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Total quality management for enhancing organizational performance: The mediating role of green manufacturing practices

Amani Said Hassan [a], Ayham A.M. Jaaron [b,*]

[a] Quality Management Program, Faculty of Graduate Studies, Arab American University, Palestine (AAUP), Al-Rehan, Ramallah, 97200, West Bank, Palestine
[b] Department of Management and Entrepreneurship, The Centre for Enterprise and Innovation, Leicester Castle Business School, De Montfort University, Leicester, LE2 7BY, UK

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ABSTRACT

Owing to the rapidly deteriorating environment in developing countries caused by practices of manufacturing organizations and lack of adequate studies that can help manufacturing organizations to counter this issue, this paper aims to investigate the underlying relationship between total quality management (TQM) and the level of green manufacturing (GM) practices implementation in Palestinian food manufacturing companies (PFMC). The paper also investigates how GM practices mediate the relationship between TQM and Organizational Performance (OP) of PFMC. A quantitative research method using a survey instrument collected data from senior, quality, and human resources (HR) managers from 250 PFMC. The statistical data analysis indicated a significant positive correlation between TQM practices and overall OP ($r = 0.605$; $p \leq 0.01$). This indicates that TQM practices significantly supports achieving overall OP objectives. Also, results found a significant positive correlation between the TQM practices and the implementation level of GM practices ($r = 0.650$; $p \leq 0.01$), suggesting the significant role of TQM in enhancing organizational capabilities in implementing GM practices. Moreover, the results indicated that GM practices are equally important to TQM practices in enhancing overall OP; as GM practices were found to have a positive correlation with improving overall OP of PFMC ($r = 0.827$; $p \leq 0.01$). Finally, TQM practices are found to have a significant indirect effect on OP mediated by GM practices ($\beta = 0.55$, $p \leq 0.05$), whereas a significant total effect of TQM practices on OP were found ($\beta = 0.64$, $p \leq 0.05$), reflecting that the GM practices' mediating effect partially accounts for roughly 86% of total effect of TQM practices on overall OP. This empirical study is considered as the first study investigating the impact of TQM practices on implementation of GM practices and their complementary impact on OP in Palestine, adding great value to literature via responding to calls to counter environmental issues in developing countries' context.

1. Introduction

Environmental deterioration and degradation issues recently become a significant concern in various parts of the world, including developing countries (Masri and Jaaron, 2017; Masron and Subramaniam, 2019; Asif et al., 2020). Manufacturing irresponsible practices in developing countries make the problem bigger (Ferronato and Torretta, 2019; Trujillo-Gallego et al., 2020; Karuppiah et al., 2020). This is resembled by common unsustainable management of manufacturing wastewater, open dumping and burning of solid waste, use of toxic substances, and uncontrolled pollutant emissions that harm the atmosphere (Ramayah et al., 2013; Namagembe et al., 2019; Ferronato and Torretta, 2019). According to Yasir et al. (2020), very few manufacturers in developing countries pay attention towards the protection of natural environment due to absence of clear green business strategies despite increasing customer environmental awareness. This was further confirmed by the work of Javeed et al. (2020) and Roscoe et al. (2019) who explained that manufacturing businesses in developing countries should invest more in environmental management strategies and practices. Hence, customer concerns about environmental issues have become a cause of exerting pressure on manufacturing companies to adopt GM practices that can minimize their impact on the environment and reach customer satisfaction (Sharmin et al., 2015). However, the concept of modern management has been linked to TQM to cover all stages and aspects of performance in companies (Snongtaweeporn et al., 2020). As a result, manufacturing companies employ TQM practices to assist in adopting

* Corresponding author.
E-mail addresses: amanihabubaker@gmail.com (A.S. Hassan), ayham.jaaron@dmu.ac.uk, ayham.jaaron@dmu.ac.uk (A.A.M. Jaaron).

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green practices by playing a significant role in responding to customer needs for a better and cleaner environment (Liao and Tsai, 2019; Dehe and Bamford, 2017). In this regard, TQM aims to produce high-efficiency products at the lowest cost and shortest delivery time (Abbas, 2020). This is a clear call for green practices through the need for waste reduction, as TQM set managerial foundations to produce right the first time (Liu et al., 2020). Hence, reducing production energy, and minimizing defects and wastes, which is the core of GM practices (Siva et al., 2016; Qasrawi et al., 2017). This introduces TQM as an environmentally friendly management system (Yusr et al., 2017; Abbas, 2020). Furthermore, TQM improves OP by the positive effects on top management communication and commitment towards continuous improvement initiatives at all levels (Keinan and Karugu, 2018; Omar et al., 2018; Qasrawi et al., 2017).

Manufacturing organizations following TQM principles focus on enhancing the individual capabilities to improve performance of operations and products and services through a continuous training process (Shafiq et al., 2019). Therefore, TQM is believed to have a major role in enhancing OP including achievement of GM practices objectives (Inman et al., 2019). In fact, GM practices can reduce the ecological impact of manufacturing activities without reducing the quality and reliability of products, and without increasing production cost, which improves OP and ensures the overall economic profit (Shang et al., 2010).

Although the strong relationship between TQM and GM practices have been proven by numerous scholars in developed countries context such as Beckmerhagen et al. (2003), Ho et al. (2016), Zutshi and Sohal (2005), and Allur et al. (2018), similar studies on the impact of TQM implementation on the adoption of GM practices is very rare in developing countries context; where quality excellence and GM practices concepts are at a prelusive level (Abbas, 2020). TQM and GM practices' demand is no longer a prerogative of manufacturers in developed countries only; manufacturers in developing countries are required to overcome traditional trade barriers and compete with manufacturers in developed countries (Iqbal, 2019). Therefore, TQM and GM practices are becoming more and more vital in developing countries. Moreover, through its focus on utilizing new technologies which enable reducing pollution, energy consumption, and waste, GM practices greatly enhance the performance and quality of existing products and services (Abbas, 2020). Therefore, this would imply that GM practices could play a similar role to that of TQM in enhancing organizational overall performance. Given prominence of TQM and GM practices, this paper aims at investigating the underlying relationship between TQM and GM practices and their impact on organizational performance using the PFMC operating in the developing country context of Palestine. The paper also investigates how GM practices mediate the relationship between TQM and Organizational Performance (OP). However, PFMC have been selected in this research due to Palestine having a high population density, which makes people more vulnerable to the dangers of environmental pollution caused by the presence of certain indiscriminately distributed manufacturers of a dangerous nature (Al-Sa'ed, 2005). In fact, a few efforts were employed in the field of environmentally friendly practices in Palestinian manufacturing sector; these efforts aimed at finding out the feasibility of applying green principles to improve the quality of Palestinian's environment and the economy with no direct links to organisational performance (Shkoukani, 2008).

This empirical study is considered as the first study investigating the impact of TQM practices on implementation of GM practices and their complementary impact on OP in Palestine, thus adding great value to literature via responding to calls to counter environmental issues in developing countries context. The study also provides valuable insights for manufacturing organizations to achieve performance development objectives through TQM and GM practices.

The remainder of the paper is organized into eight sections. Next, we present previous studies to define the concept of TQM and its relationship with OP (Section 2). Then, a literature account on TQM relationship with GM practices and GP practices impact on OP are provided (Sections 3 and 4). Based on literature, we then introduce the research conceptual framework (Section 5). Next, we represent the research methodology of this study (Section 6), followed by performing data analysis and explaining the findings (Section 7). Thereafter, we discuss the results and introduce the theoretical and managerial implications (Section 8). Finally, conclusions and future research work are presented (Section 9).

2. TQM and OP

TQM denotes both a "philosophy and a set of guiding principles that represent the foundation of a continuously improving organization" (Dahlgaard et al., 2019). It is a contemporary management philosophy based on a set of modern management indicators and concepts regarding innovative efforts, basic administrative definitions, and specialized technical skills (Singal et al., 2016). Those indicators and concepts aim to enhance performance, improvement, and continuous development (Arumugam et al., 2008). TQM is adopted in many organizations to improve quality of its services and products, help reduce defect rates, and gain customer satisfaction (Shafiq et al., 2019). In general, TQM practices within organizations are classified into two main categories, namely soft and hard practices (Rahman and Bullock, 2005). Soft practices are long term factors that are the intangible side of practices and concerned with behavioural and management aspects, and they must be in the company's TQM strategy, including "Customer Focus", "Quality System", "Supplier Relationship and Management", "Strategic Planning" and "Leadership" (Iqbal et al., 2016; Abdallah, 2013). While hard practices are the tangible side of TQM practices, aimed to maximize the soft practices' effects, and concerned with TQM tools and systems enhancement that are meant to improve TQM soft practices (Lewis et al., 2006). TQM's hard practices include "Continuous Improvement" and "Process Management and Efficiency" (Abdallah, 2013; Pattanayak et al., 2017). No wonder that TQM has become the representative of success for most organizations globally through enhancing organizational reputation and public image (Setu et al., 2016). It also helps meet customers' requirements by improving the effectiveness, competitiveness, and the flexibility of operations and management systems (Herzallah et al., 2014; Topalović, 2015). Besides, it leads the organization to reach a differentiation with a high degree, strengthen brand image, and reduce costs by preventing wasted time and low quality (Lee et al., 2015). Therefore, it creates a new firm's culture that leads to improvements in its activities and management system (Conca et al., 2004). However, scholars referred to several TQM practices in literature. In this

Table 1
TQM Practices included in research and their sources.

TQM Practices	
Customer Focus	Yas et al. (2021); Munyanduri (2018); Valmohammadi (2011); Tari (2005); Demirbag et al. (2006); Salaheldin (2009); Yusr et al. (2017); Abbas (2020).
Quality System	Yeng et al. (2018); Nithya (2018); Bayraktar et al. (2008); Sun (2000); Yusr et al. (2017).
Continuous Improvement	Nithya (2018); Talib and Rahman (2010); Sadikoglu and Zehir (2010); Antony et al. (2002).
Supplier Relationship and Management	Yusr et al. (2017); Sadikoglu and Zehir (2010); Talib and Rahman (2010); Abdallah (2013); Tari (2005); Demirbag et al. (2006); Antony et al. (2002); Yusr et al. (2017).
Process Management and Efficiency	Bajaj et al. (2016); Sadikoglu and Zehir (2010); El Shenawy et al. (2007); Feng et al. (2006), Tari (2005); Demirbag et al. (2006); Yusr et al. (2017); Abbas (2020).
Strategic Plaining	Yeng et al. (2018); Zaidi and Ahmad (2020); Bajaj et al. (2016); Lee et al. (2010); Talib and Rahman (2010); Abbas (2020).
Leadership	Bayraktar et al. (2008); Sadikoglu and Zehir (2010), Ebrahimi and Rad (2017); Bouranta et al. (2017); Yusr et al. (2017); Abbas (2020).

study, seven TQM practices were adopted based on in-depth literature reviews. Table 1 illustrates the TQM practices adopted in this research and their sources.

In their investigation of the extent of TQM adoption and its impact on OP in Indian manufacturing sector, Singh et al. (2018) found that TQM practices (i.e., organisational leadership, HR management, customer relationship, strategic planning, and supplier management) have a strong positive impact on OP in terms of financial results and customer satisfaction. Similarly, Modarres and Pezeshk (2018) examined TQM-organisational performance relationships using organisational learning as mediator. Authors explained that TQM has significant positive effect on OP, and this effect can be further enhanced when mediated by organisational learning practices. Furthermore, Sha'aar & Najjar (2015) explored TQM application in Jordanian banking sector and found that TQM practices application of strategic planning, employee empowerment, and continuous improvement have a positive impact on banks technological innovation capabilities and competitive advantage. Moreover, Pradhan (2017) identified that TQM implementation in Nepalese manufacturing organizations was related to business excellence results. In his study, Top management commitment, training and education of employees, employee empowerment, and customer relationships were among the most contributing practices to operational excellence and growth. Another research aiming at investigating which TQM practices are most contributing to OP in the telecommunication sector was reported by Qasrawi et al. (2017). Authors found that TQM practices of customer focus and process management have the most significant positive impact on OP, and that teamwork as part of TQM practices has strongest effect on organizational knowledge management effectiveness. Furthermore, results reported by considerable previous studies conducted on organizations in various business environments classified the positive impacts of TQM practice on OP into financial, operational, and employee performance. Table 2 shows several studies supporting this adopted categorization in this research.

Based on this, the following hypothesis is formulated:

H1. There is a statistically significant correlation between the TQM Practices and OP in PFMC.

3. TQM and GM

GM is the method that enables the organization, whether large or small, to understand what should be done about its negative effects on the environment that causes efficiency reduction, increases the cost, and reduces its productivity (Abdul-Rashid et al., 2017; Seth et al., 2018). GM is responsible for producing green products that does not damage the environment when it is produced, used, or destroyed (Afum et al., 2020; Vrchota et al., 2020). However, no product is totally green as it is a relative matter. In this regard, GM aims at reducing, preventing, and avoiding the waste that would occur in the production process (Belekar, 2017). This was confirmed by Karuppiah et al. (2020) who explained that the main objective of GM practices is the elimination of waste entering landfill while focusing on reducing manufacturing waste and natural resources depletion. Thus, it protects workers, the environment, alongside improving competitiveness, profitability, and industrial efficiency (Eshikumo and Odock, 2017). Lin et al. (2011) classified GM practices into two main categories, namely green supply chain management (GSCM) and total quality environmental management (TQEM) (Alhamali, 2019). However, a lot in common could be found between TQM and GM practices (Abbas, 2020). Allur et al. (2018) argues that TQM shares many practices with GM. According to authors, green practices are also categorized into soft and hard practices like TQM. Soft green practices are the intangible practices and should be concerned with behavioural and management aspects to build company's strategy including "Green Customer Satisfaction", "Green Training", "Green Cooperating with Suppliers and Customers", "Green Manufacturing Strategies", and "Green Stakeholders Commitment". While hard green practices are tangible practices and should be aimed at maximizing the soft green practices and concerned with the tools and systems including "Green Improvement Projects Selection and Implementation", "Green Waste Management", and "Techniques Green Manufacturing System". Furthermore, there has been a broad trend in last years towards implementing environmental sustainability practices as part of TQM practices (Teixeira et al., 2019; Lagrosen and Lagrosen, 2019). Both philosophies take a proactive stance in which managers' focus on long-term goals, maintaining performance achievements, zero-defect approach, waste reduction, life cycle assessment, employee participation, and training (Seth et al., 2018). Hence, inadequate quality practices damage the company's environmental performance capabilities and can, in return, harm organizational reputation and financial performance (Tasleem et al., 2018; Sharma et al., 2019). Moreover, Habib et al. (2019) found that poor quality practices indicate a weak application of GM, as it contributes to wasting human efforts and natural resources. This would imply that the application of TQM leads to the effective use of resources, especially natural resources (Shafiq et al., 2019; Siva et al., 2016).

At a more subtle level, Anil and Satish (2019) indicated that TQM proved to be efficient in GM practices adoption by playing a vital role in responding to customers' needs for a better, cleaner environment. Also, Sweis et al. (2019) emphasized that the TQM goal of 'zero defects' is closely related to the GM goal of 'no waste'. In the same vein, Allur et al. (2018) argued that organizations that have adopted TQM practices might foster and develop a set of skills that facilitate the adoption of GM practice as both practices share a similar focus; using inputs more efficiently. However, scholars in their studies referred to several GM practices that are potentially associated with TQM practices. Table 3 illustrates the GM practices adopted in this research.

Based on this, the following hypothesis was formulated:

H2. There is a statistically significant correlation between the TQM Practices and GM Practices in PFMC.

4. GM and OP

As it was discerned earlier, adoption of GM practices plays a significant role in enhancing organisational reputation and public image (Khan and Qianli, 2017; Zhu et al., 2007). In emerging economies context, several studies reported that green manufacturing would be major issue for enhancing manufacturing firms' competitiveness over the coming years (e.g., Diabat and Govindan, 2011; Rehman et al., 2013; Rehman et al., 2016; Masri and Jaaron, 2017; Zaid et al., 2018; Afum et al., 2020). Based on the work of Teles et al. (2015) in the Brazilian manufacturing sector, GM practices were found to have a positive influence on reducing consumption of natural resources and waste generation. In India too, Rehman et al. (2016) explained that GM Practices work towards improving effective utilization of organisational resources such as conservation of energy, water, raw materials, reuse of scrap, and returned products through reverse logistics. This explains why stakeholders nowadays consider GM as major contributor to environmental protection measures widely welcomed by governments and consumers

Table 2
OP categorization adopted in research and their sources.

Organizational Performance Dimensions	
Operational Performance	Garcıa-Bernal and Ramırez-Aleson (2015); Psomas and Jaca (2016); Chaudhry et al. (2018); Shafiq et al. (2019); Kim and Thapa (2018); Jyoti and Rani (2017).
Financial Performance	Dubey et al. (2015); Garcıa-Bernal and Ramırez-Aleson (2015); Psomas and Jaca (2016); O'Neill et al. (2016); Kim and Thapa (2018); Shafiq et al. (2019); Chaudhry et al. (2018); Jyoti and Rani (2017).
Employee Performance	Zairi et al. (1994); Jyoti and Rani (2017); Shafiq et al. (2019), Chaudhry et al. (2018); Nazir and Islam (2017); Zaidi and Ahmad (2020).

Table 3
GM Practices included in research and their sources.

Green Manufacturing Practices	Supporting Literature
Green Customer Satisfaction	Vafaei et al. (2019); Tarabieh (2018); Yu et al. (2017); Ghinmine and Sangotra (2015); Rehman et al. (2013); Asgharian et al. (2012).
Green Improvement Project Selection and Implementation	Bohari et al. (2017); Firdaus and Mohamed Udin (2014); Luthra et al. (2013); Choi (2009).
Green Training	Mousa and Othman (2020); Jassim and Najem (2019); Abdul-Rashid et al. (2017); Siyambalapitiya et al. (2018).
Green Cooperating with Suppliers and Customers	Azevedo et al. (2011); Ali et al. (2017); Abdul-Rashid et al. (2017); Dai (2013); Tseng et al. (2013), Chan et al. (2012); Azevedo et al. (2011).
Green Waste Management	Baumer-Cardoso et al. (2020); Afum et al. (2020); Khairani et al. (2017); Murey (2020); Roy and Khastagir (2016); Dawood and Abdullah (2018); Luthra et al. (2013); Rao (2008).
Green Manufacturing strategies	Afum et al. (2020); Al-Azawi and Al-Sabbawi (2013); Govindan et al. (2015); Maruthi and Rashmi (2015); Nunes (2011); Deif (2011).
Technique of Green Manufacturing System	Afum et al. (2020); Pang and Zhang (2019); Abdul-Rashid et al. (2017); Roy and Khastagir (2016); Maruthi and Rashmi (2015); Kauffman and Lee (2013); Yuan et al. (2012).
Green Stakeholder Commitment	Srivastava et al. (2020); Gomez and Yung (2018); Qudrat-Ullah (2018); Rehman et al. (2013).

alike (Masri and Jaaron, 2017). Afum et al. (2020) examined the mediating effect of green supply chain practices on the relationship between GM practices and sustainable performance (i.e., economic, social, environmental) in the Ghanaian manufacturing SMEs. Authors confirmed that GM practices have significant effect on sustainable performance in that context, and that green supply chain practices mediated the relationship between GM practices and sustainable performance. In the same vein, Abdul-Rashid et al. (2017) found a significant impact of sustainable manufacturing practices on sustainable performance of Malaysian manufacturing companies. It is as posited by Ghazilla et al. (2015), GM practices allow manufacturers to comply swiftly with their stakeholders' demands regarding improving their environmental footprint, hence, satisfying their customers and potentially carving a competitive niche. This has increased pressure on manufacturers to incorporate GM management practices into their business operations (Zhao et al., 2018). Emanating from this, going green through the adoption of GM practices not only enhance brand name but help organisation to compete more effectively through long-term cost reductions and higher investor interests (Dubey et al., 2015). Roy and Khastagir (2016) argued that GM management in Indian petrochemical industry was associated with better environmental performance and, thus, contributed to improved business performance in terms of process and product enhancements. Authors also found positive impacts of GM practices on organisational green innovation capabilities. According to Shrivastava and Shrivastava (2017), through its focus on rationalizing resource consumption and waste reduction, GM provides a win-win situation for organizations in terms of better environmental protection and higher economic returns. In addition, Zhu et al. (2007) emphasized that organizations with higher levels of green practice implementation are associated with better performance outcomes. Lee et al. (2015) explained that green practices encourage organizational learning and the development of internal competencies and improved organizational effectiveness. According to Abbas (2020), waste and resources consumption reductions, fundamentally practiced through GM, are enablers for increased production time and lees time to market combined with enhancement of social responsibility and human rights aspects. This view of GM attracts more customers that will contribute to improving manufacturers financial and operational performance (Zhao et al., 2018). Based on this ever-growing body of research, the following hypothesis is presented:

H3. There is a statistically significant correlation between the GM Practices and OP in PFMC.

Considering discussion in section 3 of TQM and GM, protecting natural resources by manufacturers is essentially determined by the level of quality practiced (Allur et al., 2018). According to Habib et al. (2019), malpractice of quality measure results in wastage of natural and organisational resources and, thus, reduce organisational overall green performance. In this context, TQM plays a major role in efficiently managing human and natural resources through its key principle of continuous improvement (Shafiq et al., 2019). This ensures that TQM practices are strongly linked with facilitation of GM practices, which together can improve organisational performance. However, based on this and arguments supporting hypothesis H2 presented above, it is argued that GM practices potentially play a mediating role between TQM and OP. This has led to the formulation of the following hypothesis:

H4. There is a significant indirect effect of implementing TQM practices on Organizational Performance mediated by the implementation of GM practices in PFMC.

5. Conceptual framework

The Conceptual Framework shown in Fig. 1 links the hypotheses formulated and demonstrates the conceptualisation of the research.

6. Research methodology

In this research, a quantitative research methodology using a survey instrument to test the formulated hypotheses were employed. The survey instrument was developed based on the literature using a five-point Likert scale with the following anchors (strongly disagree, disagree, neutral, agree, and strongly agree). The process of survey instrument development followed guidelines of Burton and Mazerolle (2011) and covered two main stages. First, an extensive exploration of related literature was conducted to cover main domains included in this research (i.e., TQM, GM, and OP) and their interrelationships. To ensure widest inclusions of related sources, major scholarly databases and publishers were utilised such as databases of Scopus and Web of Science, Elsevier, Emerald, Taylor and Francis, and Sage, together with search engines including Google and Google Scholar. Accordingly, keywords such as "quality and green practices", "green manufacturing and performance", "TQM and performance", "TQM and sustainability", and "TQM and clean production" were among the most used keywords in the literature search process. Based on thorough understanding of literature reviews, the second step was the survey items' generation and judgement of their appropriateness (Burton and Mazerolle, 2011). The survey used scale-items with five-point Likert scale mentioned earlier as they allowed for more streamlined analysis (Sekaran, 2000). As a part of the content validity of the survey instrument, its design, readability, and clarity have been reviewed by three independent academic professors and one expert from PFMC before it was adopted. The survey contained four sections, the first section targeted the demographic characteristics of respondents and has five items, the second section focused on TQM practices and contains 31 items, the third section covered GM practices and consisted of 36 items, and the final section focused on OP and consisted of 12 items.

Before collecting data, a pilot study was conducted to check the validity and clarity of the survey to potential respondents (Bhattacherjee, 2012). The researcher selected an independent random sample of five trusted managers and engineers who work at the HR and quality management departments of PFMC. Based on the suggestions of the sample respondents, minor modifications were made to some statements

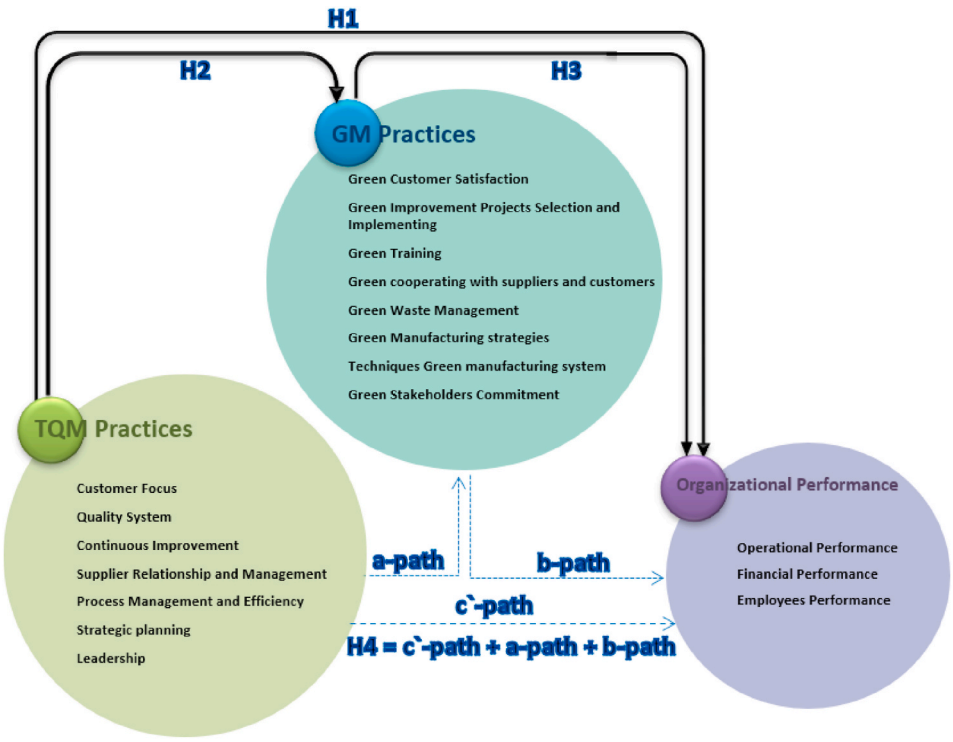

Fig. 1. The conceptual framework.

included in the survey and comments box was added where respondents could add any further comments they would like to share.

6.1. Research population and sampling techniques

As indicated before, the targeted population in this study was PFMC. To identify the total number of PFMC available, the Palestinian Food Industries Union (PFIU) was contacted for this purpose. According to PFIU (2017), there are 640 food manufacturing facilities operating in Palestine at the time of this study. However, a number of conditions must be met before a company can be chosen to be a part of the data collection process, these conditions are the following:

- A company is registered and licensed by the official Palestinian authorities.
- Has a clear and well-established organizational structure.
- Has a quality department, a quality function, or quality control/ management activities with a quality officer and announced quality policy.
- Has a HR department with announced HR policy or has HR activities carried out by an HR representative.

Based on this criterion, the total number of PFMC who were qualified for data collection was 283. However, the survey was sent to the senior, quality, and HR managers in targeted companies using email, and then followed up by telephone to ensure the correct filling out of the survey. The COVID-19 pandemic has limited physical location visits to minimal, and location visits were only made to PFMC who requested more details about the objectives of research and how they can benefit from its results. These visits followed local guidance on social distancing measures. Following these steps, the data collection process took four months to complete (i.e., April–July 2020).

The minimum sample size is necessary to be determined for surveys to be able to generalize the results from the population (Saunders et al., 2009). Singh and Masuku (2014) provided a formula for obtaining a statistically representative sample size for the population.

$$n = \frac{N^{*}P\ \ (1-P)}{\left[(N-1)*\left(\frac{d^2}{Z^2}\right)\right] + P(1-P)}$$

where:

n = Sample size
N= Population (283)
P= Proportion of property offers and neutral (0.5)
d = Error margin (0.05)
z = z value, upper α/2 from the normal distribution (For 95% of confidence level z = 1.96)

$$n = \frac{283*0.5(1-0.5)}{\left[(283-1)*\left(\frac{0.05^2}{1.96^2}\right)\right] + 0.5(1-0.5)} = 164$$

The sample size formula shows that at least 164 responses must be obtained for sufficient results from analysing the survey data. However, 283 surveys were distributed out of which 267 were returned. However, during data screening process 17 incomplete responses were found and removed. As a result, the total number of useable returned responses was 250. This represented a response rate of 88.3%.

7. Data analysis and results

Quantitative data collected from the survey was analyzed using IBM SPSS Statistics Version 25 to study and examine the hypotheses. Table 4 provides the descriptive analysis of TQM and GM practices and OP. However, Table 4 also shows the normality test for each variable using the Shapiro-Wilks test. According to Ghasemi and Zahediasl (2012), the Shapiro-Wilks test is more powerful than other tests, such as Kolmogorov-Smirnov, in detecting correlation between the data and the corresponding normal scores. Similarly, Thode (2002) recommended Shapiro-Wilk test as the best choice for normality test of research data. In the event that the collected data is not normally distributed, non-parametric tests are appropriate in this case, and vice versa

Table 4
Descriptive statistics of TQM, GM, and OP.

Practices	Mean Value	Std. Deviation	Shapiro-Wilk		
TQM Practices			Statistic	df	Sig.
Customer focus	4.1726	0.38762	0.794	250	0.000*
Quality system	4.4147	0.49003	0.772	250	0.000*
Continuous improvement	3.8016	0.44703	0.837	250	0.000*
Supplier relationship & management	3.6080	0.51509	0.920	250	0.000*
Process management & efficiency	3.6440	0.93898	0.912	250	0.000*
Strategic planning	3.8344	0.31087	0.837	250	0.000*
Leadership	4.0987	0.72011	0.926	250	0.000*
Total	3.9391	0.26070			
GM Practices					
Green customer satisfaction	4.1120	0.51301	0.873	250	0.000*
Green improvement project	4.1960	0.82859	0.864	250	0.000*
Green training	3.1270	0.62263	0.932	250	0.000*
Green cooperation	3.2160	0.39154	0.944	250	0.000*
Green waste management	2.3971	0.34722	0.848	250	0.000*
Green manufacturing strategies	4.1390	0.73354	0.896	250	0.000*
Techniques of green manufacturing	3.8450	0.77791	0.918	250	0.000*
Green stakeholders' commitment	3.9460	0.72850	0.937	250	0.000*
Total	3.6223	0.33776			
OP Indicators					
Operational performance	4.1750	0.74623	0.900	250	0.000*
Financial performance	4.3093	0.50288	0.873	250	0.000*
Employee performance	4.0920	0.70501	0.936	250	0.000*
Total	4.1921	0.47849			

* The Shapiro-Wilk test result is significant at the significance level of 0.05 (p-value $\leq$ 0.05).

(Mircioiu and Atkinson, 2017). Results from Shapiro-Wilk test show that $p \leq 0.05$, indicating non-normal distributions. Hence, a non-parametrical test was used for hypotheses testing.

7.1. Respondents' characteristics

Table 5 shows the respondents' characteristics. The results indicate that nearly 78% of respondents are males, about 50% are between 30 and 40 years old, whereas majority of respondents have BA educational degree. The results also show that most respondents have work experience of 11–15 years. Finally, results show that nearly 30% are HR managers, more than 25% are quality managers, and more than 16% are green operations managers.

Table 5
Respondents' characteristics.

Variable		Frequency	Percentage (%)
Gender	Male	194	77.6%
	Female	56	22.4%
Age	Under 30	27	10.8%
	30–40	122	48.8%
	41–50	59	23.6%
	51–60	28	11.2%
	Over 60	14	5.6%
Education	Diploma	24	9.6%
	BA	195	78.0%
	Master's	31	12.4%
	PhD	0	0.0%
Experience	Less than 5	18	7.2%
	5–10	37	14.8%
	11–15	106	42.4%
	16–20	73	29.2%
	21–25	9	3.6%
	More than 25	7	2.8%
Job title	Human resource manager	76	30.4%
	Quality manager	63	25.2%
	Green operations manager	41	16.4%
	General Manager	19	7.6%
	Others	51	20.4%

7.2. Reliability and validity tests

The researcher used Cronbach's Alpha Coefficient to test the reliability of the survey as proposed by Creswell (2013). Table 6 shows the values of Cronbach's Alpha for each variable of the survey. It is clear that all the survey variables are above 0.7 and less than 0.9, while the total is 0.913. Thus, the research data is acceptable and so, it is reliable.

Convergent validity for each individual construct (i.e., TQM, GM, and OP) was analyzed using Spearman rank correlation co-efficient test. Often denoted by the Greek letter (rho = r), Spearman's correlation coefficient has the power to assess how strong the relationship between items of the same construct or between different constructs using a monotonic function. The correlation coefficient (r) ranges between +1 and −1. Table 7 represents a rule of thumb for interpreting the correlation strengths (Moore et al., 2013).

Table 8 provides the convergent validity results for items of TQM practices included in this research. The results show that all items have a statistically significant corelation with total TQM practices ranging from ($r = 0.344$; $p \leq 0.05$) to ($r = 0.825$; $p \leq 0.01$). Based on this, it can be concluded that items of TQM practices exhibit a convergent validity with total TQM practices.

Similarly, Table 9 represents the correlation strength between each item of GM practices and the total GM practices included in this study. The results show that there is a statistically significant correlation between each item of GM practices and the total GM practices and ranged from ($r = 0.371$; $p \leq 0.05$) to ($r = 0.773$; $p \leq 0.01$). Therefore, it is found that items of GM practices have a convergent validity with their total GM practices.

As for the OP construct convergent validity, Table 10 depicts the correlation strength between the three OP items and the Total OP construct. It was found that there is a statistically significant correlation between each of the three items of OP and the total OP and ranged from ($r = 0.512$; $p \leq 0.01$) to ($r = 0.837$; $p \leq 0.01$). Therefore, convergent validity of OP construct was confirmed.

7.3. Hypotheses test

The relationships between TQM practices, GM practices, and OP in PFMC are evaluated using the Spearman's correlation coefficient (r) method. Table 11 shows the result of correlation between TQM, GM, and OP.

Table 11 depicts that there is a statistically significant correlation between TQM Practices and overall OP with correlation coefficient of $r = 0.605$ ($p \leq 0.01$). Therefore, hypothesis H1 is supported with the correlation strength is moderate (Moore et al., 2013). Moreover, there is a statistically significant correlation between TQM Practices and GM Practices with correlation coefficient of $r = 0.650$ ($p \leq 0.01$). Therefore, hypothesis H2 is also supported with moderate strength. Finally, there is a statistically significant correlation between GM Practices and OP with correlation coefficient of $r = 0.827$ ($p \leq 0.01$). This also proves that hypothesis H3 is supported, while the correlation strength is strong

Table 6
Cronbach's Alpha for each variable of the Survey.

#	Variable	No. of Item/s	Cronbach's Alpha
1	TQM Practices	31	0.718
2	GM Practices	36	0.816
3	OP items	12	0.843
4	Overall	79	0.913

Table 7
The rule of thumb for interpreting the relationship strength based on its r-value. Source: Moore et al. (2013).

Strength of Relationship	Correlation Coefficient (r)
Strong	$r > 0.7$
Moderate	$0.5 < r < 0.7$
Weak	$0.3 < r < 0.5$
Very Weak	$r < 0.3$

Table 8
The correlation strength between Total TQM practices and each item of TQM practices.

TQM	Practices	Correlation Coefficient (r)	Sig. (α) (2-tailed)	N
Total TQM Practices	Leadership	0.825[a]	0.000	250
Total TQM Practices	Process Management & Efficiency	0.770[a]	0.000	250
Total TQM Practices	Customer Focus	0.642[a]	0.000	250
Total TQM Practices	Supplier Relationship & Management	0.580[a]	0.000	250
Total TQM Practices	Strategic Planning	0.540[a]	0.000	250
Total TQM Practices	Quality System	0.497[a]	0.000	250
Total TQM Practices	Continuous Improvement	0.344[b]	0.023	250

[a] Correlation is significant at the 0.01 level (2-tailed).
[b] Correlation is significant at the 0.05 level (2-tailed).

Table 9
The correlation strength between Total GM practices and each item of GM practices.

GM	Practices	Correlation Coefficient (r)	Sig. (α) (2-tailed)	N
Total GM Practices	Green Manufacturing Strategies	0.773[a]	0.000	250
Total GM Practices	Green Improvement Project Selection & Implementation	0.730[a]	0.000	250
Total GM Practices	Green Stakeholders Commitment	0.716[a]	0.000	250
Total GM Practices	Techniques of Green Manufacturing System	0.607[a]	0.000	250
Total GM Practices	Green Customer Satisfaction	0.595[a]	0.000	250
Total GM Practices	Green Cooperation with Suppliers & Customers	0.538[a]	0.000	250
Total GM Practices	Green Training	0.454[b]	0.015	250
Total GM Practices	Green Waste Management	0.371[b]	0.045	250

[a] Correlation is significant at the 0.01 level (2-tailed).
[b] Correlation is significant at the 0.05 level (2-tailed).

Table 10
The correlation strength between Total OP and each item of OP.

OP	Practices	Correlation Coefficient (r)	Sig. (α) (2-tailed)	N
Total Performances	Operational Performance	0.837[a]	0.000	250
Total Performances	Employee Performance	0.834[a]	0.000	250
Total Performances	Financial Performance	0.512[a]	0.000	250

[a] Correlation is significant at the 0.01 level (2-tailed).

Table 11
Nonparametric correlations tests between TQM practices, GM practices, and OP.

Nonparametric Correlations			TQM Practices	GM Practices	Overall OP
Spearman's rho	TQM Practices	Correlation Coefficient (r)		0.650[a]	0.605[a]
		Sig. (α) (2-tailed)		0.000	0.000
		N		250	250
	GM Practices	Correlation Coefficient (r)	0.650[a]		0.827[a]
		Sig. (α) (2-tailed)	0.000		0.000
		N	250		250
	Overall OP	Correlation Coefficient (r)	0.605[a]	0.827[a]	
		Sig. (α) (2-tailed)	0.000	0.000	
		N	250	250	

[a] Correlation is significant at the 0.01 level (2-tailed).

(Moore et al., 2013).

However, to test the indirect effect of implementing TQM practices on OP mediated by the implementation of GM practices (i.e., H4), the data has been worked on to become normally distributed (i.e., normalization). Fig. 2 shows the relationship covered by H4. The a-path represents the relation coefficient between independent variable (i.e., TQM practices) and the mediator variable (i.e., GM practices). In contrast, the b-path represents the relation coefficient between the mediator variable (i.e., GM practices) and dependent variables (i.e., OP). On the other hand, a*b-path represents the indirect path between independent variables (i.e., TQM practices) and dependent variables (i.e., OP). The C′-path represents the mediator variable's direct effect on the relationship between independent variables (i.e., TQM practices) and dependent variables (i.e., OP) while C-path represents the total effect.

The SPSS PROCESS v3.5 macro for multiple regression analysis is used to test hypothesis H4. This was done following guidelines of Baron and Kenny (1986) for testing mediation effect of GM practices on the relationship between TQM practices and OP. Table 12 shows the analysis outputs:

Table 12 shows a significant and positive direct effect of TQM practices on GM practices; represented by a-path ($\beta = 0.6604$, $p \leq 0.05$). Similarly, c'-path reflect a significant and positive direct effect of TQM practices on OP ($\beta = 0.0899$, $p \leq 0.05$). In addition, results show significant and direct effect of GM practices on OP, represented by b-path ($\beta = 0.8326$, $p \leq 0.05$). Therefore, these first three steps of mediation analysis process were satisfied. This is in line with the conditions stated by Baron and Kenny (1986) when testing mediation effects. Also, a significant and positive indirect effect of TQM practices on OP mediated by GM practices was found using the a*b-Path ($\beta = 0.55$, $p \leq 0.05$). In

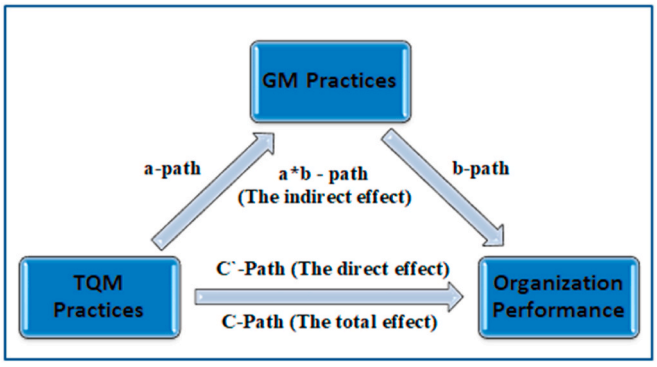

Fig. 2. The conceptual relationship between TQM practices and OP mediated by GM practices.

Table 12
Mediation relationship test between TQM practices and OP mediated by GM practices.

Path	Effect Type	Outcome Variables	Income Variable	Standardized β	p-value	LLCI	ULCI
a-path	Direct Effect of TQM on GM	GM Practices	TQM Practices	0.6604	0.0000*	0.5665	0.7543
c'-path	Direct Effect of TQM on OP	OP	TQM Practices	0.0899	0.0201*	0.0140	0.1638
b-path	Direct Effect of GM On OP	OP	GM Practices	0.8326	0.0000*	0.7577	0.9074
c-path	Total Effect of TQM on OP	OP	TQM Practices	0.64	0.0000*	0.5425	0.7349
a*b-Path	Indirect Effect of TQM on OP	Effect Of TQM On OP	Mediated By GM Practices	0.55	0.0000*	0.4483	0.6555

*Correlation is significant at the 0.05 level (p-value ≤ 0.05).

fact, the effect value of a*b-path can be found from the effect value of a-path and b-path. The Boot upper level and down level of a*b-Path are 0.45 and 0.66, respectively. On the other hand, results also show a significant total effect of TQM practices on OP; represented by c-path (β = 0.64, p ≤ 0.05). Hence, the mediator could partially account for roughly 86% of total effect (i.e., 0.64).

The total effect of TQM practices on Organizational Performance could be summarized as follow:

Total effect = Direct effect + Indirect effect

c-path = c'-path + a*b-path

c-path = 0.0899 + (0.6604*0.8326)

c-path = 0.64

Therefore, hypothesis H4 is supported. Fig. 3 represents this relationship.

Table 13 summarizes the result of hypotheses tests, and the conceptual framework can be updated as shown in Fig. 4.

8. Discussion of results

As for the result concerning the positive relationship between TQM practices and OP in PFMC, this was in line with several previous studies reported in developing countries contexts. For example, Albuhisi and Abdallah (2018) indicated that TQM contributes to improving company performance in pharmaceutical manufacturing companies of Jordan. Sha'aar & Najjar (2015) also indicated that there is a significant relationship between the practices of TQM and the effectiveness of functional performance that contributes to overall organizational performance. This result from PFMC can be explained by the fact that implementing TQM practices improved the efficiency of time management, operational performance, and customer satisfaction levels, thus, increased organizational sales and profits. On the other hand, this can be interpreted by the fact that TQM enhances organizational leadership, which leads to improving organizational performance through the positive effects of TQM on top management communication, commitment, planning, leadership, evaluation, and anticipation, and

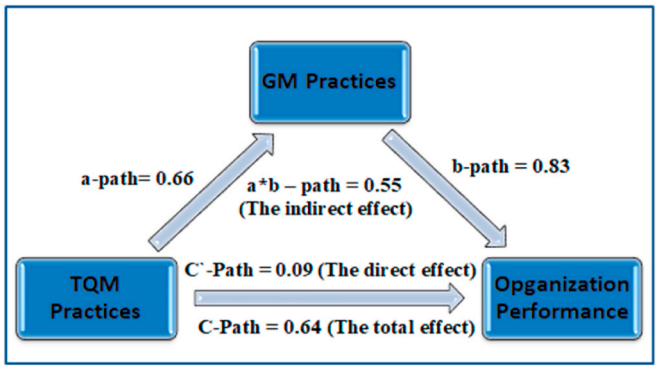

Fig. 3. The relationship between TQM practices and OP mediated by GM practices.

Table 13
Summary of hypotheses testing.

Hypothesis No.	Hypothesis	Result
H1	There is a statistically significant correlation between the TQM Practices and OP in PFMC.	Supported
H2	There is a statistically significant correlation between the TQM Practices and GM practices in PFMC	Supported
H3	There is a statistically significant correlation between the GM practices and OP in PFMC.	Supported
H4	There is a significant indirect effect of implementing TQM practices on OP mediated by GM practices.	Supported

improvement in employee performance (Keinan and Karugu, 2018; Omar et al., 2018). This view was supported by the work of Valmohammadi (2011) who found that leadership as TQM practice plays a major role in enhancing entire organizational performance in Iranian manufacturing SMEs. Furthermore, this result was asserted by Shafiq et al. (2019) in their study of TQM effects on performance of Pakistani textile sector. Authors found that among different constructs of TQM, leadership played a major role in improving innovation and business results. Moreover, results showed that customer focus was highly practiced in PFMC which implies that manufacturers respond adequately to customer needs that can enhance relationships with customers. TQM, this way, enhances organizational capabilities in customer data collection, planning for improvement, inspection, and control of the manufacturing processes to improve employees' skills which leads to improving their performance (Pradhan, 2017; Qasrawi et al., 2017). Pattanayak et al. (2017) provided similar result from Indian banking sector as they found that TQM practices can significantly improve customer focus because of enhanced service quality.

As for the result concerning the positive relationship between TQM practices and GM practices in PFMC, several scholars found a similar result where they affirmed the strong interrelated relationship between TQM and GM. This relationship has been affirmed by Zutshi and Sohal (2005) and Teixeira et al. (2019) among others. However, TQM in PFMC was found pivotal for reducing waste and defects rates. This is consistent with essence of GM practices where waste reduction and innovative ways of resource utilization are encouraged. According to Iqbal (2019), TQM practices offer an opportunity for organizations to innovate their green management approaches by supporting employees to try new practices that can, then, develop new approaches to fulfill social responsibility requirements. This argument also helps in interpreting the result concerning the positive relationship between GM practices and OP in PFMC. Rehman et al. (2016) found a similar result from the Indian manufacturing sector where he indicated that GM success factors lead to improving the OP measures such as financial performance, manpower performance, and operational performance. In fact, one of the main objectives of the GM practices is the production of products with the highest efficiency and the least defects. This, in turn, leads to better performance of the organization in all respects. In specific, PFMC adopt green manufacturing strategies with the focus on rationalizing materials and reusing scrap to help build products more efficiently, which is reflected positively on the performance of the organization. To do so, PFMC adopt stakeholder commitment practice to understand their

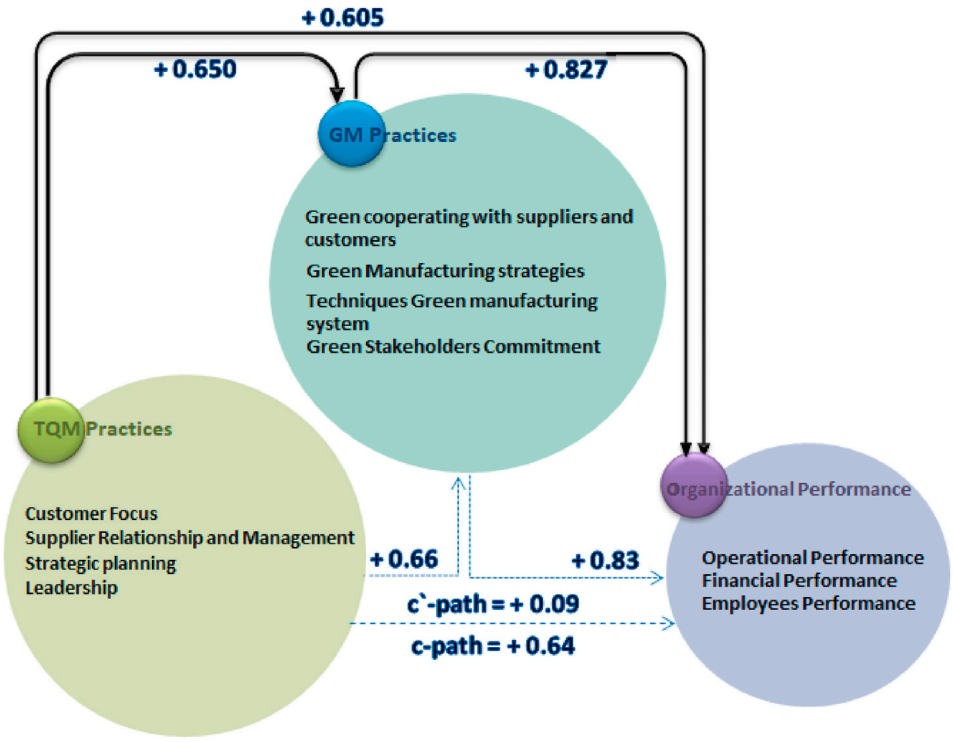

Fig. 4. Updated Conceptual Framework based on the analysis results.

requirements as part of their green manufacturing strategies (Hanieh et al., 2015).

The test result showed a positive relationship between TQM practices and GM practices named a-path, and between GM practices and organization Performance, which is named p-path. Hence, there was a positive indirect effect of TQM practices on Organizational Performance mediated by GM practices, named a*p-path. Furthermore, it was found that there was a total positive effect of TQM practices on Organizational Performance, which is named c-path. Simultaneously, the positive direct effect of TQM practices on Organizational Performance - which is named c'-path- was found very weak. Therefore, the GM Practices mediator could account for most of TQM practices' total effect on Organizational Performance at roughly 86% of the total effect. This was indirectly supported by Fuentes-Fuentes et al. (2004) who found that TQM has an impact on organizational performance depending on the level of green logistics practiced by organizations. Although the mediating role of GM practices was not mentioned, Agyabeng-Mensah et al. (2020) indicated that green supply chain practices and TQM creates positive value for OP in manufacturing firms in Ghana. However, this relationship is not excluded due to TQM practices and GM practices' common objectives, as they overlap in their content to reach better company performance. Confirming the mediation effect of GM practices on the relationship between TQM practices and organizational performance in the context of PFMC confirms the need for these companies to adopt green practices to reach ideal performance within companies.

8.1. Theoretical and managerial implications

This study has many implications for theory and practice. It adds great value to literature via responding to previous calls to counter environmental issues in developing countries' contexts (e.g., Rehman et al., 2013; Rehman et al., 2016; Seth et al., 2018). From a theoretical perspective, this study contributes to filling the literature gap on the relationship between TQM and GM in food manufacturing sector in developing countries, particularly in PFMC. The results reported here argue that TQM practices are linked with supporting GM practices necessary for the enhancement of cleaner production of food manufacturing firms and introduce TQM practices as an antecedent for improved GM practices in such manufacturing firms. This also theorizes for the first time that TQM goals of reduced waste, defects, and enhanced resources consumption are closely paralleled with the cleaner production aim of GM practices in PFMC. Furthermore, the positive impact of GM practices on OP of PFMC has not been explored previously in this context, which serves as another key contribution by enriching existing green performance literature from developing countries' context. This also helps in answering the question "does it pay to be green" posed by several researchers in GM literature (e.g., Hart and Ahuja, 1996; Berchicci and King, 2007; Afum et al., 2020). The current study also validates arguments about achieving enhancements in food manufacturing companies' OP in an efficient manner by the implementation of TQM in developing countries' context. In addition, this research supports the arguments of GM mediation effects on the relationship between TQM and OP in food manufacturing companies. To the best of the authors knowledge, this mediation effect has not been previously investigated in previous cleaner production and green performance studies performed in developing countries, thus adding another key contribution to knowledge in cleaner production and green performance.

From a managerial perspective, the results indicate the value of institutionalizing TQM practices for operationalizing GM practices and their significant role in promoting and enhancing OP of food manufacturing companies in developing countries' context. This implies that if TQM practices are applied in a systematic manner, then they will enhance customer satisfaction, lower production resource consumption, and improve green performance of food manufacturing firms. This will also offer managers of these firms the opportunity of cost saving resulting from eco-efficiency and will improve their competitive advantage. Ultimately, this will potentially offer food manufacturers access to green markets of developed countries (Seth et al., 2018). More interestingly, the study also encourages managers to concurrently invest more in GM practices to enhance the ability of food manufacturing firms to minimize impact of their products and operations on the environment. For this reason, managers should ensure the implementation of

GM practices in its true spirit by adequately raising awareness among employees of the importance of GM practices for cleaner production and through the adoption of proper GM-oriented training programs. Finally, the results indicate the significant positive role of GM practices in mediating the relationship between TQM practices and OP in PFMC. As such, the study provides further evidence for justifying investing in both TQM and GM practices due to the high financial return in the long run despite the prevailing belief about their high cost. Ultimately, food manufacturing organizations that want to achieve higher OP should increase the use of TQM and GM practices and bear in mind that this must be a continuous business.

9. Conclusion and future research work

This research was conducted in response to calls to counter environmental issues in developing countries context through the investigation of the relationship between TQM and the level of GM practices implementation in PFMC and their impacts on OP. It was found that there is a significant positive correlation between TQM and GM practices implementation, and a significant correlation between TQM and GM on OP. Perhaps the most interesting finding was the empirical evidence of the indirect effect of TQM practices on OP mediated by GM practices. Despite the value of these findings, there is still a need to revisit these findings considering research limitations. First, in this study data was only collected from food manufacturing companies operating in Palestine. There is a possibility that data collected from other sectors or countries may yield different results. Therefore, there is a need to validate this study findings in other developing countries contexts to ensure that effects of sector or country do not confound current results. Second, although findings reported here have good statistical generalizability to the PFMC sector, there is a need to replicate this study in other food manufacturing sectors operating in similar environment to improve generalizability of results. Third, scarcity of similar studies exploring relationships covered in this study limited the ability of findings to propose grounded theory development. Future research is, then, required to conduct longitudinal studies that can document quantitative changes to OP as a result of TQM and GM practices level of implementation.

CRediT authorship contribution statement

Amani Said Hassan: Writing – original draft, preparation, Software, utilization for analysis, data collection and data analysis. **Ayham A.M. Jaaron:** Conceptualization, Supervision, of the research, Methodology, development, writing-updating, reviewing and editing the original draft version.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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