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The Role of Quality Management & Innovativeness on Green Performance

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ABSTRACT
Recently, many firms have been focusing on sustainable manufacturing. The manager has to understand the social requirement of concern for environmental protection. This study develops a model to enhance the understanding of how market orientation, quality management, and innovativeness assist Thailand's food industry in attaining its optimal green performance, and to assess the mediating effect of quality management and innovativeness on market orientation and green performance. A questionnaire was developed and employed to gather data from 178 managers in the food industry. Data analysis is performed using the structural equation modelling approach. The results indicate that market orientation, quality management, and innovativeness positively and significantly affect green performance, both directly and indirectly. Moreover, quality management and innovativeness have a partial mediator effect on market orientation and green performance. This finding illustrates that Thailand's food industry could achieve green performance by developing market-driven, quality management capacity and innovation development. Copyright © 2017 John Wiley & Sons, Ltd and ERP Environment

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Introduction

IN THE ERA OF GLOBALISATION, THE CUSTOMER'S AWARENESS REGARDING ITS NEGATIVE IMPACTS HAS CHANGED RAPIDLY. ONE of the most important issues of globalisation involves its relationship to environmental problems. The significance of managing a sustainable business has become unavoidable due to the demands of customers, stakeholders, suppliers, and even global trade. Thus, a firm's performance is not only considered based on the quality of its product, but also on its environmental characteristics as well as on society as a whole. This means that companies have to operate their management systems and corporate responsibility to meet customer satisfaction, increasing sustainable competitive advantage (Alonso-Almeida *et al.,* 2014; Baumgartner, 2014; Johnson, 2015).

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Thailand's food industry holds the position as the top food and agricultural product exporter of Asia. Furthermore, the food industry is an important industry with a significant role in Thailand's economy, and there has been increasing growth in the number of food manufacturers (Satumanatpan *et al.*, 2014). Thailand's biggest export market for food and agriculture products is Japan (around 13% of the total export value), followed by the USA (around 11%), and China (around 7.6%) (Thailand Board of Investment, 2014). Thailand's food producers face pressures and constraints in both the impact of global trade (external effect) and climate change. We discuss the following issues in detail. (i) Global trade impact refers to the common effects of global trade agreements under the World Trade Organization (WTO), and with the EU and US markets, tracking increasing levels of sustainable development. By these agreements, environmental protection, waste management, and food safety concepts have been adopted alongside renewed import regulations for food importers (Satumanatpan *et al.*, 2014; Thailand Board of Investment, 2014; Ferreira *et al.*, 2015). (ii) Currently, climate change and environmental impacts are a global issue of increasingly urgent importance and directly influence Thailand's food producers. Extreme environmental effects are natural disasters, such as floods, droughts, extreme temperatures, and a rise in sea level. In addition, changes in rainfall have aggravated water resource management for farmers (Menikpura *et al.*, 2016). At the same time, the food industry generates large amounts of waste, water pollution (i.e., untreated sewage and toxic contamination in the food chain or environment), and air pollution (i.e., gaseous waste from processing) (Menikpura *et al.*, 2016).

Thailand's government has responded to this situation by improving environmental legislation and enforcement (Rimpeekool *et al.*, 2015). During the same period, the government has created many projects to assist and support the food industry. These include (Menikpura *et al.*, 2016) (i) implementing a suitable management system for the food industry, such as the International Organization for Standardization (ISO) and Hazard Analysis Critical Control Point (HACCP), and (ii) developing food production processes to meet customers' requirements and international regulations, as well as creating criteria to evaluate green industry systems and processes (Wirutskulshai *et al.*, 2011). The green industry criteria consist of five aspects: a management system, social responsibility, economic concerns, innovativeness/creativity, and environmental concerns (Green Industry, 2013). Based on the green industry concept, the aim of this study is to establish a model for determining the mediating role of quality management (QM) and innovativeness (IN) in the relationship between market orientation (MO) and green performance (GP). Specifically, this study attempts to understand the GP of Thailand's food industry, and can be applied as a managerial tool to improve organisational GP and assist managers' decision-making on environmental evaluation and social aspects.

The rest of this paper is organised as follows. Next, we present a literature review and develops the hypotheses. Subsequently, the research model is provided, and we also discuss measurement scale development, population and sampling, reliability and validity testing, data analysis, and model estimation. We then present and discuss the results of structural equation modelling, and finally, we conclude the paper.

Literature Background and Hypotheses

Green Performance

Currently, green and environmental issues are an important factor in global trading and investment. Moreover, with the trend towards increased globalisation, customers' behaviour and business activity have changed rapidly (Cassells & Lewis, 2011). As such, numerous scholars and researchers have been investigating the effectiveness of the adaption of management systems to reduce the environmental effects. The management systems are also tools, developed to evaluate a firm's implementation of GP (Martín-de Castro *et al.*, 2016). Furthermore, the management systems of international standards for GP evaluation are widely recognised to provide quantitative and objective information on the environmental protection and social standard aspects of an organisation. The key elements are designed to assess the transformation of new GP data into readable, easily understood information to implement and develop a firm. This study adopts GP indicators from ISO 14031 and identifies two types of indicators (Rowland-Jones *et al.*, 2005; Perotto *et al.*, 2008). These indicators are operational performance and environmental condition. The identification of the two aspects is as follows. (i) The operational performance indicator is intended to

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provide information regarding an organisation's operations that affect GP, such as procurement, technical process, and product/service used measures. (ii) The environmental condition indicator provides information concerning environmental conditions that are difficult to standardise (i.e., local, regional, rational, or global conditions of environmental aspects) because environmental conditions change over time or with specific events.

Quality Management

According to the environmental situation mentioned in the section, Green Performance, many firms have responded to these problems by integrating management systems with their business strategies. Previous studies have explained that QM can drive firms to avoid failures in production processing, increase productivity, and reduce environmental effects (Testa *et al.*, 2016). The food QM concept model of Luning and Marcelis (2007) and Dora *et al.* (2013) is adopted in this study, and the model consists of five aspects as follows. (i) Quality assurance deals with management systems through process documentation to ensure that entire firms or organisations implement stable, consistent processes, and adhere to them. There are many quality assurance tools appropriate for the food industry, such as HACCP, ISO, British Retail Consortium (BRC), international food system (IFS), quality system (QS), and approved contractor scheme (ACS). (ii) Quality improvement is a systematic and formal approach to improve organisational performance and facilitates problem solving through exploration across the organisation and employees' participation. Among the numerous techniques used are Lean Manufacturing, Six Sigma, Lean Six Sigma, and dashboard metrics. (iii) Quality design is a method to evaluate the level of effectiveness of design product functions based on customer requirements. Understanding customer needs is used to create new products and services, and transfer them to operational processes. Quality design techniques used include quality function development (QFD), failure mode and effect analysis (FMEA), and design of the experiment. (iv) Quality control refers to the procedures and processes to assure that the production processes and services adhere to quality criteria or meet customer requirements and expectations. Standard techniques of quality control are standard process control (SPC), acceptance sampling (AS), and visual inspection (VI). (v) Quality policy is an organisational goal towards quality and environmental crises. Total quality management (TQM), quality cost analysis (QCA), and strategic analysis are adopted to implement quality policy.

This section discusses how IN is affected by QM, and how IN mediates the effect between QM and GP. Numerous researchers have proven that QM has a positive and significant effect on IN (Perdomo-Ortiz *et al.*, 2006; Santos-Vijande & Álvarez-González, 2007; Kim *et al.*, 2012). Furthermore, some studies confirm that QM also shows a positive correlation that significantly affects green performance (Boiral & Henri, 2012; Wiengarten & Pagell, 2012; Zehir *et al.*, 2012; Fayzollahi *et al.*, 2013; Hajmohammad *et al.*, 2013; Lin *et al.*, 2013). Consequently, this study establishes the following three hypotheses to investigate how QM influences IN and GP.

H1: *Quality management positively relates to innovativeness.*

H2: *Quality management positively relates to green performance.*

H3: *Quality management mediates the relationship between market orientation and green performance.*

Market Orientation

There is growing awareness of the environmental effects of customer-created new markets for eco-friendly products/services. Moreover, forcing competitors' engagement, the public society becomes increasingly environmentally oriented (Shin & Thai, 2015). Thus, an MO firm must change and firms need to innovate their management to meet customer requirements, social performance, and environmental performance (Lee *et al.*, 2015). The MO concept of Narver and Slater (1990) is adopted in this study, and it comprises the three aspects of customer, competitor, and inter-functional orientation. Therefore, these three aspects can be explained separately as follows. (i) Customer orientation illustrates that the firms concentrate on customer needs, demands, and expectations through collecting and assessing data on customers' current and future requirements (Lintukangas *et al.*, 2015). Furthermore, the firms have to emphasise the quality of products/services and always manage customer relations. (ii) Competitive

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orientation implies understanding competitors and their strategies by using strategic management tools to scan competitors' strategies, such as using SWOT analysis, to assess competitors' internal aspects (i.e., strengths and weaknesses) and external aspects (i.e., opportunities and threats) in the current and future stages. The competitors' information enhances product development, and can be used to create new products or to differentiate services. (iii) Inter-functional orientation refers to the mechanism of all departments of organisations or companies cooperating to achieve organisational goals as well as to support customer satisfaction and competitor impetus.

To understand the correlation between MO and GP, we should, first, consider the relationship between MO and QM. Numerous scholars support the view that MO is positively affected by QM; moreover, numerous scholars have empirically investigated the relationship between MO and IN, and found a positive relationship (Wang *et al.*, 2012; Altuntaş *et al.*, 2013). In addition, many scholars have empirically investigated the relationship between MO and IN, and found a positive relationship (Wong & Ellis, 2007; Augusto & Coelho, 2009; Naidoo, 2010). Similarly, according to the results of Charles *et al.* (2012) and Chen *et al.* (2014), MO has a strong and direct effect on GP. Therefore, we propose the following hypotheses.

H4: *Market orientation positively relates to quality management.*

H5: *Market orientation positively relates to innovativeness.*

H6: *Market orientation positively relates to green performance.*

Innovativeness

The linkage between environmental concerns and IN has become increasingly important for many firms and organisations. Furthermore, it is considered the main source of firm strategies to increase EP, innovative output, and competitive advantage. To understand the IN aspect, several researchers have studied it and classified its total effects on GP (Chiou *et al.*, 2011; Ar, 2012; Sezen & Çankaya, 2013; Cheng *et al.*, 2014). The IN concept can be classified into the following three aspects. (i) Process innovation refers to the procedures, processes, and activities that influence a firm's innovation performance, which bring about differentiation in the form of quality and marketing. Moreover, process innovation can improve the capability and productiveness of production processes and product development. (ii) Knowledge and competency implies that management processes use knowledge to manage IN. This aspect also supports organisational learning, and is an important management tool used to develop and create new ideas in an organisation. (iii) Organisational support refers to the vision, mission, and strategy that emphasise innovation management. For a firm to be innovative, it needs a suitable business structure, reward system, and infrastructure to support and facilitate innovation. Thus, in line with the previous literature, we propose the following hypotheses.

H7: *Innovativeness positively relates to green performance.*

H8: *Innovativeness mediates the relationship between market orientation, quality management, and green performance.*

Based on the abovementioned literature and hypotheses, this study tests a hypotheses model (Figure 1) in which MO, QM, and IC are identified as antecedents to evaluate the achievement of GP.

Purposed Methodology

Measurement Variable Development

To develop measurement scales for ensuring the reliability and validity values, first we identify the measurement items based on the existing literature that relates to the measures of GP aspects for the food industry. Food QM

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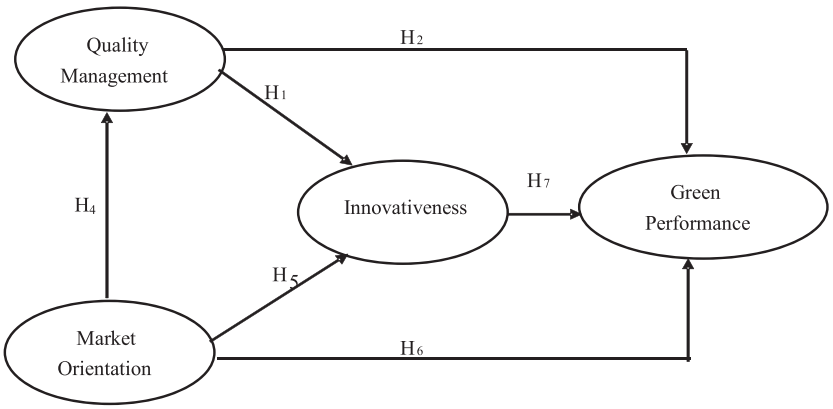

Figure 1. Hypotheses model

was adopted from Luning and Marcelis (2007). In addition, the QM aspect was divided into five types: quality assurance (Q1), quality improvement (Q2), quality design (Q3), quality control (Q4), and quality policy (Q5). The MO concept was developed from Narver and Slater (1990), and was separated into three aspects: customer orientation (M1), competitor orientation (M2), and inter-functional orientation (M3). The IN concept was adopted and combined from multiple studies (Ar, 2012; Sezen & Çankaya, 2013; Cheng *et al.*, 2014). IN can be classified into three aspects, namely process innovation (I1), knowledge and competency (I2), and organisational support (I3). The GP scale was constructed from the framework of ISO 14031, consisting of operational performance (G1) and environmental condition indicators (G2). We used a seven-point Likert scale throughout the questionnaire, in which the respondents were asked to assess their firm regarding QM, MO, IN, and GP dimensions. The reason for applying the Likert scale in this study is the easiness for respondents to understand it and the fact that it saves time.

Population and Study Sample

The respondents in this study belong to the food industry in Thailand, and have obtained certificates from the Department of Industrial Works. The target groups consist of vice-presidents or chief executive officers, as well as managers in Thailand's food industry, because they are the most knowledgeable about the extent to which their firms promote QM, MO, IN, and environmental management systems. Stratified sampling was used to select participants and the aim was to ensure that the final samples were a good representation of the different subcategories within the sample frame. For collecting the questionnaires in this study, multi-approach techniques were used to distribute the questionnaires, consisting of internet survey, mail survey, and drop-off survey techniques, resulting in 178 respondents. The background information of firms is provided in Table 1. In terms of organisational position, around 88.2% of the respondents were managers (i.e., general, production, and quality assurance managers), and around 11.8% were chief executive officers. Regarding QM, the respondents were asked to identify QM initiatives in their firms. Based on QA, around 77.5% of the food industry that participated in this study used HACCP, and around 74.2% used ISO, followed in descending order of use by BRC, IFS, ACS, and QS. The majority of respondents were asked to identify quality improvement techniques initiated in their companies. More than 40% of responding companies used lean manufacturing techniques, followed by Six Sigma, Lean Six Sigma, and dashboard metrics. Regarding quality design, the highest number of respondents used QFD, followed by the FMEA approach and design of experiment. On the other hand, based on the quality control dimension, around 80.3% of respondents used the SPC technique, followed by AS and VI techniques. For the last characteristic of respondents, the quality policy dimension, more than 53% of respondents used TQM, around 44.9 per cent used quality cost analysis, and 36% used strategic analysis.

Analysis

We used the structural equation modelling (SEM) method to measure the hypotheses of the proposed model. SEM is a statistical technique that represents the flexible interaction between theory and empirical data for

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Characteristics of respondents	N	Per cent (%)
Organizational position		
Chief executive officer	21	11.80
Managers (general managers, production managers, quality assurance managers)	157	88.20
Quality assurance		
Hazard Analysis Critical Control Point (HACCP)	138	77.5
International Organization for Standard (ISO)	132	74.2
British Retail Consortium (BRC)	42	23.6
International Food System (IFS)	13	7.3
Quality System (QS)	5	2.8
Approved Contractor Scheme (ACS)	10	5.6
Quality improvement		
Lean manufacturing	76	42.7
Six Sigma	39	21.9
Lean Six Sigma	23	12.9
Dashboard metrics	10	5.6
Quality design		
Quality function development (QFD)	93	52.2
Failure mode and effect analysis (FMEA)	49	27
Design of experiment	38	21.3
Quality control		
Statistical process control (SPC)	143	80.34
Acceptance sampling (AS)	128	72
Visual inspection (VI)	109	61.2
Quality policy		
Total quality management (TQM)	96	53.9
Quality cost analysis (QCA)	80	44.9
Strategic analysis	64	36

Table 1. Demographic data

comprehending the real world clearly. Furthermore, it can also illustrate structural relations graphically as to enable a conceptual framework of the theory being studied. The proposed model can be analysed statistically in a simultaneous analysis of the entire construction of variables. The SEM analytical process in this study consists of three stages – (i) measurement model estimation, (ii) structural model assessment, and (iii) mediating assessment – which we explain as follows.

Stage 1: Measurement Model Estimation

First, we performed exploratory factor analysis (EFA) to identify the unidimensionality of the variables and test the link of different dimensions (observed variables) on their underlying latent variables. The acceptable standard of EFA testing, the Kaiser–Meyer–Olkin (KMO) value, was below 1, and Bartlett's test of sphericity was significant. Subsequently, the confirmatory factor analysis (CFA) was tested to measure the validity of the measurement model, and the acceptable model fit value was measured using different common model fit measures as follows: (i) $1.0 < c^2/df < 3.0$; (ii) the goodness-of-fit index (GFI), comparative fit index (CFI), and increment fit index (IFI) > 0.90; and (iii) root mean square error of approximation (RMSEA) should not exceed 0.10 (Hair *et al.,* 2010; Schumacker & Lomax, 2010).

In order to test the reliability and validity, Cronbach's α method and composite reliability (CR) were used to assess inter-item consistency as well as the stability of the questions, to ensure that the respondents understood the questions in the questionnaire; the results showed high reliability, with Cronbach's α and CR both exceeding 0.7 (Chen *et al.,* 2014; Shin & Thai, 2015). Moreover, to test the reliability, we performed a pilot study with 30 managers in Thailand's food industry, and analysed the data using Cronbach's α method. Further, we employed factor-loading values of CFA to assess convergent validity, for which the high value is one greater than 0.5 (Hair *et al.,* 2010; Schumacker & Lomax, 2010).

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The EFA, reliability, validity, and measurement model results of the MO, QM, IN, and GP aspects are provided in Table 2. The KMO results indicate that all constructs exceeded 0.5, Bartlett's test results are significant ($p < 0.05$), and Cronbach's α and CR values exceed 0.7. In addition, all of the variables have factor-loading values higher than the acceptable value, which means that the observed variables are correlated with the representative factors and suitable to the actual data; moreover, all of the questions in the questionnaire can be used to gather data and measure the construct variables in this study. Further, after testing the measurement model, the results show a good fit to the data.

Stage 2: Structural Equation Assessment

The SEM approach was employed for estimating model fit and hypotheses testing. The results of the construct model conclude that the model meets the acceptable standards of model fit, which means that the observed variables' reliability manifests the theoretical construct (Hair *et al.,* 2010; Schumacker & Lomax, 2010). Within the proposed model, the results suggest that the hypothesised model fits the testing data ($\chi^2 = 176$; $df = 156$; $\chi^2/df < 3$; GFI, CFI, and IFI > 0.900; and RMSEA =0.014). Thus, the results of the conducted analysis reveal an adequate measurement portion of the model.

Stage 3: Mediating Assessment

To confirm the mediation effects, this study used Baron and Kenny (1986) to evaluate the mediating linkage between independent, mediator, and dependent variables. The authors suggested three models that should be estimated with the following conditions: (i) the independent variable significantly affects the dependent variable in the expected direction, (ii) independent variable significantly affects the mediator variable in the expected direction, and (iii) mediator variable significantly affects the dependent variable in the expected direction. Perfect mediation holds that the effect of the independent variable on the dependent variable is either not significant or significantly decreases when the mediator variable is controlled (James & Brett, 1984; Mackinnon, 2008; Fairchild & MacKinnon, 2009).

Variables	KMO and Bartlett's test	CR	Factor loading	Cronbach's α	χ^2/df	GFI	CFI	RMSEA
QM	0.907**	0.884						
- Q1			0.563	0.854	0.374	0.999	1	0.000
- Q2			0.851	0.822	1.794	1	0.995	0.048
- Q3			0.842	0.791	2.433	1	0.994	0.065
- Q4			0.775	0.867	2.519	1	0.993	0.067
- Q5			0.830	0.842	1.748	1	0.994	0.047
MO	0.912**	0.731						
- M1			0.828	0.882	0.560	1	1	0.000
- M2			0.837	0.882	0.075	1	1	0.000
- M3			0.833	0.811	0.803	1	1	0.000
IN	0.907**	0.822						
- I1			0.752	0.834	2.300	1	0.996	0.062
- I2			0.766	0.856	2.681	1	0.990	0.084
- I3			0.818	0.866	2.028	1	0.997	0.055
GP	0.930**	0.833						
- G1			0.914	0.918	1.049	0.988	0.999	0.012
- G2			0.772	0.904	2.131	0.994	0.997	0.058

Table 2. Results of exploratory and confirmatory factor analyses

Notes:

*and

**= significant at $p < 0.01$ and $p < 0.05$, respectively.

df = degrees of freedom, KMO = Kaiser–Meyer–Olkin value, CR = composite reliability, GFI = goodness-of-fit index, CFI = comparative fit index, RMSEA = root mean square error of approximation, QM = quality management, MO = market orientation, IN = innovativeness, GP = green performance.

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Results and Discussion

We conducted SEM to test the hypotheses (Figure 2 and Table 3). H_1 predicts that QM is not related to IN ($p > 0.05$). The results regarding the linkage between QM and GP illustrate a clearly positive impact of QM on GP ($\gamma_1 = 0.642, \rho < 0.01$); this result is statistically significant and, thus, H_2 is supported by this analysis. The three paths of hypotheses H_4, H_5, and H_6 are ratified, MO showing a significant relationship with GM, IN, and GP ($p < 0.01$), and the standardized factor loadings are 0.878, 0.791, and 0.491, respectively. Thus, the hypothesised positive impact of MO on QM, IN, and GP is supported. Moreover, the positive influence of MO is nearly as strong on IN as it is on QM. The results, with regard to the impact of IN on GP, are strongly significant, with a factor loading of 0.786. Therefore, IN is positively supported with GP and, thus, H_7 is confirmed. Further, the results show that the total effect from MO on GP is significant; the direct effect is 0.491 and indirect effect is 1.186. This implies that the adequate MO, QM, and IN of a firm impels and contributes to GP for developing green implementation.

Following the mediation testing steps explained in the Analysis section, we evaluated whether the mediator variables (IN and QM) mediate the relationship between the independent (QM and MO) and dependent variables (GP), as shown in Table 4. Overall, the model is a good fit and deemed appropriate.

The results on the mediating roles of QM and IN on the relationship between MO and GP from Table 4 indicate that the mediating role of IN in Model 4, for the effect of MO on GP, is not significant and decreasing ($\gamma = 0.0.50$, $\rho > 0.05$), when compared to the relationship between MO and GP in Model 2. This means that IN has a significant and complete mediating effect on the relationship between MO and GP. Whereas, according to Model 5, QM has a partial mediating effect on MO and GP ($\gamma = 0.455$, $\rho < 0.05$). Furthermore, the regression analysis result in Model 6

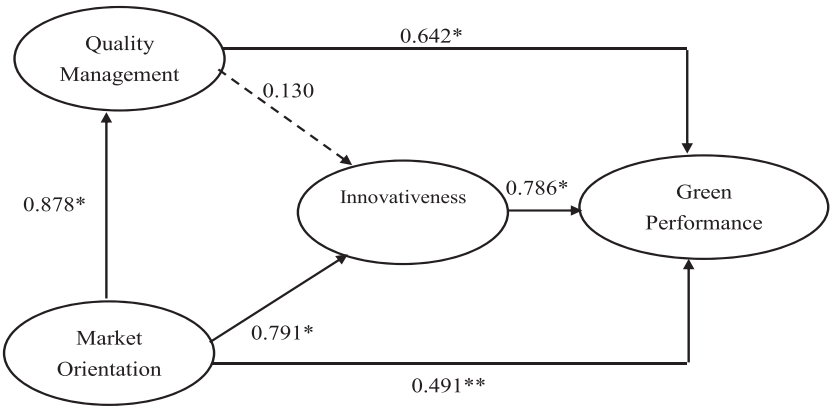

Figure 2. Path model

Causal path	Hypothesis	Point estimate	Hypothesis support
QM ➔ IN	H_1	0.130	No
QM ➔ GP	H_2	0.642*	Yes
MO ➔ QM	H_3	0.878*	Yes
MO ➔ IN	H_4	0.791*	Yes
MO ➔ GP	H_5	0.491**	Yes
IN ➔ GP	H_6	0.786*	Yes

Table 3. Results of hypotheses
Notes:
*and
**= significant at $p < 0.01$ and $p < 0.05$, respectively.
QM = quality management, MO = market orientation, IN = innovativeness, GP = green performance.

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Causal path	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
QM ➔ IN			0.810*			0.130
QM ➔ GP	0.840*		0.341*		0.451**	0.642*
MO ➔ QM					0.849*	0.878*
MO ➔ IN				0.923*		0.791*
MO ➔ GP		0.740*		0.050	0.455**	0.491**
IN ➔ GP			0.607*	0.867**		0.786*

Table 4. Results of regression
Notes:
*and
**= significant at $p < 0.01$ and $p < 0.05$, respectively.
QM = quality management, MO = market orientation, IN = innovativeness, GP = green performance.

partially supports a positive and significant effect of MO on GP, through IN and QM. Consequently, QM and IN partially mediate the relationship between MO and GP in this model. Thus, H_3 and H_8 are confirmed, that is, QM and IN can mediate the relationship between MO and GP, as well as increase the effectiveness of GP evaluation.

Conclusion

The objective of this study was to assess the mediating effect of QM and IN on MO and GP. Specifically, we combined QM, IN, and MO foundations to develop a hypotheses model. Overall, the results indicate that QM and IN have a positively significant mediating effect on MO and GP in Thailand's food industry. The main finding of this study reveals that MO, QM, and IN positively and significantly influence GP, which means that significant opportunities exist for Thailand's food industry to implement MO, QM, and IN, to complement the effectiveness of GP and promote a firm's GP. Contradictory to our expectations, we found no relationship between QM and IN; however, it is possible that this relationship is not suitable given the context of Thailand's food industry. This is consistent with the findings of Parast (2011) that QM programs are best implemented to support innovativeness and firm performance (Johnson, 2015), but are not suitable for all businesses and industries. Moreover, according to Bon and Mustafa (2013), Jackson *et al.* (2016), and Parast (2011), QM systems emphasise standards, conformity, cost efficiency, error reduction, and standardisation enforcement, which could limit opportunities for IN. However, according to Prajogo and Sohal (2012), quality improvement may have beneficial effects on firms' IN through training, teamwork, and continuous communication to encourage change and create ideas in organisations. Furthermore, integrating QM and MO can support firms' development of IN and GP.

The results of this study contribute to academic literature in several ways. Especially, this study attempts to contribute to the GP literature through constructing the framework model of the interrelationships among the roles of MO, QM, and IN for scholars and researchers to understand. Consequently, our findings make three academic contributions. First, according to the academic finding on the relationship between MO and GP, this study enriches the knowledge in this domain by integrating the appropriate variables to increase the effectiveness of the GP measurement, such as QM and IN, as the mediator variables in the proposed model, which helps to fill the gap in the extant literature. Second, in accordance with empirical findings, the results discover that the impact of MO on GP is positively significant. Moreover, we also find that dynamic MO can improve firms' GP. Third, IN has a completely mediating role on MO and GP, which means the significance of MO and IN is critical for GP. Namely, if the companies invest in facilities and resources, as well as enhance their IN and MO, they will achieve GP, whereas QM mediates the connection between MO and GP. Therefore, this finding revealed the considerable influence of IN and QM when companies carry out both factors and pursue GP. Thus, the development of the QM dimension is important for companies in order to increase sustainable manufacturing in the GP context and enhance their competitive advantage.

We provide a timely contribution to corporate sustainable management literature, particularly concerning the reduction of environmental effects, since the results illustrate that MO can influence the effectiveness of QM and IN as well as promote firms' GP. Therefore, in order to enhance the current and future GP of a company, managers

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should emphasise the dynamic consumer behaviour, regarding society and global trade, by setting up suitable goals and business strategies, which can support the company in achieving GP (Martín-de Castro *et al.*, 2016). For instance, companies should explicitly strengthen their strategies regarding environmental awareness to adhere to environmental regulations and public policies, in order to obtain an improved GP outcome (Cassells & Lewis, 2011; Doda *et al.*, 2016; Graafland & Smid, 2016). Furthermore, managers should integrate the environmental aspect into their firms' financial and nonfinancial strategies by increasing the investment rate and number of facilities, to support environmental activity and hold the leading position in the market (Ortas *et al.*, 2015; Testa *et al.*, 2016).

In addition, the results of this study show that firms' commitment to QM and IN play an important mediating role in MO and GP. As such, regarding GP performance, firms should embed MO into their operational strategies. Moreover, to create organisations' culture concerning environmental protection and green awareness, managers should find ways to perform MO, QM, and IN programmes concurrently, and integrate them in the firms' daily activities. Further, to increase firms' environmental or green awareness, policymakers should develop the appropriate environmental regulations, create prominent criteria for evaluating GP to enhance firms' environmental implementation, and provide the information and training courses appropriate for the business level, such as management systems and technology for supporting production.

This study has some limitations, which can assist in identifying the direction for further research. First, this study is the first that explores the mediating effect of QM and IN on MO and GP, and gathers data based on the point of view of managers in Thailand's food industry, who may have some biases that can affect the results. In addition, future studies should verify these results by extending the research area (i.e., a wider range of businesses and countries). Second, although our study indicates the significant relationships among variables, with respect to GP, further research can be explored to apply this proposed model to enhance firms' GP. For instance, regarding helping a business to achieve sustainable manufacturing, future studies should investigate how this issue can be embedded into the concepts of green marketing, QM, and IN.

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