this industry. These challenges include the fact that state mechanical firms are slow to adapt to new changes in management and technology. In addition, private firms, which are generally small and medium scaled, have been slow to implement improved methods. Many of these firms face obstacles in product specialization, research and development, product design capacity, outdated manufacturing processes, inefficient management and quality control, and lack of business planning and cooperation. All of these problems cause high production costs, low product quality, and a lack of customer satisfaction, resulting in being less than competitive in domestic and foreign markets. It is essential for the mechanical firms to look for suitable operations management practices to improve their performance and maintain competitive advantages. Therefore, the purpose of this research is to examine the impact of a set of operations management practices on firm performance by assessing the implementation of those practices at mechanical firms in Vietnam. This research's results will show that the implementation of suitable OM practices helps firms to gain competitiveness and affects to firm performance not only in high-class manufacturing firms, but also in small and medium ones.

Anh Minh Dao, MBA, MSc, Instructor , Foreign Trade University, Hanoi, anhdm@ftu.edu.vn
Bruce Walker, PhD, Associate Professor of Management, University of Louisiana at Monroe, LA, walker@ulm.edu
Cindy Strickler, MBA, Instructor of Management, University of Louisiana Monroe, LA, strickler@ulm.edu

Literature review

Operations management practices

Operations management practices are referred to as every procedure or solution which is carried out on the shop floor and which is meant to improve the efficiency of production and logistic processes for industrial goods (Battistoni, et al., 2013). Duarte et al. (2011) assumed that internal factors at firms are primarily responsible

for performance variation, and organizations are expected to make changes based on best practices to their structural and infrastructural elements in order to achieve improved performance outcomes. Hayes and Pisano (1996) indicate that new manufacturing technologies, including management-related ones, such as JIT and QM, might place firms on improved performance curves. Flynn et al. (1995) describe practices as approaches used by management and workers with the goal of achieving certain types of performance.

JIT is a philosophy of eliminating waste by producing goods and services exactly when they become needed, not before or after (Flynn et al., 1995). Cua et al. (2001) indicated JIT is a manufacturing program with the primary goal of continuously reducing and ultimately eliminating all forms of waste via manufacturing process simplification, as well as eliminating large lot size and inventory. At the same time, according to Flynn et al. (1995), QM is an approach to improving goods and service quality. It is a foundation of the firm's production without defects, data-based decision making and continuous improvement of all processes.

Davies and Kochhar (2002) explain that using JIT practices may improve not only JIT performance, but also quality performance as they provide alternative means of reducing potential damages, identifying problems in the process, improving process feedback, and reducing process variability. In its turn, using QM practices can lead to less variation in manufacturing processes, so that firm can reduce the need for safety stock buffers.

Infrastructure practices are referred to as practices that create an environment that is conducive for JIT and QM practices to be effective in a plant. They have formed a strong foundation for both JIT and quality performance. Sakakibara et al. (1997) indicated that core JIT practices without considering other ones, such as quality management, workforce management, manufacturing strategy, etc. cannot by itself lead to improved performance. Ahmad et al., (2003) showed the strategic-oriented and human-common practices, such as committed leadership, improved strategic planning, cross-functional training, employee involvement and information and feedback. Cua et al. (2001) used those practices to support JIT and QM programs' implementation.

A comparison of empirical studies on JIT, QM and infrastructure practices reveal five practices that are frequently cited as JIT practices, five identified as QM practices and four identified as infrastructure practices (Dao, 2019) (see Table 1). References: 1. Banker et al. (1993), 2. Flynn (1994), 3. Flynn et al. (1995), 4. Sakakibara et al. (1997), 5. Cua et al. (2001), 6. Ahmad et al. (2003), 7. Ketokivi and Schroeder (2004a), 8. Ketokivi and Schroeder (2004b), 9. Cua et al. (2006), 10. Matsui (2007), 11. Phan (2014).

Firm performance

Firm performance is essential for organization's optimum management (Li and Simerly, 1998). The success of firm performance has been measured both by financial criteria

Table 1: Commonly suggested operations management practices used in literature

Literature	1	2	3	4	5	6	7	8	9	10	11
JIT practices											
Daily schedule adherence (DSA)	X	X	X	X	X	X			X	X	X
Equipment layout (EL)				X	X	X			X	X	X
JIT delivery by suppliers (JDS)		X		X	X	X	X	X	X	X	X
Kanban (KAN)		X	X	X		X				X	
Setup time reduction (STR)	X	X	X	X	X	X	X	X	X	X	X
QM practices											
Cleanliness and organization (CO)		X	X							X	X
Customer focus (CF)		X	X		X	X	X	X	X	X	X
Maintenance (MAIN)				X						X	X
Process control (PC)		X	X	X	X	X		X	X	X	X
Supplier quality management (SQM)		X	X	X	X	X	X	X	X	X	X
Infrastructure practices											
Committed leadership (CL)		X	X	X	X	X				X	X
Multifunctional training (MT)			X	X	X	X			X	X	X
Employee involvement (EI)				X	X	X			X	X	X
Information and feedback (IF)				X	X	X			X	X	X

like market share, earnings, profit and growth, and by non-financial categories by product quality, cost, delivery, flexibility and customer satisfaction. Firm performance can be measured by financial performance, such return on assets (ROA), return on equity (ROE), return on investment (ROI) and sales growth (Seedee et al., 2009); profitability and sales growth (Yusuff, 2004; Kannan and Tan, 2005), or profitability and revenue growth rate (Duarte et al., 2011).

The most common approach to capture firm performance used in literature is non- financial performance or manufacturing performance, including cost (low cost unit), quality (conformance quality), delivery (on-time delivery), flexibility (volume flexibility) (Cua et al., 2001; Ahmad et al., 2003, Ketokivi and Schroeder, 2004a; Cua et al. 2006; Matsui, 2007; Phan, 2014), and customer satisfaction (Yusuff, 2004; Arumugam et al., 2008). Normally, the indicators are measured by managers' evaluation about firm performance when comparing to competitors' ones in the same industry. They are used to measure firms' production capability and strategic preferences (Peng et al., 2008).

Relationship between operations management practices and firm performance

The need to link practices to performance has become especially important for firms to maintain competitive advantages. Voss and Blackmon (1994) indicate that operating practice is critical to operating performance, and that operating performance is critical to overall competitiveness. Thus, the causal relationships between operating practices and operational performance are keys to improve overall competitiveness.

JIT, QM and specific infrastructure practices have received much attention from both academics and practitioners (Kannan and Tan, 2005). In fact, research shows positive performance improvement when firms apply those practices together. Empirical studies show a significant positive relationship between JIT practices and plant performance (Sakakibara et al., 1997; Matsui, 2007; Phan, 2014), QM practices and quality performance (Rungtusanatham et al., 2005; Kristal et al., 2010), as well as common infrastructure practices and plant performance improvement (Ahmad et al., 2003), and also the integrated program that includes three sets of practices and the positive effect on firm performance (Ahmad et al., 2003; Yusuff, 2004; Cua et al., 2006; Anuar and Yusuff, 2011, Phan, 2014).

Flynn et al. (1995) showed that the combination of JIT and QM practices yielded synergies that resulted in further performance improvement. Cua et al. (2006) provided evidence that implementing QM, JIT, and Total Productive Maintenance (TPM) practices resulted in a consistent positive effect on multiple dimensions of manufacturing performance. Seedee et al. (2009) indicated that best practices do lead to higher firm performance, in which four out of nine best practices dimensions were positively and significantly related to firm performance. Battistoni, et al. (2013) recommended that firms be studied as a complex system, where the interactions among elements are more important than each single element, suggesting that the main operational management practices can generate improvements in the performance of manufacturing companies; and that positive effects can be increased by the synergies of combining different approaches. Other studies have shown that there is no positive relationship between operations management practices and firm performance. Duarte et al. (2011) explain that the impact of these practices on performance depends on different contexts.

It is seen that there are many OM practices that have been applied by various manufacturing firms and the impact of those practices on firm performance has been varied at different contexts. The academic researchers have recommended that it should be examined in other context, like at manufacturing firms in developing countries. Hence, it is necessary to identify the suitable operations management practices that impact and help to increase firm performance and competitiveness in the context of Vietnam's mechanical firms.

Research model and hypotheses

The research model has been developed to illustrate the relationship between operations management practices and firm performance. This study adapts operations management practices from Cua et al., 2001; Ahmad et al., 2003; Cua et al., 2006; Matsui, 2007.

Financial performance is illustrated by two elements: sales growth and profit growth (Yusuff, 2004; Kannan and Tan, 2005; Seedee et al. 2009). Non-financial performance is presented by five elements: conformance product quality, production cost, on-time delivery, flexibility in dealing with volume variability (Cua et al., 2001; Ahmad et al., 2003; Matsui, 2007; Phan, 2014), and customer satisfaction (Yusuff, 2004; Arumugam et al., 2008).

The research model shown in Figure 1 presents the relationship between operations management practices and firm performance. The literature review suggests that implementing operations management practices should result in better firm performance, and this research study attempts to examine the impact between JIT practices, QM practices and infrastructure practices on firm performance in mechanical enterprises in Vietnam.

JIT practices have been used to eliminate waste by doing things over time with the increased participation of all employees. Waste has been identified as inventory, work-in-progress and in delays in production processes (Cua et al., 2001). The different types of waste can be eliminated by controlling production process, streamlining the facility layout, and reducing production time through the improved daily schedule (Ahmad et al., 2003). JIT practices include five variables: daily schedule adherence, equipment layout, JIT delivery by supplier, Kanban, and setup time reduction, which are used and approved in previous research.

The relationship between JIT practices and firm performance has been discovered in a number of studies. In particular, JIT practices can lead to reduced inventory (Huson and Nanda, 1995; Nakamura et al., 1998; Callen et al., 2000; Fullerton and McWatters, 2001). There is a positive relationship between JIT practices and manufacturing performance (Flynn et al., 1995; Sakakibara et al., 1997; Upton, 1998; Ahmad et al., 2003; Matsui, 2007). Meanwhile, according to Claycomb et al. (1999), Fullerton et al. (2003), there is a positive relationship between JIT practices and financial performance.

Based on literature, the first two hypotheses, are:

Hypothesis 1: JIT practices have a positive impact on firms' financial performance.

Hypothesis 2: JIT practices have a positive impact on firms' non-financial performance.

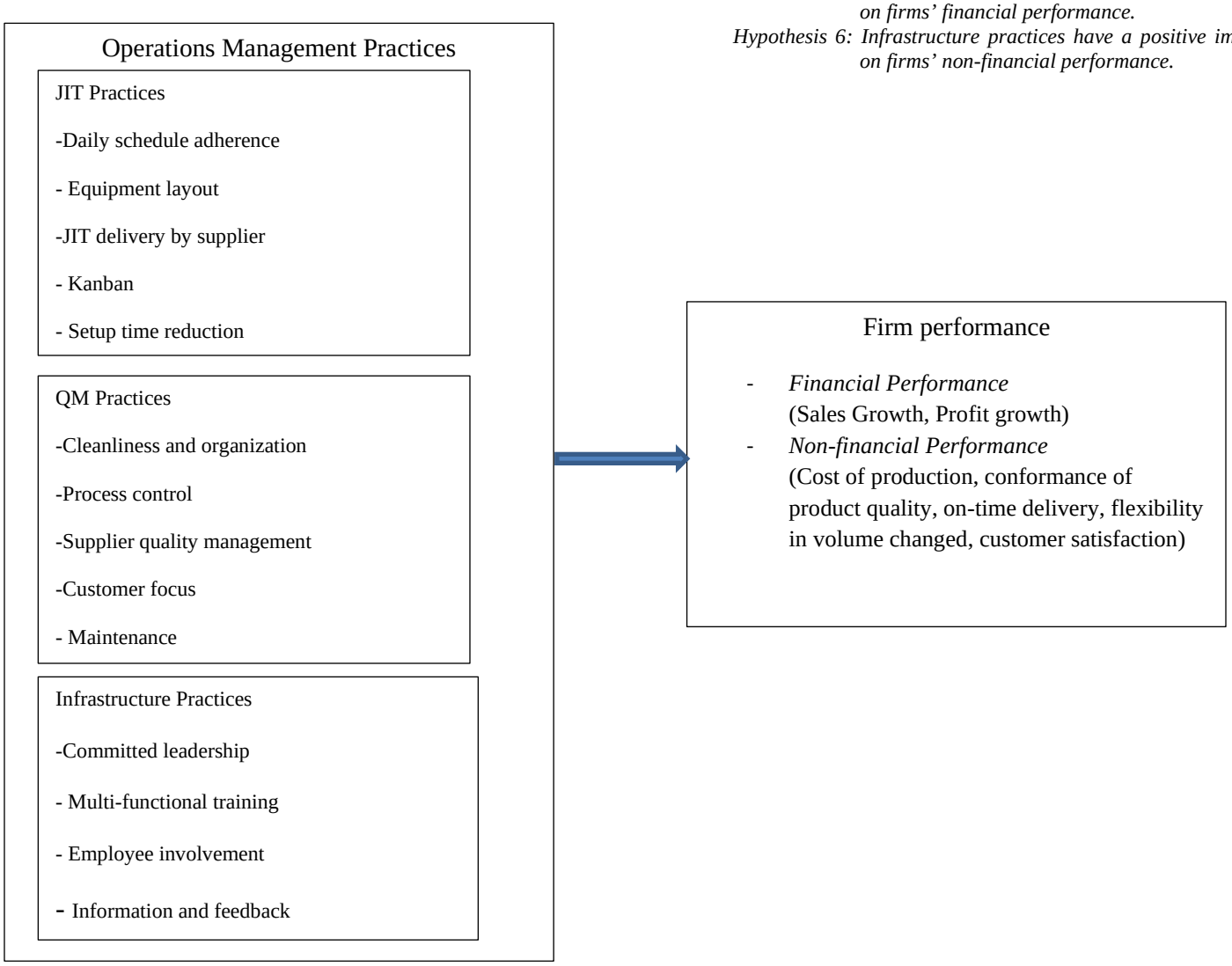
Quality management (QM) practices have been seen as key factors for an enterprise's competitiveness. Quality management is not only related to products, but also to the relationship between the enterprise and its suppliers, customers, employees, as well as in all processes in the enterprise (Raja et al., 2011). QM practices include five variables: cleanliness and organization, process control, supplier quality management, customer focus, and maintenance, which are used in many previous studies (Flynn et al., 1995; Forza, 1995; Phan, 2014).

Quality management practices support enterprises to increase product quality, reduce defects, then reduce production cost and cycle

time, and ensure on-time delivery (Ferdows and Demeyer, 1990; Ahmad and Schroeder, 2002); QM practices also have been shown to increase firm flexibility and continuous improvement (McAdam and Bannister, 2001). There is a positive impact of QM practices on a firm's non-financial performance (Tata et al, 2000).

Meanwhile, Buzzell and Gale (1987) indicated that financial performance indicators are improved as a result of QM practices. Curkovic et al. (2000b) suggest that there is a significant positive impact of QM practices on financial performance. Kumar et al. (2009) show there is a positive relation between QM practices and revenue growth and profit growth. Moreover, customer satisfaction will increase while customer complaints decrease.

Figure 1: Research model



Based on this literature, the next two hypotheses are as follows:

Hypothesis 3: QM practices have a positive impact on firms' financial performance.

Hypothesis 4: QM practices have a positive impact on firms' non-financial performance.

Infrastructure practices are those practices designed to support successful implementation of JIT and QM practices. Research has shown the importance of infrastructure practices such as committed leadership (Flynn et al., 1995; Tran and Bui, 2009); employee involvement in problem solving, teamwork and multi – functional training (Flynn, 1994; Tran and Bui, 2009); and information and feedback (Ahmad et al., 2003; Cua et al., 2006; Matsui, 2007) in improving firm effectiveness. As such, the last two hypotheses are as follows:

Hypothesis 5: Infrastructure practices have a positive impact on firms' financial performance.

Hypothesis 6: Infrastructure practices have a positive impact on firms' non-financial performance.

Methodology

Data for this study was collected data via a questionnaire - based survey. The authors contacted 110 mechanical enterprises and 62 of these mechanical enterprises were located primarily in the Northern regions of Vietnam have agreed to join. The list of firms was taken from Keieijuku's club – one member of Vietnam – Japan Institute of Human Resources Development (VJCC) and Vietnam Chamber of Commerce and Industry (VCCI Vietnam). The respondents included directors, vice directors, production managers, quality managers, human resource managers, and financial and accounting managers of mechanical enterprises. In each enterprise, each director and vice director replied to a single questionnaire, whereas other managers answered a part of the questionnaire related to their specific responsibilities. Plan-level data was calculated as an average value of all the valid responses at the plant for each quantitative and qualitative question item (Matsui, 2007). The survey was administered from December, 2017 to May, 2018.

The questionnaire was adopted from Ahmad et al. (2003), Cua et al. (2006), Matsui (2007) and Phan (2014) and used a five-point Likert scale. For operations management practices and financial performance questions, answers were obtained using a scale from 1 (totally disagree) to 5 (totally agree). For non-financial performance, a scale from 1 (much lower than competitors) to 5 (much higher than competitors) was used to evaluate the plant performance relative to its competitors (Cua et al., 2006). The questionnaire was translated from English into Vietnamese, and was revised by three professors in operations management in order to check the content validity of the measurement. The instrument was then pre-tested by thirty managers in different manufacturing firms to check whether the practices are suitable for Vietnam's mechanical enterprises and was re-worded, when necessary. The data collected were analyzed using the Statistical Package for Social Sciences (SPSS) 20.0. The statistical methods used are descriptive statistics, reliability analysis, and regression analysis was used for the hypothesis testing.

Results

Descriptive statistics

Table 2 provides a summary of operations management practices in Vietnam's mechanical enterprises. Except Kanban (2.8339), all practices have overall mean scores of 3.6008 to 4.21. Among JIT practices, JIT delivery by suppliers has the highest score (4.0753), which shows that suppliers of the firms are usually on time to deliver materials. The second highest belongs to equipment layout (4.059). The firms try to arrange equipment in groupings (family or cell manufacturing) to help reduce the production's transportation and stock in the production process. Daily schedule adherence (3.8633) indicates that the daily production schedule is fairly suitable and mechanical firms are able to complete tasks as scheduled. Kanban has a score of 2.8339, the lowest among five JIT practices, possibly meaning that Kanban is still quite new to many mechanical enterprises.

The implementation of quality management in these mechanical enterprises is fairly high, from 3.608 to 4.21. Supplier quality management has the highest score (4.21). Supplier quality management is an important factor since it ensures the quality of materials from suppliers, as well as long-term relationships between mechanical firms and their suppliers. Customer focus has a score of 4.1341. It means that mechanical firms also pay much attention to customers in order to meet customer demand and gain customer satisfaction. Cleanliness and organization has the second highest score (4.2016). Mechanical firms are trying to make their plants cleaner and organized. From the survey, they have applied many modern methods, such as 5Ss – a workplace organization method in order to establish a clean environment and improved working space. Maintenance has a score of 3.9554 and process control -3.6008 meaning that mechanical firms are trying to take care of their machines and equipment in order to reduce breakage and damages, as well as, apply statistical methods for controlling processes in order to make the production process more effective.

Table 2: Descriptive statistics and reliability analysis

OM Practices	Mean	Standard deviation	Cronbach's Alpha
Daily schedule adherence (DSA)	3.8633	0.59674	0.702
Equipment layout (EL)	4.059	0.47407	0.776
JIT delivery by suppliers (JDS)	4.0753	0.4653	0.658
Kanban (KAN)	2.8339	0.96588	0.879
Setup time reduction (STR)	3.7528	0.86498	0.939
Cleanliness and organization (CO)	4.2016	0.64422	0.884
Process control (PC)	3.6008	0.89553	0.915
Supplier quality management (SQM)	4.21	0.53281	0.873
Customer focus (CF)	4.1341	0.51355	0.726
Maintenance (MAIN)	3.9554	0.71772	0.791
Committed leadership (CL)	4.1658	0.49458	0.807
Multifunctional training (MT)	3.9758	0.58251	0.879
Employee involvement (EI)	3.9172	0.74498	0.894
Information and feedback (IF)	3.8139	0.6847	0.856

Infrastructure practices are considered to be the practices to support the successful implementation of JIT and QM. Committed leadership (4.1658) was the factor that had the greatest impact on mechanical firm results. In these firms, management boards are ready to join quality programs and support teamwork. Multi-functional employee training (3.9758) appears to focus on making sure their employees can handle different tasks when needed. Employee involvement is 3.9172, meaning that employees are encouraged to solve problems. Information and feedback (3.8139) is recently applied a lot in these firms. These firms encourage their employees to share information and give feedback in order to create smooth processes.

The above results are similar to those of Thailand companies, ranging from 3.46 to 4.16 (Seedee et al., 2009); They are also similar to the level of manufacturing best practices by Malaysian small and medium enterprises, which reflected scores from 2.95 to 4.16 respectively (Anuar and Yusuff, 2011).

Reliability analysis

Table 2 also shows the reliability analysis. The Cronbach's alpha coefficient of all practices is above 0.6, from 0.658 to 0.939. According to Matsui (2007) and Phan (2014), the reliability of measurement scales is judged based on the Cronbach's alpha coefficient, which should be greater than 0.6. So all variables are reliable for further research.

The impact of operations management practices on firm performance

Table 3 presents the impact of JIT practices on financial performance. JIT practices were significantly related to financial performance and explained an additional 14% of the variance in financial performance. The Sig. (F) = 0.019 <0.05 means that this regression model is rational with 95 percent of the credibility. Moreover, it reflects that financial performance can be improved by JIT practices. Among the five practices, Equipment layout has a significant and positive relationship with financial performance (Beta = 0.694 and p-value <0.05). The result supports hypothesis 1.Similarly, JIT practices were significantly related to non-financial performance and explained an additional 39.3% of the variance in non – financial performance. Among five practices, Equipment layout, JIT delivery by suppliers, and Kanban (with p-value <0.05) have a significant and positive relationship with non-financial performance. Equipment layout has the highest impact (Beta = 0.404), followed by JIT delivery by suppliers (Beta = 0.382) and Kanban (Beta = 0.175). The results in table 3 support hypothesis 2. Table 4 presents the impact of QM practices on financial performance. QM practices were significantly related to financial performance and explained an additional 14.2% of the variance in financial performance. The Sig. (F) = 0.017 <0.05 means that this regression model is rational with 95 percent credibility. Moreover, it reflects that the financial performance can be improved by QM practices. Among the five practices, supplier quality management has a significant and positive relationship with financial performance (Beta = 0.687 and p-value <0.05). The result supports hypothesis 3.

Similarly, QM practices were significantly related to non-financial performance and explained an additional 32.9% of the variance in non – financial performance. Among the five practices, cleanliness and organization (with p-value <0.05 and Beta = 0.265) has a significant and positive relationship with non-financial performance. The results in table 4 support hypothesis 4.

Table 5 shows the impact of infrastructure practices on financial performance. Infrastructure practices were not significantly related to financial performance since the Sig. (F) = 0.192 > 0.05 The result did not support hypothesis 5.

However, infrastructure practices were significantly related to non-financial performance and explained an additional 23.5% of the variance in non – financial performance. Among the four practices, information and feedback (with p-value <0.05 and Beta = 0.328) has

Table 3: Impact of JIT practices on firm performance

	R	R2	Adjusted R2	Sig.	df.	Const.	DSA	EL	JDS	KAN	STR
Financial Perf.	.459[a]	.210	.140	.019[b]	61	1.472	-.210	.694	.156	-.012	-.027
P. value							.233	.001	.425	.899	.818
Non-financial Perf.	.666[a]	.443	.393	.000[b]	61	.083	-.010	.404	.382	.175	.002
P. value							.927	.001	.002	.005	.978

Table 4: Impact of QM practices on firm performance

	R	R2	Adjusted R2	Sig.	df.	Const.	CO	PC	SQM	CF	MAIN
Financial Perf.	.461[a]	.213	.142	.017[b]	61	2.087	.233	-.170	.687	-.226	-.109
P. value							.257	.261	.007	.381	.564
Non – financial Perf.	.620[a]	.384	.329	.000[b]	61	1.916	.265	.135	-.042	-.026	.130
P. value							.047	.164	.791	.873	.285

Table 5: Impact of Infrastructure practices on firm performance

	R	R2	Adjusted R2	Sig.	df.	Const.	CL	MT	EI	IF
Financial Perf.	.316[a]	.100	.037	.192[b]	61	3.015	.195	.052	-.301	.295
P. value							.483	.765	.089	.056
Non – financial Perf.	.534[a]	.285	.235	.001[b]	61	1.982	.141	-.071	.053	.328
P. value							.431	.529	.642	.001

a significant and positive relationship with non-financial performance. The results in table 5 support hypothesis 6.

Discussion

Previous research has shown the positive impact of JIT practices, QM practices and infrastructure practices on firm performance. Enterprises that have implemented these practices outperform those firms which have not (Flynn et al., 1995; Cua et al., 2001; Kannan and Tan, 2005; Cua et al., 2006; Tran and Bui, 2009).

The regression result posit that JIT practices have positive impact on firm performance. Among these five practices, equipment layout has the largest positive effect on financial performance. This result is supported by the previous research of Claycomb et al. (1999), Fullerton et al. (2003). It also shows the positive impact of equipment layout, JIT delivery by suppliers, and Kanban on non-financial performance. The positive impact of equipment layout on non – financial performance was also found in the research of Matsui (2007). Cua et al. (2001) indicated that JIT delivery by suppliers and Kanban had a significant effect on performance. The implementation of Kanban in mechanical firms at the moment is in its early stages with low – score implementation (2.8339). However, implementing Kanban will be important for these firms to improve firm performance according to regression result.

The result of this research has shown the positive relationship between QM practices and firm performance, in particular, supplier quality management practice and financial performance. According to Buzzell and Gale (1987), financial performance is a key indicator of quality results. Deming (1986) confirms that quality improvement helps firms to eliminate wastes, reduce costs, and improve financial performance. Mohrnan et al. (1995b) indicate QM practices have positive impact on profit growth and firm competitiveness. Moreover, cleanliness and organization has a significant impact on non – financial performance. This is similar to the result shown by Flynn (1994) and Matsui (2007). QM practices help firms to increase product quality, reduce defects, control production process effectively, so that firms can reduce costs and cycle time, as well as, maintain on – time delivery (Ferdows and Demeyer, 1990; Ahmad and Schroeder, 2002); and increase flexibility and continuous improvement (McAdam and Bannister, 2001).

Infrastructure practices contribute to firms' higher performance levels. The research results show there is no significant relationship between infrastructure practices and financial performance. It can be explained that infrastructure practices do not directly impact financial performance, and they are seen as important factors in implementing JIT and QM practices successfully. Tan et al. (2007) indicated that firm performance may be affected by applying multiple operations management practices as a whole and not just depend on a particular group of practices. Meanwhile, information and feedback has a positive impact on non – financial performance, a result found by Ahmad et al. (2003). This practice helps employees and managers to update information related to productivity, quality, defects, machines and equipment status and have immediate problem solving.

Some operations management practices do not significantly impact firm performance. Duarte et al. (2011) found that there is no significant relationship between those practices and financial performance, even with large sample sizes. It offered an opportunity for in-depth empirical examination. It should be understood that those operations management practices are important in the case of Vietnam's mechanical firms. The sample was taken at a particular time point, whereas all practices are used to measure and suggest dimensions in order to improve organizational practices, quality and performance over a long time. Therefore, there may be discrepancies between the short-term view and the long-term effect of the practices (Seedee et al., 2009).

Conclusion and implication

The findings present, firstly, the extent of operations management practices that have been implemented in Vietnam's mechanical enterprises is fairly high. The above results are similar to those of Thailand companies, ranging from 3.46 to 4.16 and those of Malaysian small and medium enterprises, which reflected scores from 2.95 to 4.16. Secondly, it shows that the impact of these practices on firm performance is positive and significant. Equipment layout and supplier quality management were positively and significantly related to financial performance; and equipment layout, JIT delivery by suppliers, Kanban, cleanliness and organization, and information and feedback were positively and significantly related to non-financial performance. However, infrastructure practices did not have significant impact on financial performance.

The result contributes to both the theoretical and practical sides. This research extends previous research to show that identifying suitable OM practices (such as JIT, QM and infrastructure practices) and implementing them will lead to improve firm performance, not only in high – class firms in developed countries, but also in SMEs in developing countries, like Vietnam.

It suggests to mechanical enterprises in Vietnam that they should employ these practices which have a significant impact on firm performance in order to maintain and improve performance, and gain competitive advantages. It requires Vietnam's mechanical firms evaluate their capability and resources, set up timeline to implement those practices gradually and review results regularly. Managers of those firms should evaluate the results and compare them before and after applying practices because there are short-term and long term effects of those practices. Moreover, they should apply not only a particular set of practices, such as JIT or QM practices, but a combination of JIT, QM and infrastructure practices. Further research may continue to discover whether applying a set of operations management practices will lead to higher performance.

The limitation of the research was that the sample size was small and that the samples were mainly in the North region of Vietnam. The results of this study should encourage researchers to increase the sample size and widen the research to firms in other parts of Vietnam, as well as implement qualitative case study research to find out why some of operations management practices have no significant relationship with firm performance because they are considered to be important to mechanical firms and have been implemented daily in those firms.

References

Ahmad, S., Schroeder, R. G. (2002). "Dimensions of competitive priorities: Are they clear, communicated, and consistent?" *Journal of Applied Business Research*, 18(1), pp.77-86.

Ahmad, S., Schroeder, R. G., Sinha, K. K. (2003). "The role of infrastructure practices in the effectiveness of JIT practices: implications for plant competitiveness", *Journal of Engineering and Technology Management*, 20(2003), pp.161-191.

Anuar, A., Yusuff, R. M. (2011). "Manufacturing best practices in Malaysian small and medium enterprises (SMEs)", *Benchmarking: An International Journal*, 18(3), pp.324-341.

Arumugam, V., Ooi., K., Fong, T. (2008). "TQM practices and quality management performance: An investigation of their relationship using data from ISO 9001:2000 firms in Malaysia", *The TQM Magazine*, 20(6), pp.636-650.

Banker, R. D., Potter, G., Schroeder, R. G. (1993). "Reporting manufacturing performance measures to workers: An empirical study", *Journal of Management Accounting Research*, 5, pp.33-55.

Battistoni *et al*. (2013). "An analysis of the effect of operations management practices on performance", *International Journal of Engineering Business Management*, 5 (44), pp.15-27.

Buzzell, R. D., Gale, B. T. (1987). *The PIMS Principles: Linking strategy to Performance*. The Free Press, New York, NY.

Callen, J. L., Fader, C., Krinsky, I. (2000). "Just in time: a cross sectional plant analysis", *International Journal of Production Economics*, 63, pp.277-301.

Cua, K. O., McKone, K. E., Schroeder, R., G. (2001). "Relationships between implementation of TQM, JIT, and TPM and manufacturing performance", *Journal of Operations Management*, 19(2001), pp.675-694.

Cua, K. O., McKone-Sweet, K. E., Schroeder, R. G. (2006). "Improving performance through an integrated manufacturing program", *The Quality Management Journal*, 13(3), pp.45-60.

Curkovic, S., Vickery, S., Droge, C. (2000b). "Quality-related action programs: their impact on quality performance and firm performance", *Decision Sciences*, 31(4), pp.885-905.

Dao, M. A. (2019). "Best manufacturing practices and firm performance in the context of Vietnam's mechanical enterprises", *External Economic Review*, 118/2019, pp.17-32.

Davies, A. J., Kochhar, A. K. (2002). "Manufacturing best practice and performance studies: a critique", *International Journal of Operations & Production Management*, 22(3), pp.289-305.

Deming, W. E. (1986). *Out of the crisis*. MIT Press, Cambridge, MA.

Dilber, M. et al. (2005). "Critical factors of total quality management and its effect on performance in health care industry: A Turkish experience", *Problems and Perspectives in Management*, 4/2005, pp.220-235.

Duarte, A., Brito, L., Serio, L., Martins, G. (2011). "Operational practices and financial performance: an Empirical analysis of Brazilian manufacturing companies", *Brazilian Administration Review*, 8(4), pp.395-411.

Ferdows, K., Demeyer, A. (1990). "Lasting improvements in manufacturing performance: in search of a new theory", *Journal of Operations Management*, 9(2), pp.168-183.

Flynn, B. B. (1994). "The relationship between quality management practices, infrastructure and fast production innovation", *Benhmarking for Quality Management & Techonology*, 1(1), pp.48-64.

Flynn, B. B., Sakakibara, S., Schroeder, R. G. (1995). "Relationship between JIT and TQM: practices and performance", *Academy of Management Journal*, 38(5), pp.1325-1360.

Forza, C. (1995). "Quality information systems and quality management: a reference model and associated measures for empirical research", *Industrial Management & Data Systems*, 95(2), pp.6-14.

Fullerton, R. R., McWatters, C. S. (2001). "The production performance benefits from JIT implementation", *Journal of Operations Management*, 19, pp.81-96.

Huson, M., Nanda, D. (1995). "The impact of just in time manufacturing on firm performance in the US", *Journal of Operations Management*, 12, pp.297-310.

Kannan, V. R., Tan, K. C. (2005). "Just in time, total quality management and supply chain management: understanding their linkages and impact on business performance", *Omega*, 33, pp.153-162.

Ketokivi, M., Schroeder, R. G. (2004a). "Strategic, structural contingency and institutional explanations in the adoption of innovative manufacturing practices", *Journal of Operations Management*, 22 (2004), pp.63-89.

Ketokivi, M., Schroeder, R. G. (2004b). "Manufacturing practices, strategic fit and performance: A routine-based view", *International Journal of Operations & Production Management*, 24(2), pp.171-191.

Kristal, M., Huang, X., Schroeder, R. G. (2010). "The effect of quality management on mass customization capability", *International Journal of Operations & Production Management*, 30(9), pp.900-922.

Kumar, V., Choisne, F., Grosbois, D., & Kumar, U. (2009). "Impact of TQM on Company's Performance", *International Journal of Quality & Reliability Management*, 26(1), pp.23-37.

Li, M., Simerly, R. Y. (1998). "The moderating effect of environmental dynamism on the ownership and performance relationship", *Strategic Management Journal*, 19 (2), pp.169-179.

Matsui, Y. (2007). "An empirical analysis of just-in-time production in Japanese manufacturing companies", *International Journal of Production Economics*, 108(2007), pp.153-164.

McAdam, R., Bannister, A. (2001). "Business performance measurement and change management within a TQM framework", *International Journal of Operations and Production Management*, 21(1/2), pp.88-107.

Mohrman, S. A., Tenkasi, R. V., Lawler, E.E., Ledford, G. E. (1995). "Total quality management: practices and outcomes in the largest US firms", *Employee Relations*, 17(3), pp.26 -41.

Nakamura, M., Sakakibara, S., Schroeder, R. G., (1998). "Adoption of Just-in-time manufacturing methods at U.S. – and Japanese-Owned plants: some empirical evidence", *IEEE Transactions on Engineering Management*, 45(3), pp.230 -240.

Peng, D. X., Schroeder, R. G., Shah, R. (2008). "Linking routines to operations capabilities: A new perspective", *Journal of Operations Management* 26 (2008), pp.730-748.

Phan, C. A. (2014). *Impacts of quality management practices on competitive performance in manufacturing companies: Experiences from the United States, Japan, Germany, Italy and Korea*. Hanoi: Vietnam National University Publisher.

Raja, M. W., Bodla, M.A., Malik, S. A. (2011). "Evaluating the effect of total quality management practices on business performance: A study of manufacturing firms of Pakistan", *International Journal of Business and Social Science*, 2(9), pp.110-117.

Rungtusanatham, M., et. al. (2005). "TQM across multiple countries: Convergence Hypothesis versus national specificity arguments", *Journal of Operations Management*, 23, pp.43-63.

Sakakibara, S., *et. al*, (1997). "The impact of Just-in-time manufacturing and its infrastructure on manufacturing performance", *Management Science*, 43(9), pp.1246-1257.

Seedee, R., Sulaiman, M., Ismail, I. (2009). *Best business practices and performance in ceramics industry in Thailand*. 9th Global Conference on Business & Economics. UK: Cambridge University.

Tan, K. C., Kannan, V. R., Narasimhan, R. (2007). "The impact of operations capability on firm performance", *International Journal of Production Research*, 45(21), pp.5135 -5156.

Tata, J., Prasad S., Motwani, J. (2000). "Benchmarking quality management practices: US versus Costa Rica", *Multinational Business Review*, 8(2), pp.37-42.

Tran, K.L., Bui, N. H. (2009). "Impact of managerial practices on productivity", *Journal of Science and Technology Development*, 12(15), pp.73-86.

Upton, D. (1998). "Just-in-time and performance measurement systems", *International Journal of Operations & Production Management*, 18(11), pp.1101-1110.

Voss, C., Blackmon, K. (1994). "The impact of national and parent company origin on world class manufacturing: Findings from Britain and Germany", *International Journal of Operations & Production*, 16(11), pp.98-109.

Yusuff, R. M. (2004). "Manufacturing best practices of the electric and electronic firms in Malaysia", *Benchmarking: An International Journal*, 11(4), pp. 361-369.