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Prioritize the key parameters of Vietnamese coffee industries for sustainability

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Abstract

Purpose – The purpose of this paper is to identify the critical parameters of the Vietnam coffee industry and develop a comprehensive structural relationship to rank them for effective sustainable development.
Design/methodology/approach – The team of ten experts, having experience of over eight years in the field of various coffee industries in Vietnam, was created to give scores to multiple parameters. Technique for order of preference by similarity to ideal solution (TOPSIS) technique is used to develop the model for fifteen key parameters and then to rank them.
Findings – From the data analysis and results, marketing and brand innovation, product quality, strategic planning and implementation have emerged as top three key parameters while new technology development, supply chain and logistics management, and alliance-joint venture are identified as the bottom three parameters. The findings provide a rank of parameters that help to other coffee industries to identify their key parameters. Besides, the key parameters defined as necessary inputs show the firms more active and well-prepared comprised of ten companies.
Practical implications – The key parameters of the success of any organization are essential contributions. Aiming to improve organizational performance, metrics should be identified as the source of strength to achieve high productivity, profitability and sustainable business performance.
Originality/value – The emphasis of study on key parameters will help organizations to achieve competitive advantage and high productivity for high sustainability in an organizational context.

Keywords Performance, Sustainability, Parameters, TOPSIS method, Vietnam coffee industry
Paper type Research paper

1. Introduction

Vietnam is now considered as an emerging economy in the globe with the Vietnamese income per capita rising approximately to USD2,400 and Vietnam's population is more than 93m people and ranked 15th (World Bank, 2019; United Nations, 2017). Vietnam's economy has marked a significant change in past 30 years to the development policy revolution supported by the Vietnamese government with its name renovation (Doi moi) since 1986 (Edwards and Phan, 2014). Besides that, the Vietnam government has adopted the opening policy of the economy (chinh sach mo cua) since 1990s, and Vietnam has joined the economies organizations worldwide such as ASEAN, APEC, WTO. Moreover, Vietnam has also expanded foreign trade relations with other countries (Vuong, 2014) and consequently, Vietnam's export value has increased over the years significantly.

According to Vietnam Import-Export Report 2018 of the Ministry of Industry and Trade (MIT), the value of goods from Vietnam export to the global market reached more than

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USD243bn in 2018 and there has been a USD28.37bn rise in this number compared to 2017 equivalent to 13.2 percent (MIT, 2019). Especially from 2019, new free trade agreements (FTA) will be executed; it means opening several opportunities as well as challenges for Vietnamese agricultural products to penetrate new markets. The agricultural commodity is ranked fourth among the top ten largest export commodity groups of Vietnam in 2018. These product groups including vegetables, cashew nuts, pepper, tea, coffee, rice, cassava and rubber products. These goods had increased slightly by 0.2 percent compared to 2017 and experience reached more than USD17.8bn (MIT, 2019) and the coffee industry is contributing to this achievement. In 2018, Vietnam's coffee bean exports experience reached about 1.9m tons with the value is approximately USD3.6bn. These numbers have been increased significantly compared to the year 2017 are 20.1 and 1.2 percent, respectively (MIT, 2019).

Currently, Vietnamese coffee production is a famous name on the world coffee map, and ranked second in the world, followed by Brazil and Colombia ranked third (International Coffee Organization, 2019). The coffee industry is one of the critical sectors that contributes a great deal to the development of Vietnam's economy. However, Vietnam coffee industry faces many challenges and risks impact on achieving sustainable development (SD) goals as well as Vietnam's economy as the volatile market, environments influence, technology development (Nguyen and Sarker, 2018; Zhang, 2016).

In terms of the SD concept was highlighted for the first time in 1987, the idea of SD was first mentioned and demonstrated in the report of Brundtland Commission at the Rio Earth Summit in 1992. The "Sustainability" keyword has witnessed dramatic growth both in academic and practical research over three past decades (Verma *et al.*, 2017). It even has become a popular keyword that appears in every report on the development strategy of the organization and worldwide (Samper and Quiñones-Ruiz, 2017; Singh, 2016). Nowadays, there is scope for various interpretations and applications in the diversity of industry, the theoretical fundamental for SD remains focused on balancing the three essential objectives, including the social, economic and environmental issues.

Vietnam's economy is considered as an emerging market, therefore, in the context of international integration in recent years and other conditions may have an impact on production activities of enterprises as a farmer, suppliers, export market, social (Gonzalez-Perez and Gutierrez-Viana, 2012; Ho *et al.*, 2018; Nguyen and Sarker, 2018). Thus, the role of coffee companies is not only to improve competitive advantage but also associated with ensuring the lives of workers as well as contributing to the development of local society. Sustainability certification has valuable and very significant for businesses, especially small- and medium-sized enterprises which have a little reputation in Vietnam (Meyfroidt *et al.*, 2013; Oya *et al.*, 2018; Ssebunya *et al.*, 2019). While facing many challenges and risks in coffee production, it is clear that developing countries with the natural advantage for coffee production which always strive to achieve sustainable goals, this is a feasible solution to improve the national economy as well as contributing to better social improvement (Hajjar *et al.*, 2019; Ho *et al.*, 2018; Nguyen and Sarker, 2018; Onyas *et al.*, 2018; de Queiroz *et al.*, 2018; Rahn *et al.*, 2018; Ssebunya *et al.*, 2019).

According to the report of Food and Agriculture Organizations (FAO), there are around 125m of the world's rural poor that depend upon coffee production for their livelihoods (FAO, 2019). Therefore, sustainability in the coffee industry plays an important role and responsibility of the governments and enterprises in the global platform. From previous studies on coffee production toward sustainable goals in emerging economies are depending on each research field. Thus several parameters have been identified which affect the sustainability in the coffee production industry (Linton, 2008; Saito, 2004; Samper and Quiñones-Ruiz, 2017; Velmourougane and Bhat, 2016). Further, this study aims to address research questions as follows:

RQ1. What are the various related parameters and their roles in the Vietnam coffee industry?

RQ2. Identify the ranking of these parameters for the coffee industry.

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In this way, the study handles the empirical research of the Vietnam coffee industry using TOPSIS methodology and draw the significant implications of this study. Literature review and expert's suggestions help to find suitable parameters to develop sustainable growth. Thus, the purpose of this study aims to determine the critical parameters of the coffee industry for sustainability in Vietnam. The results of the study will contribute to fill the gap in sustainable research in coffee production in emerging economies, besides, recommendations new research directions in the future.

The structure of this research includes a total of seven sections as follows. The next section extracts the reason chosen for this study and its purpose. The literature review and the research methodology of this study will be described in Sections 2 and 3. Section 4 outlines the results and discussion. Managerial implications of this study and conclusions with limitations of the research as well as suggestions for new study directions in the future will be shown in Sections 5 and 6, respectively.

2. Literature review

2.1 Sustainable development

The past few decades have witnessed a significant change in the awareness of national governments worldwide with "sustainability" (Kumar *et al.*, 2017; Kumar and Sharma, 2018). Although, the United Nations (UN) helps the primary goals of these countries and businesses is attempting to develop its economies besides adopting its responsibilities toward other social problems like reducing poverty as well as protecting the fundamental environmental issues (Ali *et al.*, 2018; Hernández and Carrà, 2016; Schönherr *et al.*, 2018; Xiao *et al.*, 2017).

Aiming to help countries identify clear goals toward SD vision for 2030, the UN has demonstrated that a total of 17 primary SD goals within 169 targets covering all issues around economics, environment and society (Ali *et al.*, 2018; Schönherr *et al.*, 2018). It was evident that the UN organization had set specific goals and measures will help countries and enterprises worldwide to plan their long-term development strategy more stable, particularly when they face with the significant changes of the current business environment.

In developing countries, it is clear that the development blueprints of the company toward sustainable goal in the future still has many problems for research and discussion. In recent years, many businesses which are operating or capital investment in these low-income countries have un-respected local laws. Moreover, they just focused on economic benefit. As a consequence, they are leading to existing still many cases of environmental pollution or did not ensure minimum working conditions (Ali *et al.*, 2018; Huang *et al.*, 2019). One of the reasons affecting the development strategy of the business as well as compliance with the law in emerging economies is an unstable political environment. Furthermore, competition among parties to gain control of the government and natural resources; besides, these areas also are existing high rates of corruption and embezzlement followed by the inequality in the socio-economic environment increasingly. These inevitable consequences will have a direct impact on the enterprises which are attempting to gain SD target, thus leading to many obstacles and challenges for businesses (Hansen *et al.*, 2018; Ramos-Mejía *et al.*, 2018; Wieczorek, 2018).

In the previous studies as we mentioned above, the parameters of the industry have been affected by the external environment. Equally essential elements are related to the capacity of the enterprise itself such as strategic planning and implementation, supply chain and logistics management, infrastructure or their human resource and application of new technology development (Bhardwaj, 2016; Gonzalez-Perez and Gutierrez-Viana, 2012; Nguyen and Sarker, 2018; Zhang, 2016).

Consequently, an industry that needs to grow with SD, both the internal and external of the enterprise should be dependent on many different parameters. Therefore, it is necessary to identify the parameters affecting the SD goals of enterprises. Furthermore, these companies also must answer the question that how the importance of these parameters with

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their blueprint; it can also help in solving the challenges and difficulties immediately with the right decision, then the highest professional to gain efficiency.

2.2 Identification of key parameters in the coffee industries of Vietnam

The purpose of this research to contribute to filling the gap toward sustainability coffee production via a case in a developing country, especially in Vietnam where gross national income (GNI) is approximately $2,400 per capita in 2017 (World Bank, 2019). Vietnam is considering itself in the emerging economy category, where nearly half of the Vietnamese population is working in the agriculture industry (GSO, 2018). Being fourth in Vietnam's top ten largest export commodity groups in Vietnam in 2018, the Vietnamese coffee industry has made a significant contribution to this result, whose total value is more than 20 percent; apart from this, Vietnam has seventeen percent share of global coffee production (MIT, 2019; Tatarski, 2017).

In recent years, there have been several studies that focus on the sustainability of Vietnamese coffee industry; however, along with the broad scope of the coffee industry, there are other limitations of this research. Thus, each study has chosen a different aspect to clarify the research issue might affect the sustainability in coffee production. Studies on the sustainability of the coffee industry often focus on climate change of environmental sustainability; meanwhile, some other studies focus on concentrating and developing the way of livelihood of coffee farmers and their life is dedicated to the coffee production (Amarasinghe *et al.*, 2015; FAO, 2019; Haggar and Schepp, 2012; Haggar *et al.*, 2017; Ho *et al.*, 2018; Linton, 2008; Millard, 2017). Therefore, there is still a lack of concern about the coffee industry's sustainability, especially in Vietnam.

In this part, we identify the various parameters from previous literature that help Vietnamese coffee industries to improve their productivity and to achieve sustainability. Identifying these parameters give to strengthen the performance of the current coffee industry as well as influencing the current coffee industry to achieve sustainable goals.

Awareness and training to coffee producers (F1). The "sustainability" topic in the coffee industry has become a popular topic and received the attention of coffee-producing enterprises in Vietnam as well as globally. Coffee producers have become more aware and interested in training in the coffee production process, leading to their products can access more difficult markets where sustainability certification is a necessary condition for coffee exporters. Moreover, it also helps them gain more advantage of competitive (Barham and Weber, 2012; Haggar *et al.*, 2017; Ho *et al.*, 2018; Oya *et al.*, 2018; Ssebunya *et al.*, 2019). For more than two decades in Vietnam, coffee producers are adopting some standards toward sustainability as organic agriculture, fair trade, Rainforest Alliance and UTZ (pronounced o͞otz kahpāy means "good coffee") certified. In addition, these producers also create the Common Code for the Coffee Community known as 4C. Although all these certifications have different content and approaches, they all have a common goal of moving toward SD of coffee production in Vietnam. Furthermore, the Ministry of Agriculture and Rural Development has also implemented activities to raise awareness and support training activities for Vietnamese coffee producers. The most significant project related to this issue as a certificate for sustainable coffee production in the central highlands. As a result, several mixed solutions have been applied by coffee-producing companies, especially for the implementation of UTZ and 4C certifications in their farms for the training of coffee farmers (Ho *et al.*, 2018; Tatarski, 2017; Zhang, 2016).

Environment impact (F2). In the agriculture production industry like coffee production, the natural environment has a significant meaning to the survival and SD of this industry. Environmental factors such as climate change, water resource protection and soil nutrient preservation always mentioned first in reports on sustainable solutions (Chengappa *et al.*, 2017; Haggar and Schepp, 2012; de Queiroz *et al.*, 2018; Rahn *et al.*, 2018; Utting, 2009).

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In previous research, environmental factors have a significant influence on coffee production in Vietnam has been proved. Especially in the central highlands which are the main area for growing coffee in Vietnam, there are only two seasons: rainy season and dry season. During the past years, the prolonged drought has occurred, while the irrigation techniques of farmers follow long-standing habits. Consequently, the use of waste and inefficient water leads to difficulties in sustainable production goals (Haggar and Schepp, 2012; Nguyen and Sarker, 2018; Nguyen *et al*., 2017a, b; Tatarski, 2017; Utting, 2009).

Marketing and brand innovation (F3). Gonzalez-Perez and Gutierrez-Viana (2012) have demonstrated that the application of marketing and branding innovations will achieve positive effects on business performance, also, enhancing the competitiveness for coffee exporting companies to potential markets. Furthermore, the implementation of marketing strategies and brand positioning also contributes to promoting exceptional coffee of Vietnam and Colombia, directing businesses for employees and society. These are the problems which in emerging economies where agriculture makes up a high proportion of GDP is moving toward the goal of sustainability (Gonzalez-Perez and Gutierrez-Viana, 2012; Mussatto *et al*., 2011; Zhang, 2016).

Regulatory frameworks and policies (F4). In developing countries, not only the coffee industry but other industries are also facing difficulties in regulatory frameworks and policies. The most concerned coffee businesses are stability and long-term development policy. Thus, this factor has a significant influence on the development of the business strategy and quality (Kumar and Sharma, 2014; Kumar *et al*., 2018) of the coffee production. Moreover, aiming to support coffee producers, coffee associations have been established and the role of associations to link coffee companies into a collective unity. Colombia is recognized as the National Association of Coffee Growers (FNC) while the counterpart in Vietnam is remarked as Vietnam Coffee-Cocoa Association (VICOFA) (Gonzalez-Perez and Gutierrez-Viana, 2012; Levy *et al*., 2016; Zhang, 2016).

Strategic planning and implementation (F5). The implementation of a long-term strategy along with the blueprint is inevitable, also considering as the solutions of coffee enterprises. In particular, the majority of the number of the coffee-production company is still small and medium enterprises in emerging economies (Krishnan, 2017; Zhang, 2016). Nonetheless, there is a lack of proper attention to the implementation of the strategy, which has significantly influenced the firm's performance. A comprehensive blueprint is a necessity for the conservation of local specialty coffee, environmental protecting, responsibility with the society and at least that the survival of coffee enterprise (Krishnan, 2017).

Packaging and processing (F6). The characteristics of coffee plants differ from other products. Therefore, it is related to weather, climate and soil. The coffee production is concentrated in the central highland region of Vietnam; however, the distance between this area and processing factories is very far around 400 kilometer (Gonzalez-Perez and Gutierrez-Viana, 2012). After harvesting, coffee beans are processed, packaged and transported to processing plants and eventually transported to seaports for export. Consequently, due to the long-distance as well as the characteristics of coffee beans during storage and movement lead to the difficulties of this parameter that companies in the coffee industry must pay attention to more than another sector if they want to achieve more economicbenefit (Gonzalez-Perez and Gutierrez-Viana, 2012; Krishnan, 2017; Murthy and Madhava Naidu, 2012; Zhang, 2016).

Alliance-joint venture (F7). Although some other countries have succeeded with the alliance-joint venture model like Colombia, otherwise, in Vietnam where application the alliance-joint venture model is still entirely new and is attracting the attention of some big coffee enterprises that participate in this model (Gonzalez-Perez and Gutierrez-Viana, 2012; Zhang, 2016). It undertakes to connect ventures to business customers or retail businesses with coffee producers. Moreover, it also will help the Vietnamese coffee industry to reach the

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world coffee market more efficiently. As a result, from 2015, Vietnam's coffee industry has started participating in this process with the first joint venture between Starbucks and Vietnamese coffee. Vietnamese coffee will be sold in Starbucks's chain over 21,500 stores globally. Besides, other small joint ventures of domestic enterprises in Vietnam also gradually developed (Zhang, 2016).

Supply chain and logistics management (F8). In terms of supply chain and logistics management of the Vietnamese coffee industry, the coffee supply chain management (SCM) is a lengthy and complicated process from up-streams is coffee production farmers to down-streams as final consumers. Throughout the coffee supply chain, there are many factors that impact in both positive and negative way of SCM process (Krishnan, 2017). Recent studies are focused on how to ensure sustainable goals in the coffee supply chain in Vietnam. For instance, Nguyen and Sarker (2018) focused their empirical study for Buon Me Thuot city where many coffee companies are concentrated and considered as the coffee capital of Vietnam. Meanwhile, in another aspect, Nguyen *et al.* (2017a) have approached the qualitative method when adopted the Casual Loop Modeling to clarify which parameter has a significant impact on the Vietnamese coffee supply chain. In the year 2017, in a study attempting to increase the competitiveness for Vietnamese coffee products, Nguyen *et al.* (2017b) have trying to combine one more modeling technique is that Bayesian belief networks into the Vietnamese coffee supply chain.

Competitive cost position (F9), Product quality (F10), Flexibility and responsiveness (F11) and Infrastructure (F12). These studies have described some of the key factors by considering these four parameters together (Nguyen and Sarker, 2018; Nguyen *et al.*, 2015; Nguyen *et al.*, 2017a, b). These parameters create the individual nature toward the cost, quality flexibility and infrastructure of the coffee industry. Among these parameters, Nguyen *et al.* (2017b) focused on the coffee supply chain cost which can influence the relationship between coffee export companies and final customer where coffee export companies come to know the actual demands because customer satisfaction depends on the selling price of the coffee commodity. Meanwhile, regarding the study of Nguyen and Sarker (2018), the main factors affecting the supply chain of Vietnamese coffee were identified like product quality flexibility and responsiveness (Nguyen and Sarker, 2018). The competitive cost position aims to handle the issues that reduce the cost production and achieve competitive advantage and more profit (Verma *et al.*, 2016) for the coffee enterprise. The high value and quality of Vietnam coffee make it an international brand and famous in worldwide markets. When the quality of coffee production improves then customers are more satisfied and influenced to achieve more profit and generate revenue for the coffee enterprise. The flexibility and responsiveness of the industry are the vision of a continuous improvement process that gives strategic importance in long-term planning and decision making (Kumar and Sharma, 2015; Kumar and Sharma, 2016). The coffee industry must have the qualities of an efficient and responsive supply chain, especially in the coffee market currently volatile and uncertain. The infrastructure of the coffee industry refers to the underlying systems and services that the coffee enterprise needs to function correctly in the supply chain process. Regardless in the public sector or private sectors, the role of these parameters is very significant for the sustainable goals of coffee supply chain in Vietnam. However, management capacity is not sufficient, backward technology and incomplete supply chain are the specific limitations of emerging economies while participating in the global supply chain. Although approaching different aspects, Nguyen and Sarker (2018) and Nguyen *et al.* (2015, 2017a, b) also pointed out that the lack of interest of coffee producers in the infrastructure along with the government support that will significantly affect the overall coffee SCM. Thus, it is clear that comprehensive solutions for a sustainable approach will help to make profits in a competitive advantage for Vietnamese coffee industry (Nguyen and Sarker, 2018; Nguyen *et al.*, 2015, 2017a, b).

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Human resources (F13). In Vietnam, most of the coffee production (grown and produced) is done in the central highlands. This is a rural area where the Vietnamese government is facing pressure from inequality, poor living standards and low education levels of the local population. In the Triple Bottom Line model, the social sustainability aspect plays an equally important role in comparison to economic sustainability and environmental sustainability (Elkington, 1997; Elkington, 2004). In this context, the social responsibility of coffee companies must support and develop the local human resource by the project ensuring the rights of farmers and workers in factories, limiting market risks and coffee prices for farmers (Krishnan, 2017; Nguyen and Sarker, 2018; Nguyen, 2016). Thus, human resources have been identified as a parameter that can impact on the sustainability of Vietnamese coffee industry.

New technology development (F14). Investing in new technology is a feasible solution leading to gain higher productivity in coffee production, especially food goods like coffee which requires strict storage, processing and storage conditions following clear regulations and procedures to ensure quality in the best state. Thus, adopting modern technology, new machines for processing, transportation from coffee raw material areas to factories and warehouses will solve the coffee product quality issues. Furthermore, it also considered as a solution for reducing production cost (Gonzalez-Perez and Gutierrez-Viana, 2012; Nguyen *et al*., 2017a, b). Nguyen *et al*. (2017a, b) have illustrated that if coffee companies invest in entire stages in the coffee supply chain, they will achieve more competitive advantage in both the domestic and foreign markets. Therefore, we identified the new technology development as one of those factors influence on the Vietnamese coffee industry.

Cooperation and coordination (F15). Last but not least, the ability of cooperation and coordination of coffee enterprises with other counterpart or the linkage of the coffee industry with their stakeholders. Vietnam and Colombia, which are two countries ranked second and third in the global coffee export market, respectively. Through the study of these cases, Gonzalez-Perez and Gutierrez-Viana (2012) have proved that cooperation between various coffee industries will help create opportunities for coffee company development, increase their competitive advantage in the global market and achieve more economic benefits through reducing the production cost (Gonzalez-Perez and Gutierrez-Viana, 2012; Nguyen *et al*., 2017a, b; Osorio, 2002). Thus, comprehensive cooperation for the whole coffee industry is the new direction for each counterpart in the global coffee market. The factors will contribute to increasing the position of coffee enterprises, besides, increasing the value of these companies in the global value chain where the decision-making rights belong to the retail chains or factories producing such as Starbuck and Nestle (Gonzalez-Perez and Gutierrez-Viana, 2012; Osorio, 2002).

Regarding the previous studies about the coffee industry in the world as well as consult from the perspective of this industry experts, the authors illustrated several parameters as below in Table I.

2.3 Research gaps

The research gaps are highlighted in the following points:

(1) The inevitable consequence is that leading to many obstacles and challenges for businesses when they want to develop sustainability (Hansen *et al*., 2018; Ramos-Mejía *et al*., 2018; Wieczorek, 2018) in Vietnam coffee industry (World Bank, 2019). Consequently, an industry which needs to grow sustainably must depend on many different parameters both internal and external of the enterprise. Therefore, identifying the parameters affecting the SD goals of enterprises is essential.

(2) In recent years, there have been several studies on the sustainability of Vietnamese coffee industry (World Bank, 2019); however, due to the broad scope of the coffee industry as well as other limitations of this research. Therefore, there is still a lack of

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S. No.	Barriers	Brief description	Macro process of the supply chain	References
1	Awareness and training to coffee producers (F1)	Leading to coffee products can access more difficult marketplaces where sustainability certification is a necessary condition for coffee exporters	SRM	Tatarski (2017), Zhang (2016), Ho *et al.* (2018)
2	Environment impact (F2)	This factor plays an essential role and has a permanent impact on sustainability in coffee production. Thus coffee companies always consider this parameter as the most priority	SRM	Utting (2009), Tatarski (2017), Nguyen and Sarker (2018), Chengappa *et al.* (2017), de Queiroz *et al.* (2018)
3	Marketing and brand innovation (F3)	This approach will achieve positive effects on firm performance, moreover, enhancing the competitive advantage for coffee exporting companies to potential markets	CRM	Mussatto *et al.* (2011), Gonzalez-Perez and Gutierrez-Viana (2012), Zhang (2016), Kumar and Sharma (2017b)
4	Regulatory frameworks and policies (F4)	Coffee associations have been established and the role of associations to link coffee companies into a collective unity, and support coffee producers	SRM, ISCM and CRM	Gonzalez-Perez and Gutierrez-Viana (2012), Zhang (2016), Levy *et al.* (2016)
5	Strategic planning and implementation (F5)	The blueprint is inevitable, also considering as the solutions of coffee enterprises	SRM, ISCM, and CRM	Zhang (2016), Krishnan (2017), Hieu (2018)
6	Packaging and processing (F6)	Based on characteristics of coffee plants are different from other products, this factor has a role in the supply chain from harvest stage to the final customer	CRM	Murthy and Madhava Naidu (2012), Gonzalez-Perez and Gutierrez-Viana (2012), Zhang (2016), Krishnan (2017)
7	Alliance-joint venture (F7)	This ventures to link business customers or retail businesses with coffee producers aim to enhance market size	SRM and CRM	Gonzalez-Perez and Gutierrez-Viana (2012), Zhang (2016), Bhaumik *et al.* (2019)
8	Supply chain and logistics management (F8)	The coffee supply chain management (SCM) is a lengthy and complicated process from up-streams is coffee production farmers to down-streams as final consumers	SRM, ISCM and CRM	Nguyen *et al.* (2015), Nguyen *et al.* (2017a, b), Nguyen and Sarker (2018)
9	Competitive cost position (F9)	Aiming to handle the issues aim to reduce the cost production and achieve more profit for the coffee enterprise	CRM	Nguyen *et al.* (2015), Nguyen *et al.* (2017a, b), Nguyen and Sarker (2018)
10	Product quality (F10)	This parameter to handle the issues aim to reduce the cost production and achieve more profit for the coffee enterprise	CRM	Nguyen *et al.* (2015), Kumar and Sharma (2017a), Nguyen *et al.* (2017a, b), Kumar and Sharma

Table I.
The key parameters impact the sustainability in the Vietnamese coffee industry

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S. No.	Barriers	Brief description	Macro process of the supply chain	References
				(2017c), Nguyen and Sarker (2018)
11	Flexibility and responsiveness (F11)	Qualities that most the coffee enterprise should have, especially in the coffee market currently volatile, and uncertain	SRM, ISCM and CRM	Nguyen *et al.* (2015), Nguyen *et al.* (2017a, b), Nguyen and Sarker (2018)
12	Infrastructure (F12)	The infrastructure of the coffee industry refers to the underlying systems and services that the coffee enterprise needs to function correctly in the SCM	SRM, ISCM and CRM	Gonzalez-Perez and Gutierrez-Viana (2012), Nguyen *et al.* (2017a, b), Nguyen and Sarker (2018)
13	Human resources (F13)	Human resource management (HRM) refers to the issue aim to ensure the worker right, their income, insurance, and so on	SRM and CRM	Nguyen (2016), Krishnan (2017), Nguyen and Sarker (2018)
14	New technology development (F14)	Adopting new technology product coffee goods will solve the coffee product quality issue, and it also considered as a solution for reducing the production cost	CRM	Gonzalez-Perez and Gutierrez-Viana (2012), Nguyen *et al.* (2017a, b)
15	Cooperation and coordination (F15)	Requirement the linkage of the coffee industry with their stakeholders will help ensure sustainability in the relationship	SRM, ISCM and CRM	Osorio (2002), Gonzalez-Perez and Gutierrez-Viana (2012), Nguyen and Sarker (2018)

Notes: SRM, supplier relationship management; ISCM, internal supply chain management", CRM: "customer relationship management"

Table I.

concern about the sustainability of the coffee industry in coffee production companies, especially in Vietnam. Consequently, we identify the various parameters from previous literature which help Vietnamese coffee industry to improve their productivity and achieve sustainability that strengthen the current coffee production performance as well as achieves sustainable goals.

(3) Literature also lacks in identifying the suitable Vietnam coffee industry parameters and finding the rank of them using TOPSIS technique for this purpose in this work.

3. Research methodology

3.1 Case empirical research

The study has adopted the case study method approach to bring the significant findings which may help to find the suitable types of coffee industry parameters as multi-criteria to prioritize the heterogeneous parameters to the coffee production. The seminal article on "Building Theories from Case Study Research" has motivated to explorative research of diverse areas to build concepts and theories considering case research (Eisenhardt, 1989) on different parameters on coffee production in Vietnamese industries is no exception. The study is purely qualitative based on the semi-structured interview and observation method is employed in the big coffee industries in Vietnam. In this process initially, we have

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identified some of the parameters and made a set of questions to know the view of top management of such industries. The target respondent for the interview session was the top managers who are working with coffee production. These industries are the leading brands in Vietnam. For developing the contextual relationships among the different parameters, twelve respondents were targeted for the data collection, but only ten agreed to participate in the interview with their expert suggestions and recommendations in certain conditions such as confidentiality issues related to the name of the brand, employee. These coffee industries that have been taken in the study are renowned coffee production in Vietnam, and all of them also have collaboration with international partners. These respondents are well experienced and also a pioneer in the field of such industry in Vietnam. From the sample respondents, the vast majority of the respondents (70 percent) were male, and only 30 percent of the respondents were female. All respondents belong to the manufacturing units. 10 percent of the respondents belong to the age of younger than 35 years. The most substantial proportion (60 percent) of the respondents is in the age category of 35–39 years, and 10 percent of respondents belong to 40–49 years while 20 percent of respondents belong to 50–59 years. From the respondent group, 10, 20 and 40 percent of respondents belong to less than ten years, 10–15 years and 16–20 years of work experience, respectively, while 30 percent of respondents belong to more than 20 years' work experience years' group. From the target respondents, 50 percent are directors of the big coffee industries in Vietnam. Along with the consideration of directors of the coffee industries, we focused other top management such as 20 percent are vice director, while 10 percent each is related to the dean of HRM, manager of the product quality department and the dean of the complex department. Table II represents that summary of the demographic analysis.

After collecting the responses, we have taken these respondents as ten decision-makers (DMs) because they belong to the top management of the coffee industry. The fifteen coffee production parameters are awareness and training to coffee producers (F1), environment impact (F2), marketing and brand innovation (F3), regulatory frameworks and policies (F4), strategic planning and implementation (F5), packaging and processing (F6), alliance-joint venture (F7), supply chain and logistics management (F8), competitive cost position (F9), product quality (F10), flexibility and responsiveness (F11), infrastructure (F12), human resources (F13), new technology development (F14) and cooperation and coordination (F15)

Profile	Classification	Percentage
Respondents	Male	70
	Female	30
Type of industry	Manufacturing unit	100
	Service unit	0
	Other	0
Age	Younger than 35 years	10
	35–39 years	60
	40–49 years	10
	50–59 years	20
Work experience	Less than 10 years	10
	10–15 years	20
	16–20 years	40
	More than 20 years	30
Department of respondents	Director	50
	Vice Director	20
	The dean of HRM	10
	Manager of product quality department	10
	The dean of complex department	10

Table II.
Summary of demographic details

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have been assumed constructed. Further, we follow the research process of the study. Figure 1 represents the flowchart of the proposed research work of the current study.

3.2 TOPSIS method

For the ranking of different parameters, multi-criteria decision making (MCDM) tool is used. The technique called TOPSIS was proposed as the most widely MCDM technique by Hwang and Yoon (1981) while first introduced by Chen (2000) to solve the MCDM problems under uncertainty and vagueness. Now a day, many scholars have been analyzing their data using TOPSIS (Singh *et al.*, 2016). In total, 15 criteria and 10 DMs have been considered in this study while the TOPSIS method is applied directly for this problem to deal with unstructured problems. We need to check some assumptions of TOPSIS including the connections among multiple dependent and independent factors before using the TOPSIS method. Wang and Lee (2009) and Singh *et al.* (2016) have considered TOPSIS method using an expert-based method to prioritize the parameters with three, five, or ten experts sometimes and these researchers did not consider measuring the redundancy in their research. In the same scenario, we considered ten experts for this current research. However, these fifteen parameters are

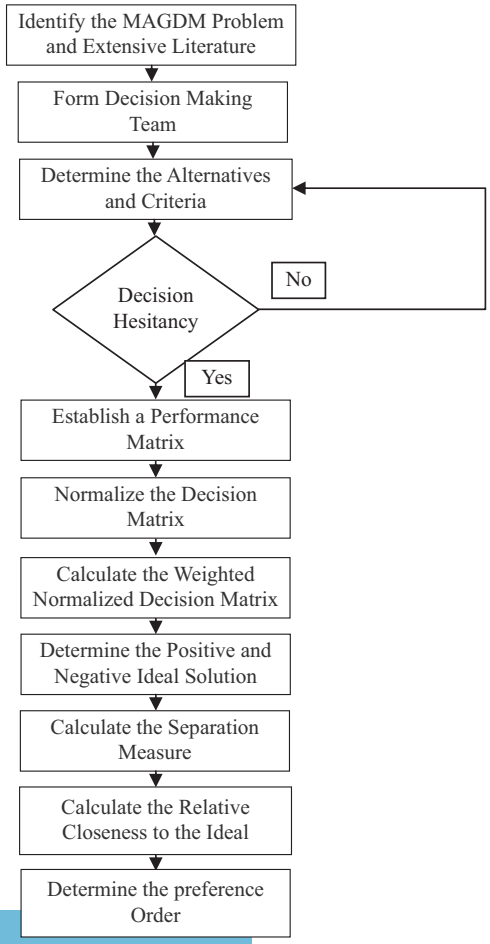

Figure 1.
Flowchart of the proposed research work

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measured by the TOPSIS method gives rank them in their units where all represent the maximizing the coffee production for current industries in Vietnam. The conventional TOPSIS method is focused only on crisp (binary) and static values. In this situation, the linguistic variables are used to measure evaluating criteria by DMs in this method, depicted in Table III.

The extent following steps are included in the TOPSIS method:

- Step 1: a MAGDM problem can be concisely expressed in matrix format as $[x_{ij}]_{m\times n}$ on the basis of m alternative and n criteria having a rating of ith DMs and jth criteria. The decision matrix is expressed as:

	C_1	C_2	.	.	.	C_n
A_1	x_{11}	x_{12}	.	.	.	x_{1n}
A_2	X_{21}	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
A_m	X_{m1}	.	.	.	.	X_{mn}

r_{ij} 0-----1

where number of alternative $i = 1, 2, \ldots, m$ and number of criteria $j = 1, 2, \ldots, n$.

- Step 2: the normalize decision matrix has been developed considering Equation (1). It has been made all the data set is equal measuring criteria in a single platform for normalization of the matrix. We then obtain the normalized fuzzy decision matrix (denoted by R):

r_{11}	r_{12}	.	.	.	r_{1n}
r_{21}	r_{22}	.	.	.	r_{2n}
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
r_{m1}	r_{m2}	.	.	.	r_{mn}

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^2}}, \tag{1}$$

where $i = 1, 2, \ldots, n$ and $j = 1, 2, \ldots, m$.

Table III. Linguistic code for evaluating criteria

Linguistic scale	Code	Scale
Unimportant	UI	1
Slightly Important	SI	2
Fairly Important	FI	3
Important	I	4
Very Important	VI	5

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- Step 3: constructthe weighted normalized matrix denoted as:

v_{11}	v_{12}	.	.	.	v_{1n}
v_{21}	v_{22}	.	.	.	v_{2n}
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
v_{m1}	v_{m2}	.	.	.	v_{mn}

$$v_{ij} = w_j \times r_{ij}, \tag{2}$$

where $i = 1, \ldots, n$; $j = 1, \ldots, m$; and w_j = weights of different attributes

- Step 4: we determine the ideal solution using Equations (3)–(6). The ideal solution is not achievable so, we maximize each objective and each criterion individually, then make a group of the values and try to achieve that said value, we then finally minimize the distance of the decision and this ideal solution that having a maximum value:

$$A^+ = \left(v_1^+, v_2^+, \ldots, v_n^+\right) \text{ the ideal solution,} \tag{3}$$

$$v_j^+ = \left\{\max_i.v_{ij}, \min_i.v_{ij}\right\} \quad \text{BA} = \text{Benefit attribute,} \tag{4}$$

$$j \in \text{BA} \quad j \in \text{CA.}$$

$$A^- = \left(v_1^-, v_2^-, \ldots, v_n^-\right) \text{ Negative or anti ideal solution,} \tag{5}$$

$$v_j^- = \left\{\min_i.v_{ij}, \max_i.v_{ij}\right\} \quad \text{BA} = \text{Benefit attribute,} \tag{6}$$

$$j \in \text{BA} \quad j \in \text{CA.}$$

- Step 5: the next step measures the distance of each alternative measured by the Euclidean distance from the positive and negative ideal solutions using the following equations. The Euclidean distance between two TFNs $A_1(a_1, b_1, c_1)$ and $A_2(a_2, b_2, c_2)$ is calculated by:

$$d_i^+ = \sqrt{\sum_j \left(v_{ij}^+ - v_j^+\right)^2}, \tag{7}$$

$$d_i^- = \sqrt{\sum_j \left(v_{ij}^- - v_j^-\right)^2}, \tag{8}$$

where $i = 1, 2, \ldots, \text{m}$ and $j = 1, 2, \ldots, n$.

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- Step 6: the closeness coefficient CC_i of the alternative is calculated using the following equation:

$$CC_i = \frac{d_i^-}{d_i^- + d_i^+}, i = 1, 2, \ldots, m \quad (9)$$

- Step 7: the closeness coefficient CC_i depicts the best solution if it is closest to 1 and determine the rank of alternative. The best choice having the shortest distance to the ideal solution and this shortest distance depicts the longest distance from the negative ideal solution.

4. Results and discussion

For the research questions given in this research paper, there are ten DMs, who belong to top management and help current related industries rank their best practices. These ten DMs (DM1–DM10) each have good experience in coffee industries. From the source of literature, we selected fifteen criteria related to coffee production. We then developed models to rank the parameters using TOPSIS. The execution of this model is presented in the next section with results and discussion. These top-ranking firms mainly belong to the coffee industry sectors. Based on DMs' (DM1–DM10) experience, they have given the weight of "0.11," "0.09," "0.08," "0.1," "0.09," "0.125," "0.1," "0.11," "0.1" and "0.095," respectively. These parameters are given a score on a scale of 1–5 (1 – unimportant, 5 – very important). Table IV represents the scores of the decision matrix and various experts have given weights for the individual parameter. The normalized values of this decision matrix are given in Table V. Using Steps 2 and 3, we develop the weighted normalized decision matrix which is shown in Table VI. Using Step 4, positive and negative ideal solutions are determined and outlined in Table VII. Using Step 5, the separation of each parameter from the positive and negative ideal solution is determined and shown in Tables VIII and IX, respectively. Now using Step 6, the relative closeness of each parameter to the ideal solution (closeness ratio) is found as given in Table X and based on closeness ratio in Step 7, the relative ranking of these parameters and their performance are shown in Table X and Figure 2, respectively. This execution of the TOPSIS method is expressed in succession to the following steps.

The final rank of the parameters is F3 > F10 > F5 > F11 > F2 > F4 > F6 > F13 > F9 > F15 > F1 > F12 > F14 > F8 > F7. From Table X, we see that F3 has the highest CC_i score is 0.80 while F7 has the lowest CC_i is 0.36. On the basis of CC_i scores, the graph has been plotted in Figure 2 that represents the coffee production and their performance. The results and findings show that F3 is recognized as the first priority in the coffee production parameters list.

Vietnamese coffee production was ranked 2nd in the coffee export market worldwide after Brazil. There are two popular types of coffee in the world currently grown and produced in Vietnam, including Arabica and Robusta. Especially, Robusta coffee amount of from ninety percent to ninety-five percent total of Vietnamese coffee production annual, and also accounting for one-third of global coffee export volume (International Coffee Organization, 2019). Furthermore, due to Vietnam has a competitive advantage in environmental conditions, soil, climate, water resources have contributed to making the quality of coffee beans which originating from Vietnam become famous. On the other hand, in recent years, climate change has been substantial in Vietnam; besides water resources are no longer guaranteed for coffee farms.

As a consequence, annual coffee harvests in Vietnam have suffered significant losses in both output and quality. Notably, in 2016, the coffee industry has been sustained the most severe drought in the past 30 years in the Central Highlands where is the area that accounts for greatest of the coffee production area in Vietnam. Second, although Vietnamese coffee production is very high, however, the coffee value is not high due to the raw coffee

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Table IV. The scores of the decision matrix and weight

Weight →	0.11 DM1	0.09 DM2	0.08 DM3	0.1 DM4	0.09 DM5	0.125 DM6	0.1 DM7	0.11 DM8	0.1 DM9	0.095 DM10
Awareness and training to coffee producers (F1)	4	4	2	4	4	5	4	4	5	4
Environment impact (F2)	5	5	5	5	3	5	5	5	4	3
Marketing and brand innovation (F3)	5	5	4	4	5	5	5	5	5	5
Regulatory frameworks and policies (F4)	5	3	5	4	4	5	5	4	4	4
Strategic planning and implementation (F5)	5	4	4	5	5	5	4	5	5	5
Packaging and processing (F6)	5	4	3	5	4	5	4	5	4	5
Alliance-joint venture (F7)	5	3	3	4	3	4	3	5	4	3
Supply chain and logistics management (F8)	3	3	4	4	5	4	4	4	3	3
Competitive cost position (F9)	5	3	4	4	4	4	3	5	5	4
Product quality (F10)	5	5	4	5	5	5	5	5	4	5
Flexibility and responsiveness (F11)	5	4	4	4	5	5	5	4	5	4
Infrastructure (F12)	4	4	3	4	3	5	4	5	4	4
Human resources (F13)	4	4	4	4	5	4	4	5	4	5
New technology development (F14)	3	3	3	5	3	5	4	5	5	3
Cooperation and coordination (F15)	5	4	3	4	3	5	4	4	4	4

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S. No.	Weight	0.11 DM1	0.09 DM2	0.08 DM3	0.1 DM4	0.09 DM5	0.125 DM6	0.1 DM7	0.11 DM8	0.1 DM9	0.095 DM10
1	F1	0.2250	0.2626	0.1377	0.2369	0.2486	0.2716	0.2430	0.2202	0.2951	0.2495
2	F2	0.2813	0.3283	0.3442	0.2962	0.1864	0.2716	0.3037	0.2752	0.2361	0.1871
3	F3	0.2813	0.3283	0.2754	0.2369	0.3107	0.2716	0.3037	0.2752	0.2951	0.3119
4	F4	0.2813	0.1970	0.3442	0.2369	0.2486	0.2716	0.3037	0.2202	0.2361	0.2495
5	F5	0.2813	0.2626	0.2754	0.2962	0.3107	0.2716	0.2430	0.2752	0.2951	0.3119
6	F6	0.2813	0.2626	0.2065	0.2962	0.2486	0.2716	0.2430	0.2752	0.2361	0.3119
7	F7	0.2813	0.1970	0.2065	0.2369	0.1864	0.2173	0.1822	0.2752	0.2361	0.1871
8	F8	0.1688	0.1970	0.2754	0.2369	0.3107	0.2173	0.2430	0.2202	0.1771	0.1871
9	F9	0.2813	0.1970	0.2754	0.2369	0.2486	0.2173	0.1822	0.2752	0.2951	0.2495
10	F10	0.2813	0.3283	0.2754	0.2962	0.3107	0.2716	0.3037	0.2752	0.2361	0.3119
11	F11	0.2813	0.2626	0.2754	0.2369	0.3107	0.2716	0.3037	0.2202	0.2951	0.2495
12	F12	0.2250	0.2626	0.2065	0.2369	0.1864	0.2716	0.2430	0.2752	0.2361	0.2495
13	F13	0.2250	0.2626	0.2754	0.2369	0.3107	0.2173	0.2430	0.2752	0.2361	0.3119
14	F14	0.1688	0.1970	0.2065	0.2962	0.1864	0.2716	0.2430	0.2752	0.2951	0.1871
15	F15	0.2813	0.2626	0.2065	0.2369	0.1864	0.2716	0.2430	0.2202	0.2361	0.2495

Table V.
Normalized values of decision matrix

		DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	F1	0.0248	0.0236	0.0110	0.0237	0.0223	0.0340	0.0243	0.0242	0.0295	0.0237
2	F2	0.0309	0.0295	0.0275	0.0296	0.0168	0.0339	0.0304	0.0303	0.0236	0.0178
3	F3	0.0309	0.0295	0.0220	0.0237	0.0280	0.0339	0.0304	0.0303	0.0295	0.0296
4	F4	0.0309	0.0177	0.0275	0.0237	0.0224	0.0339	0.0304	0.0242	0.0236	0.0237
5	F5	0.0309	0.0236	0.0220	0.0296	0.0280	0.0339	0.0243	0.0303	0.0295	0.0296
6	F6	0.0309	0.0236	0.0165	0.0296	0.0224	0.0339	0.0243	0.0303	0.0236	0.0296
7	F7	0.0309	0.0177	0.0165	0.0237	0.0168	0.0272	0.0183	0.0303	0.0236	0.0178
8	F8	0.0186	0.0177	0.0220	0.0237	0.0280	0.0272	0.0243	0.0242	0.0177	0.0178
9	F9	0.0309	0.0177	0.0220	0.0237	0.0224	0.0272	0.0182	0.0303	0.0295	0.0237
10	F10	0.0309	0.0295	0.0220	0.0296	0.0280	0.0339	0.0304	0.0303	0.0236	0.0296
11	F11	0.0309	0.0236	0.0220	0.0237	0.0280	0.0339	0.0304	0.0242	0.0295	0.0237
12	F12	0.0248	0.0236	0.0165	0.0237	0.0168	0.0339	0.0243	0.0303	0.0236	0.0237
13	F13	0.0248	0.0236	0.0220	0.0237	0.0280	0.0272	0.0243	0.0303	0.0236	0.0296
14	F14	0.0186	0.0177	0.0165	0.0296	0.0168	0.0339	0.0243	0.0303	0.0295	0.0178
15	F15	0.0309	0.0236	0.0165	0.0237	0.0168	0.0339	0.0243	0.0242	0.0236	0.0237

Table VI.
Weighted values of decision matrix

	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
Positive ideal solution	0.0309	0.0295	0.0275	0.0296	0.0280	0.0340	0.0304	0.0303	0.0295	0.0296
Negative ideal solution	0.0186	0.0177	0.0110	0.0237	0.0168	0.0272	0.0182	0.0242	0.0177	0.0178

Table VII.
Positive and negative ideal solution

bean export. Furthermore, the selling price still depends on big business customers leading to the limitations in economic benefits for Vietnamese coffee enterprises. Moreover, the Vietnamese coffee production system model helps to the current industries to focus on the cost reduction, improve the quality substantially, create "competitiveness" among them with their improved farming and cultivation quality system. In this way, all coffee industries in the current era making a strategic plan for future decisions to the expansion of Vietnam's coffee production, export base, and future export growth. It will lead and in turn, contribute to the economic development.

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		DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	F1	0.0062	0.0059	0.0165	0.0059	0.0056	0	0.0061	0.0061	0	0.0059
2	F2	0	0	0	0	0.0112	0	0	0	0.0060	0.0119
3	F3	0	0	0.0055	0.0059	0	0	0	0	0	0
4	F4	0	0.0118	0	0.0059	0.0056	0	0	0.0061	0.0060	0.0059
5	F5	0	0.0059	0.0055	0	0	0	0.0061	0	0	0
6	F6	0	0.0059	0.0110	0	0.0056	0	0.0061	0	0.0060	0
7	F7	0	0.0118	0.0110	0.0059	0.0112	0.0068	0.0122	0	0.0059	0.0119
8	F8	0.0124	0.0118	0.0055	0.0059	0	0.0068	0.0061	0.0061	0.0118	0.0119
9	F9	0	0.0118	0.0055	0.0059	0.0056	0.0068	0.0122	0	0	0.0059
10	F10	0	0	0.0055	0	0	0	0	0	0.0059	0
11	F11	0	0.0059	0.0055	0.0059	0	0	0	0.0061	0	0.0059
12	F12	0.0062	0.0059	0.0110	0.0059	0.0112	0	0.0061	0	0.0059	0.0059
13	F13	0.0062	0.0059	0.0055	0.0059	0	0.0068	0.0061	0	0.0059	0
14	F14	0.0124	0.0118	0.0110	0	0.0112	0	0.0061	0	0	0.0119
15	F15	0	0.0059	0.0110	0.0059	0.0112	0	0.0061	0.0061	0.0059	0.0059

Table VIII. Distance from the positive ideal solution (d_i^+)

		DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	F1	0.00612	0.0059	0	0	0.0056	0.0068	0.0061	0	0.0118	0.0059
2	F2	0.01238	0.0118	0.0165	0.0059	0	0.0068	0.0121	0.0061	0.0059	0
3	F3	0.01238	0.0118	0.0110	0	0.0112	0.0068	0.0121	0.0061	0.0118	0.0119
4	F4	0.01238	0	0.0165	0	0.0056	0.0068	0.0121	0	0.0059	0.0059
5	F5	0.01238	0.0059	0.0110	0.0059	0.0112	0.0068	0.0061	0.0061	0.0118	0.0119
6	F6	0.01238	0.0059	0.0055	0.0059	0.0056	0.0068	0.0061	0.0061	0.0059	0.0119
7	F7	0.01238	0	0.0055	0	0	0	0	0.0061	0.0059	0
8	F8	0	0	0.0110	0	0.0112	0	0.0061	0	0	0
9	F9	0.01238	0	0.0110	0	0.0056	0	0	0.0061	0.0118	0.0059
10	F10	0.01238	0.0118	0.0110	0.0059	0.0112	0.0068	0.0121	0.0061	0.0059	0.0119
11	F11	0.01238	0.0059	0.0110	0	0.0112	0.0068	0.0121	0	0.0118	0.0059
12	F12	0.00628	0.0059	0.0055	0	0	0.0068	0.0061	0.0061	0.0059	0.0059
13	F13	0.0062	0.0059	0.0110	0	0.0112	0	0.0061	0.0061	0.0059	0.0119
14	F14	0	0	0.0055	0.0059	0	0.0068	0.0061	0.0061	0.0118	0
15	F15	0.0124	0.0059	0.0055	0	0	0.0068	0.0061	0	0.0059	0.0059

Table IX. Distance from the negative ideal solution (d_i^-)

		d_i^+	d_i^-	CC_i	Rank
1	F1	0.0228	0.0190	0.4545	11
2	F2	0.0173	0.0294	0.6293	5
3	F3	0.0081	0.0324	0.8002	1
4	F4	0.0177	0.0269	0.6030	6
5	F5	0.0101	0.0295	0.7447	3
6	F6	0.0161	0.0241	0.5993	7
7	F7	0.0281	0.0160	0.3623	15
8	F8	0.0275	0.0168	0.3795	14
9	F9	0.0216	0.0227	0.5132	9
10	F10	0.0081	0.0313	0.7950	2
11	F11	0.0131	0.0283	0.6835	4
12	F12	0.0215	0.0171	0.4435	12
13	F13	0.0160	0.0238	0.5982	8
14	F14	0.0268	0.0180	0.4022	13
15	F15	0.0214	0.0193	0.4733	10

Table X. Summary of the closeness ratio and their ranking

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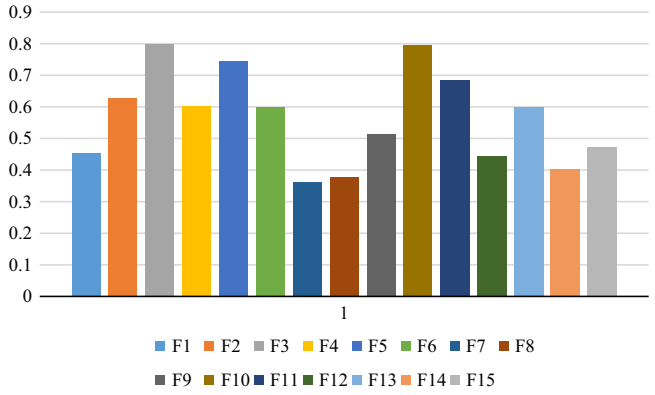

Figure 2.
Rank of the parameters' performance

5. Managerial implications

According to the Vietnam government report for vision development by 2020, the production of the coffee industry is one of the strategic products that needs to be promoted in restructuring activities. However, most coffee areas are grown and produced in the Central Highlands, where there are still limitations in intellectual standards, low income, as well as their ability to access new technologies to improve production efficiency. Furthermore, the field research in this developing country keeps support in the economic system with a predominant agricultural development; in addition, there are significant dependencies from coffee industries to economic growth. Leading to the Vietnamese coffee industry will face opportunities and challenges in sustainability in the future. The recent studies focus on the development of coffee industries and give technical support to the world as well as to Vietnamese coffee production. The sustainability targets are considered by all companies and researchers to close the theory and practice gap. As a result, academic seminars and practice workshops are conducted continuously by local research institutes, and the goal of universities is to develop and adopt useful principles for actual production. Therefore, it has been prioritized through the identified fifteen parameters of this research article to help current coffee industries. Later it increases the value-adding activities in quality production and changes the policy systems to achieve competitive advantages. In particular, it has a direct dependence on the sustainability of the coffee industry and will also bring many benefits to the Vietnamese coffee industry. Therefore, the determination of fifteen parameters for the sustainability of Vietnam coffee industries is not only in national development and economic benefit for coffee enterprises, but also it helps in achieving other benefits for society and the sustainable environment. In a local community where the residents and their domestic economy depend too much on coffee trees, it is clear that the SD of the coffee industry will affect society. It ensures not only their economic benefits or issues related to environmental sustainability (water and soil resources) but also contributes to solving problems related to social life in these areas such as preserving and developing a local culture to reduce the unemployment rate.

The findings suggested that "marketing and brand innovation," "product quality," and "strategic planning and implementation" are the most influential parameters that affect Vietnamese coffee production. Marketing and brand innovation have demonstrated that will achieve a positive impact on business performance and increase competition for coffee export companies in potential markets. The high value and quality of Vietnam coffee makes it the international brand and is well-known in worldwide markets. When the

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quality of coffee production improves, customers are more satisfied, leading to achieve more profit and generate revenue for the coffee industry. Determination of key parameters to achieve the sustainability goal plays an essential role in the strategic planning of the overall sector. Planning a business strategy involves the implementation of a long-term strategy as well as the blueprint that is inevitable; it is also considered as a solution for coffee enterprises. Thus, it was clear that a comprehensive solution to a sustainable approach would help create more profit competitive for the development of Vietnamese coffee industry, which is facing difficulties and challenges from many different parameters.

6. Conclusions, limitations and future scope of this study

The goal of this study was to propose a new procedure and to prioritize the best parameters in the Vietnam coffee industry to improve productivity and increase the competitive advantage using the TOPSIS methodology. The TOPSIS method is applied to obtain the final ranking preference in descending order, thus allowing relative performance to be compared. Based on data analysis, the "marketing and brand innovation," "product quality," "strategic planning and implementation" emerged as top three best key parameters with the value of 0.8, 0.795, and 0.74, respectively which achieved the best relative closeness to the ideal solution. While "new technology development," "supply chain and logistics management," and "alliance-joint venture" are identified as the bottom three parameters having closeness coefficients are 0.4, 0.38 and 0.36, respectively. This study has been succeeding in identifying 15 key parameters of coffee industries for SD with a snapshot of coffee industries in Vietnam and has developed a comprehensive structural relationship to make them effective. It is suggested by the results and findings that bottom three parameters also have strong support and play an important role. The functioning model in the coffee industry is to strive to achieve the desired trademark status in the global market through the development of high quality, cost-effective and enhance the competitive advantages, efficiency gains, economies of scope and high profitability. The development of a coffee production system model provides coffee producers with a snapshot of their farming system. Therefore, economic factors and social factors (including education, training, farm status, etc.) need to be standardized in choosing an appropriate coffee production system. In view of these parameters, the current industry may have to adopt its new business models to maintain long-term competition in the market.

It is also important to address the limitations of this study. From these constraints of the Vietnamese coffee industry, this research study is carried out with an impact on the sustainable goal of Vietnamese agriculture. The main objective of this research is to identify the critical parameters of coffee industries for sustainability in Vietnam. As the first limitation of this study is to adopt qualitative case studies with ten samples for in-depth interviews. Thus, it cannot measure the strength of parameters influencing the sustainability of Vietnamese coffee industries and their relations.

Nonetheless, due to the purpose of this research to reveal critical parameters; the employment of thematic analyses using TOPSIS in analyzing qualitative data allowed the scholars to recognize that on the sustainability of coffee industries in Vietnam metrics have the most impact. The future scope of this study can use various modeling techniques, which can be used in the Bayesian belief networks into the Vietnamese coffee industry to significantly increase in production in various operations, productivity, and performance. The study recommends fifteen parameters while missing some criteria such as vendor selection, distribution, customer, etc., that may be considered in a future study. Moreover, it provides excellence path for other industries to execute their business plans in further research.

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