Enablers of green business process management in the oil and gas sector

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Abstract

Purpose – The integration of green business process management (GBPM) to the existing processes of the oil and gas companies (O&G) in the Gulf Cooperation Council (GCC) countries can lower environmental damage in the O&G sector (OGS), which causes more environmental hazards than other sectors. Studies suggest that sustainability remains a challenge for GCC O&G companies. In this context, this study assesses the following enablers and subenablers related to GBPM integration in these companies: strategy, management, people and culture, information technology, methods and governance.

Design/methodology/approach – Using data from a survey of 12 strategy experts from four GCC O&G companies and the analytical hierarchy process, this study prioritized the key enablers and subenablers driving GBPM.

Findings – Strategy was the highest-ranked enabler, followed by management; governance was the lowest-ranked enabler. Measuring green metrics was the highest-priority strategy enabler, and revising responsibilities and management involvement in strategy development were the highest-priority sub-enablers.

Practical implications – This study recommends O&G companies to invest in optimizing the existing BPM to enhance process-based decision-making, before GBPM integration. The formation of sustainability groups can bring enablers together to improve sustainability performance. Management and governments must reevaluate their commitment to sustainability while developing policies for the GCC OGS.

Originality/value – This study investigated which enablers and subenablers significantly affect GBPM integration in the sector; the results can support researchers and practitioners with the necessary knowledge for future developments.

Keywords Oil and gas sector, Gulf cooperation council, Green business process management, Sustainable development, Analytical hierarchy process

Paper type Research paper

1. Introduction

Sustainability is a broad concept and can be applied to various fields, depending on its environmental, economic and social implications. In the business context, organizations should be aware of the importance of sustainability. In fact, an increased focus on the environmental impact and responsibility of organizations has driven them to attach importance to sustainability (Couckuyt and Van Looy, 2019). Therefore, it is imperative for organizations to incorporate the varied aspects of sustainability into their business processes, and thereby integrate them with the green business process management (GBPM) solution (Hernández González *et al.*, 2019). This study focuses on environmental sustainability in the oil and gas sector (OGS) as this sector is viewed as one of the major contributors to industrial pollution across the world (Pichtel, 2016). While OGS is considered one of the key drivers of the global economy, this sector has been highly criticized for damaging the overall environment and adversely affecting the lives of humans and animals. The OGS organizations are responsible for high greenhouse gas emissions, and the OGS causes

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more environmental damage than other sectors (Schneider *et al.*, 2013). The production of oil and gas entails venting, flaring and the accidental release of methane (Tantau *et al.*, 2017), a greenhouse gas with a global warming capacity several times higher than that of carbon dioxide (Tollefson, 2013). A significant amount of greenhouse gas is released by the engines and compressors used during the oil and gas drilling and production processes (Tollefson, 2013). The OGS has been responsible for large oil spills that have a devastating impact on wildlife habitats (UNDP, 2017). Recently, several sustainability-related problems have also been attributed to operational disruptions in the OGS and the increasing awareness of the nonrenewable nature of petroleum products (George *et al.*, 2016). The environmental and social impacts associated with the OGS can lead to unfavorable outcomes, and therefore there has been an increasing focus on implementing sustainable practices and solutions in oil and gas (O&G) companies. These companies have been recommended to integrate sustainability practices with their performance management systems (Prior *et al.*, 2012). The primary goal of an O&G company is to generate substantial profits and revenues, they focus very less on environmental sustainability. However, a focus on the broader concept of sustainability can help these companies to enhance the performance of the OGS effectively. For instance, by implementing environmental sustainability, the OGS can drastically reduce its waste management costs (Kwok and Grondzik, 2018). Thus, the introduction of sustainable and green measures can be crucial for the OGS. Environmental sustainability is frequently operationalized as a small group of measurable objectives in organizational inputs and outputs, such as lowering energy consumption, reutilizing or reducing waste, and minimizing carbon dioxide emissions (Brooks *et al.*, 2012; D'Agostini, 2017; Ferreira and Pernici, 2016). O&G companies tend to view social and environmental management as partly a voluntary approach and usually dependent on leadership and culture (Tomlinson, 2017). However, today, an O&G company cannot operate without responding to social and environmental issues (Tomlinson, 2017; UNDP, 2017). Therefore, the implementation of GBPM in the OGS will lead to the development of methods and systems that can integrate environmental management with different operational areas, including prospecting, drilling, production, storage and transportation (Cleven *et al.*, 2012). In other words, OGS can benefit substantially from the application of GBPM. The combined effects of these measures can considerably aid in the enhancement of operational sustainability and green practices. While GBPM can contribute toward the development of sustainability in all businesses, it is particularly relevant for the OGS, which is characterized by high environmental damage (Tomlinson, 2017). Thus, the adoption of green business process management (GBPM) signifies the development of sustainability in a methodical manner (Ferreira and Pernici, 2016).

Prior studies (Pádua and Jabbour, 2015; George *et al.*, 2016) primarily considered green process management for different organizations and sectors in Western countries, rather than the GCC or Middle Eastern region. Moreover, Rana and Alayed (2018) suggested that O&G companies, specifically in the GCC, must improve sustainability-related activities in order to implement sustainable principles effectively. Therefore, we conceptualize new research that is specific to the GCC region. It must also be noted that there is much uncertainty about the factors or capabilities that must be worked upon in reference to GBPM integration. For instance, Maciel (2017) identified six core capabilities of GBPM – green strategic alignment, green governance, green methods, green information technology (IT), green people and green culture; the study by Aghelie (2017) also suggested that GBPM is driven by regulations, green knowledge and training, green organizational culture, ecological concern, social influence, financial motivation and competitive advantage. This can pose confusion to companies or sectors that have newly adopted GBPM. Therefore, this study has integrated both into a strategic model based on the following six enablers: managerial, people and culture, IT, methods and governance. This approach can reduce the uncertainty surrounding the enablers while establishing the importance of each enabler along with its subenablers.

This study, however, aims to investigate different enablers that can promote GBPM across O&G companies. An identification of these enablers in the organizational setting will enable the GCC OGS to reduce its carbon footprints. Different types enablers can contribute toward GBPM. Thus, prioritizing these enablers based on their characteristics can contribute toward improving the green environment efficiently. In the above context, this study aims to accomplish the following:

(1) Critically examine the enablers and subenablers driving GBPM integration in the GCC OGS.

(2) Prioritize the key enablers and subenablers of GBPM integration in the GCC OGS by using the analytical hierarchy process (AHP), in order to provide relevant recommendations.

This study contributes toward bridging the knowledge gap in GBPM integration in the GCC OGS by providing a valuable reference to policymakers and practitioners aiming to mitigate the barriers to GBPM adoption; briefly, this study promotes the successful integration of GBPM. The findings can also help international organizations intending to integrate GBPM within the GCC OGS to achieve more sustainable development goals.

2. Literature review

2.1 Theoretical background

Organizations apply several concepts to expand, automate, elevate or evaluate their business process. This approach is known as business process management (BPM). A company must adopt such an approach to improve the efficiency of quality management, and thereby enhance customer satisfaction, requirements and maintenance (Jeston, 2018). The ability to maintain something at a certain rate is known as sustainability. Companies employ sustainability initiatives as business drivers, using customers as their main focus. A business that focuses on consumer preference and maintains good product services is highly likely to maintain a good flow of customers in the long-term. Maintaining the quality of products and services encourages customer retention. Most businesses create long-term value by applying this approach. Concerning product quality, we should also consider the socioeconomic and ecological environment of an organization. For instance, a company can commit to sustainability by maintaining environmental transparency, and thereby increase its customers. For example, a manufacturing company can choose to recycle its waste rather than polluting the environment.

These socioeconomic and environmental contexts of sustainability help a business achieve ethical and responsible success. There are several ways through which a business can maintain sustainability. They include embracing change with the changing times, believing in the business, focusing on growth, constant reinvention and focusing on creating value proposition (Lang, 2014). These aspects ensure that a company does not conflict with its financial goals by avoiding conflicts or depletion of nonrenewable resources. Business sustainability can contribute to profitability in the long-term and ensure return on investment. These profits also depend on an organization's employees. In this regard, we discuss the theory of contingency, which demonstrates how leadership can be handled based on the issues at hand. This theory suggests that an organizational issue should be applied to plan and organize an effective solution for the issue (Hoffer, 2011). This approach is also known as situational approach. A good leader should be able to ascertain the best style of management to achieve the goal in a situation. According to this theory, leaders are highly likely to influence their employees if they possess a good relationship with the employees. Organizations that value employees' opinions drive employees to listen to their leaders

accordingly. The theory also states the importance of making a detailed note of the task of every employee. Since the employees are aware of their responsibilities, leaders find it easier to use their tine to exert a positive influence on their employees.

Companies apply the above two theories to improve and to expand, automate, elevate or evaluate their business processes. On the one hand, sustainability enables a business to reorient its decisions around the long-term rather than the short-term. During the long-term, a company can progress focusing on future growth and profits. The contingency theory, on the other hand, enables leadership in the company to be reasonable and balanced (Luthans and Stewart, 2012). The two theories enable the growth of a company while focusing on profits for both the present and future purposes. The following sections present related work to understand the green business process management in this study.

2.2 Business process management and environmental sustainability

Business process management (BPM) incorporates diverse means of discovery, modeling, analysis, measurement, improvement, optimization and automation of business processes (Weske, 2012). Mathiesen *et al.* (2013) called BPM a systematic method for locating, designing, executing, documenting, measuring, monitoring and governing processes to achieve continuous and targeted results that match strategic objectives. BPM can be integrated with sustainability, which is crucial for modern businesses; sustainability is considered a performance element, in addition to the conventional elements time, cost, flexibility and quality (Cleven *et al.*, 2012; Seidel *et al.*, 2012; do Amaral Castro *et al.*, 2019). Green practices are becoming increasingly important, and hence firms must adhere to multiple norms and standards to make a positive environmental impact (Schneider *et al.*, 2013). An organization's BPM plays a considerable role in expanding the carbon footprint of an organization (Recker *et al.*, 2012; Reiter *et al.*, 2014). Therefore, focused on the enhancement of an organization's business process, BPM could be a significant and substantial enabler in the creation of environmentally sustainable business firms (Brocke *et al.*, 2014). Furthermore, the environmental sustainability of an organization can be monitored using environmental performance indicators (EPI). The most significant EPIs that can be thoroughly captured are associated with water consumption and quality, air pollution, fuel, energy consumption, recycling of materials and waste management. Specifically, there is a strong relationship between environmental sustainability and BPM, accruing to the fact that BPM can comprehensively measure and incorporate EPIs at various levels of processes (Isaksson, 2015). Hence, GBPM can be considered for integrating sustainability with BPM (Vom Brocke and Rosemann, 2014).

2.3 Green business process management

Dües *et al.* (2013) characterized GBPM as the total of all management actions that monitor and reduce the environmental consequences of business processes during their creation, enhancement, application or operation or during changes to BPM. It was also suggested that GBPM is a BPM that is essential, well organized, supple and quantifiable within a business organization and that delivers organizational value while having reduced effects on the environment (Weske, 2012). The literature on GBPM can be segregated into two main categories – studies giving a general view of GBPM and those focusing on the particular aspects of GBPM (Nowak *et al.*, 2011a). According to Cooper and Fava (2006), future studies will stress the positioning of GBPM within the comprehensive organizational strategy to examine how organizations can better manage compromises between financial and environmental objectives (Vujičić *et al.*, 2013). In the context of BPM, Ferreira and Pernici (2016) suggested six primary fundamentals of BPM: strategic arrangement, organizational authority, processes, IT, human resources and organizational culture. These dimensions can

be used to assess GBPM. While there have been pertinent investigations of green IT as a facilitator of GBPM, few studies have focused on lifecycle process, such as the tools that can facilitate the management of green initiatives, specifically in the OGS. The literature has also given limited attention to management, human resources and culture in GBPM. Thus, further detailed investigation of these issues is necessary to understand GBPM.

2.4 Enablers that influence GBPM integration

Organizations, especially in developing countries, are working to expand their GBPM (Reiter *et al.*, 2014). There have been several attempts to understand the factors and capabilities of successful GBPM integration in the literature. Our literature review led us to organize these factors into six enabler categories – strategic; managerial; people and culture, IT, methods and governance.

2.4.1 Strategic enablers. Currently, most organizations recognize the importance of green strategies and GBPM, whether they are motivated by a concern for the environment, compliance with government regulations, stakeholder pressure or economic profit (Opitz *et al.*, 2014a; Gallotta *et al.*, 2016). Recent work conducted in Saudi Arabia concluded that all large corporations, especially in the OGS, should create well-defined, strategic sustainability management policies (Rana and Alayed, 2018). Therefore, the cornerstone of successful GBPM integration is formulating a clear, strategic green policy that focuses on all organizational aspects – people, training, metrics and decision-making (Jakobi *et al.*, 2016).

It is not enough to devise a green strategy; in order to achieve environmental goals, the strategy must be aligned and tightly linked with the complete BPM cycle (George *et al.*, 2016; Maciel, 2017). In addition, GBPM does not entail a reinvention of BPM but a modification of existing approaches that can allow proper exploitation of BPM's potential (Jakobi *et al.*, 2016). Hence, many organizations have implemented GBPM without negatively impacting their existing BPM (Nowak *et al.*, 2011a). Moreover, contemporary organizations accept BPM tools and techniques to manage and optimize organizational performance, by considering time, cost, quality, flexibility and sustainability (Opitz *et al.*, 2014b). Thus, organizations can select specific processes to optimize, relative to performance indicators, and, subsequently, investigate their environmental impact and achievement of green goals (George *et al.*, 2016; Jakobi *et al.*, 2016; Maciel, 2017; Houy *et al.*, 2012). In fact, it is suggested that failure to report green performance measures can result in strategic inefficiencies (Jakobi *et al.*, 2016). Finally, Labuschagne *et al.* (2005) reported that the management of several organizations, in different business sectors and different countries, fail to suitably fund the implementation of sustainability initiatives; this can adversely impact GBPM implementation and result in unnecessary delays (Husgafvel *et al.*, 2015). Hence, GBPM implementation should be optimized by changing existing business processes to more sustainable, greener ones while managing associated costs (George *et al.*, 2016; Couckuyt and Van Looy, 2019).

2.4.2 Managerial enablers. Organizational management can drive GBPM in many ways. However, many organizations, especially in developing countries, have inadequate knowledge of technological, operational and business dimensions crucial for the successful implementation of GBPM (Opitz *et al.*, 2014b). It has also been suggested that managers, especially in the OGS, require education to overcome environmental challenges in their work; green strategies cannot be implemented without bringing all managers to the same level of awareness, (George *et al.*, 2016; Rana and Alayed, 2018). The lack of management support is also frequently cited as an important cause for the lack of rapid implementation of GBPM (George *et al.*, 2016; Vujičić *et al.*, 2013). While organizational managements frequently espoused the need for sustainability and development of GBPM methods and systems, they did not follow this up by providing adequate internal leadership and management support to

the process (Houy *et al.*, 2012). Finally, Seidel *et al.* (2012) asserted the importance of the involvement of the top management for developing green strategy required for implementing GBPM to enable an understanding of change capabilities, understanding change implications and managing change. Creating an eco-friendly environment within an organization begins by developing awareness in the workforce. The managerial enablers must incorporate adequate programs of recycling and promote energy conservation throughout the organization (Gunasekaran *et al.*, 2014). Although it does not directly connect with the green strategy, the managers must encourage the healthiness of employees within the workplace, which can directly impact sustainability (Mandip, 2012).

2.4.3 People and culture. Cultural and social factors are a fundamental part of implementing any organizational change. Here, culture comprises the beliefs and values that define BPM-related attitudes and behaviors affecting business performance (Maciel, 2017). Xianyong and Yifeng (2014) discussed the significance of cultivating a green corporate culture in order to develop the soul of GBPM, by selecting a low-carbon and ecological green approach as the standard corporate approach and establishing a green image. In relation to GBPM, cultural factors also focus on what could drive or constrain employees to implement GBPM from the beginning to the end of the process, as the human factor (Pádua and Jabbour, 2015). Opitz *et al.* (2012) concluded that employee resistance hinders organizational sustainability and the implementation of GBPM methods and systems. Studies show that employees resist and obstruct change initiatives on account of the lack of comprehensive information about the issue and apprehensions about the impact of GBPM implementation on their individual work and responsibilities (Baggia *et al.*, 2016; Dües *et al.*, 2013). Hence, individual responsiveness to process change is considered a capability in relation to implementing GBPM (Maciel, 2017). However, even where individuals have a positive attitude toward organizational change, low individual self-responsibility toward the environment may lead to a low green attitude, thus influencing the behavior and commitment of individuals toward sustainable initiatives and leading to a misalignment between their values and organizational values (Lui *et al.*, 2012; Shu-Chiang *et al.*, 2017; Athapaththu and Karunasena, 2018; Seidel *et al.*, 2012; Aghelie, 2017). Green attitude reflects the organizational attitude and/or of its employees toward ecological sustainability, and it is a basic requirement for implementing long-term GBPM (Opitz *et al.*, 2014a). This implies that the staff members should be regularly trained to enhance their green awareness (George *et al.*, 2016). Finally, the effectiveness of GBPM can also be improved by integrating staff expertise with strategy development; this approach will motivate the personnel to alter their behavior and coordinate with GBPM changes (Jakobi *et al.*, 2016). The employees can play a vital role in promoting green business processes internal and external to the organization. For example, the employees can utilize alternative transportation options while traveling from and to the office. Activities like carpooling and walking with fellow employees can significantly enhance an eco-friendly environment while reducing air, noise and water pollution (Whalen and Carrasco, 2013).

2.4.4 Information technology. IT is a primary resource for BPM; it uses IT-based solutions for collecting, processing and providing information to determine and improve ecological indicators for GBPM, also known as green IT (Reiter *et al.*, 2014). Green IT involves the use of information systems (IS) to support environmental sustainability (Sayeed and Onetti, 2018). It is a part of the fundamental changes in the economy and society and is a subset of larger green business trends, in which green ideas, concepts, models and definitions help businesses reconcile practices with profit (Opitz *et al.*, 2014b). Implementing green IT can involve process automation and improved GBPM. It has been suggested that the management should rely on IT to gather data on environmental impacts immediately after the implementation of a green process (Opitz *et al.*, 2012). Further, these green IT activities should be organized and re-engineered to ensure profitability and the satisfaction of the environmental objectives (Harmon *et al.*, 2010). Thus, re-engineering

should involve the use of smart monitoring and feedback technology for the collection of real-time consumption data, disaggregated at the device or room level to enhance the understanding of energy consumption by particular devices and report green process measures (Jakobi *et al.*, 2016). Finally, IT uses natural resources in the manufacturing, use and disposal of its hardware and software (Reiter *et al.*, 2014). In this regard, an investigation on the importance of energy consumption in business processes reveals that organizations should adopt methods and tools to reduce energy consumption in IT devices to achieve optimum GBPM (Reiter *et al.*, 2014; Nowak *et al.*, 2011b). With the advancement of technology, cloud and distributed computing options have enabled the BPM to become more efficient, green, streamlined and collaborative, by eliminating the use of paper (Dhamdhere, 2013). Software like Google Drive and Microsoft Office are one of the key tools used to coordinate the project information remotely.

2.4.5 Methods. According to Seidel *et al.* (2012), the methods used in BPM support and enable consistent actions and outcomes. Organizations with a mature IT-based BPM, such as most O&G companies, do not need to create new methods for GBPM. However, they may require to improve the existing methods and process; this might include the development of sustainability metrics for GBPM that can be used to develop measures that fit a particular BPM (Larsch *et al.*, 2017; Pádua and Jabbour, 2015; Gohar and Indulska, 2015). Studies have attributed the failure of several GBPM transformations to missing process performance indicators (PPIs) (Gallotta *et al.*, 2016). Consequently, to achieve process improvements in sustainability, process specialists must understand and analyze existing BPM. In addition, organizations must develop approaches and tools for process viewing; this can facilitate the observation of facts and support overall enterprise-wide process management, thus contributing to making BPM more environmentally sustainable (Maciel, 2017; Larsch *et al.*, 2017; Jakobi *et al.*, 2016). Finally, Jakobi *et al.* (2016) suggested that, to alter the status quo, organizations should encourage their employees and managers to practice any new GBPM process before its launch. This will promote knowledge sharing at all organizational levels and increase stakeholders' understanding of GBPM, thereby allowing for process improvements (Jakobi *et al.*, 2016).

2.4.6 Governance. In BPM, governance supports decision-making, provides compensation and manages process-related actions (Maciel, 2017). To transform BPM into GBPM, an organization must apply appropriate methods to measure its GBPM's maturity and design structured and consistent decision-making standards to guide GBPM actions (Maciel, 2017). This can be done by prioritizing change processes, considering all stakeholders; this approach will facilitate an alignment between capacities, such as people, technology and installations, establishing a winning integration strategy (Pádua and Jabbour, 2015). A green governance structure depicts management structures, their roles and responsibilities, the decision-making authority, and the types of control over green actions (Schmidt and Kolbe, 2011). This implies that the roles and responsibilities specified in the existing structure must be revised to achieve green processes objectives (Maciel, 2017). Finally, governance is responsible for facilitating collaboration between different external and internal participants of the process (Opitz *et al.*, 2014a). Hence, it has been suggested that, to improve governance, organizations should establish a sustainability office or committee to support green activities and increase cooperation between departments (Opitz *et al.*, 2014a; George *et al.*, 2016). The review of the literature has helped in identifying the key enablers and their respective subenablers.

3. Methodology

The study utilizes the AHP method to make a rational and mathematical determination of enablers that should be prioritized for GBPM integration in the GCC OGS. Developed and further modified by Daim *et al.* (2013), this prioritization approach is critically important as it

will help organize the factors enabling GBPM integration. It is appropriate for evaluating and prioritizing business processes (Lau *et al.*, 2016; Gallego *et al.*, 2015; Lankarani and Asadi, 2012; Mehrajunnisa and Jabeen, 2020; Veit *et al.*, 2017). Developed by Saaty (2008), the AHP model is highly recommended for performing complex decisions that incorporate comparing elements, which are otherwise quite challenging to quantify. This tool also helps in ranking (hierarchy) different elements of decision by comparing each potential pair within the matrix (cluster) (Mehrajunnisa and Jabeen, 2019). This study employs the AHP model to evaluate the potential enablers that can help in transforming a polluted environment into a greener environment (Razandi *et al.*, 2015). In the AHP method, the decisions are based on the following 5 steps:

(1) Step 1: Structuring a problem as a goal with dependent loops;

(2) Step 2: Eliciting judgments of experts or managers through intuition, feelings and experience;

(3) Step 3: Assigning weights according to the importance;

(4) Step 4: Analyzing results;

(5) Step 5: Analyzing sensitivity to change in regard to judgments

This study employed a three-phase design methodology elaborated below:

Phase 1 – Analyzing the literature and developing the AHP model

First, we reviewed and analyzed the literature on the critical enabling factors of GBPM. Several enablers were identified and grouped into six categories – strategic, managerial, people and culture, IT, method and governance (Table 1). Subsequently, the hierarchical structure of the AHP model was developed; it included 6 main enablers and 24 subenablers for GPBM integration (Figure 1). Level 1, at the top of Figure 1, represents the goal of the study, determining the critical enablers of GBPM integration. This goal is broken down into the six main enablers, which are tested in Level 2. In Level 3, each main enabler of GBPM integration is divided into 24 subenablers. Finally, Level 4 gives the rating scale used as a guide to develop decision-making standards that affect GBPM integration in the GCC OGS.

Phase 2 – Interviews and data collection

The second phase of the study was exploratory; in this phase, we distributed a questionnaire survey among strategy experts and decision-makers from the GCC OGS. An email invitation was sent to 12 O&G companies operating in the GCC, of which only four agreed to participate; these companies allowed us to contact the appropriate people for the survey. Table 2 below summarizes the different relevant characteristics of each respondent. We collected data using a questionnaire in order to quantify the information gathered from the literature review and explore the enablers that affect GBPM integration in the GCC OGS. The questionnaire items assessed the six main enablers and their subenablers related to the GBPM integration; these items were rated by participants on a 9-point Likert scale (Table 3).

This study used a cross-sectional research design. The 12 participants worked in strategy departments at the four participating O&G companies in GCC. The organizations and respondents have been anonymized to protect the confidentiality of their responses. After the model was explained, each respondent was asked to rely on own judgment about the relative meaning and importance of the enablers influencing GBPM integration, based on a pairwise comparison with respect to their impact. Following Daim *et al.* (2013), these expert evaluations were converted to meaningful numbers; they were processed and compared over the entire range of enablers and subenablers, which were analyzed in the third phase.

Enabler	Subenablers	Source
Strategic	Having a green policy and strategy Sustainable strategy alignment and optimization with existing BPM Implementing GBPM without negatively impacting existing BPM Measuring and reporting green performance measures Ability to fund GBPM without additional cost	Rana and Alayed (2018); Gallotta *et al.* (2016); Jakobi *et al.* (2016); Opitz *et al.* (2014a); Maciel (2017); George *et al.* (2016); Jakobi *et al.* (2016); Nowak *et al.* (2011a); Maciel (2017); George *et al.* (2016); Houy *et al.* (2012); Jakobi *et al.* (2016); Pádua and Jabbour (2015); George *et al.* (2016); Hoesch-Klohe *et al.* (2010)
Managerial	Knowledge and awareness of managers Managerial commitment Managerial involvement in strategy development	Rana and Alayed (2018); George *et al.* (2016); George *et al.* (2016); Houy *et al.* (2012); Vujičić *et al.* (2013); Seidel *et al.* (2012)
People and culture	Establishing a green corporate culture Individual positive attitude toward organizational change Individual positive green attitude Staff training on sustainability and green issues Staff participation in the development of sustainable strategy	Maciel (2017); Pádua and Jabbour (2015); Xianyong and Yifeng (2014); Maciel (2017); Baggia *et al.* (2016); Dües *et al.* (2013); Opitz *et al.* (2012); Aghelie (2017); Shu-Chiang *et al.* (2017); Opitz *et al.* (2014a); Lui *et al.* (2012); Seidel *et al.* (2012); Lui *et al.* (2012); George *et al.* (2016); Jakobi *et al.* (2016)
Information technology (IT)	Implementing green IT Re-engineering existing IT systems for green processes Development of feedback for automated green process measures Redesigning existing IT systems for lower energy consumption	Sayeed and Onetti (2018); Reiter *et al.* (2014); Opitz *et al.* (2014a); Tollefson (2013); Harmon *et al.* (2010); Jakobi *et al.* (2016); Opitz *et al.* (2012); Sayeed and Onetti (2018); Reiter *et al.* (2014); Nowak *et al.* (2011b)
Methods	Development of environmental metrics Development of measurement methods for environmental metrics Development of green process viewing tools Green process practices	Larsch *et al.* (2017); Gallotta *et al.* (2016); Gohar and Indulska (2015); Pádua and Jabbour (2015); Larsch *et al.* (2017); Gallotta *et al.* (2016); Larsch *et al.* (2017); Maciel (2017); Jakobi *et al.* (2016); Jakobi *et al.* (2016)
Governance	Designing decision-making processes to guide sustainability Revising roles and responsibility for sustainability Establishing a sustainability office or committee	Maciel (2017); Maciel (2017); Schmidt and Kolbe (2011); George *et al.* (2016); Opitz *et al.* (2014a)

Table 1.
Enablers influencing GBPM integration

4. Results

The third phase of this study involved measuring the data collected. Internal consistency in comparisons was checked using the consistency index (CI). Subsequently, the consistency ratio (CR), which was calculated by dividing CI by a random index (RI), was used to test whether each enabler's matrix was satisfactorily consistent (Daim *et al.*, 2013). A random pairwise comparison was conducted to give average random indices for the matrices used. The RI values are presented in Table 4. According to Daim *et al.* (2013), a CR value greater than 0.10 indicates an inconsistent matrix.

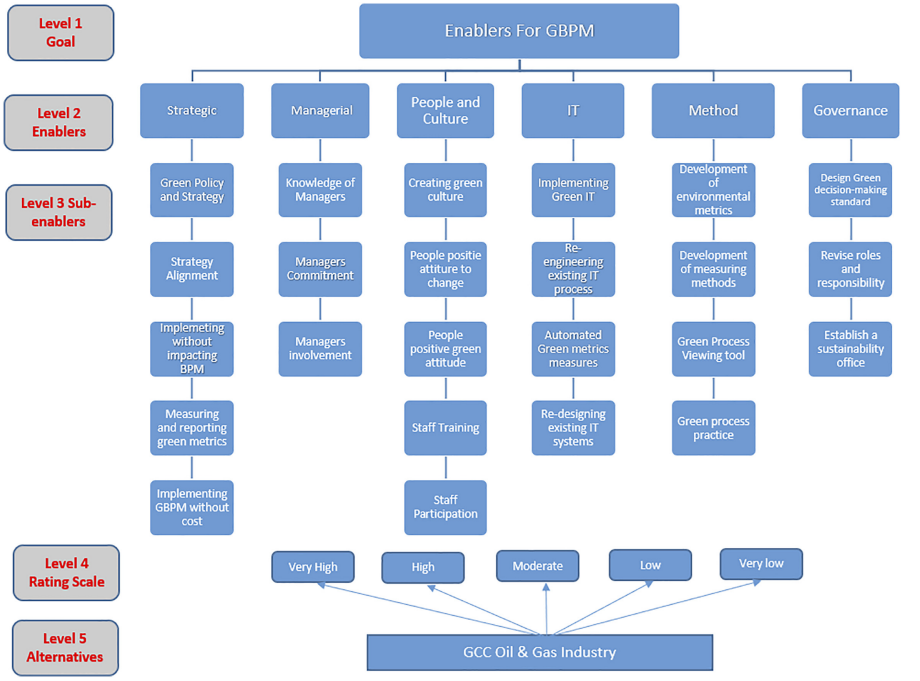

Figure 1.
Analytic hierarchy process model

Respondents	Designation	Experience (years)	Age (years)
Respondent 1	Operation Manager	17	39
Respondent 2	Strategic Manager of major Projects	16	40
Respondent 3	Plant manager	20	44
Respondent 4	Operational excellence manager	16	36
Respondent 5	Interface department manager	17	42
Respondent 6	Vice President, Health safety environment	11	34
Respondent 7	Strategic Planning Executive	15	38
Respondent 8	Senior Vice President, Operations	28	52
Respondent 9	Senior Vice President, Supports	28	55
Respondent 10	Senior Vice President, Projects	24	51
Respondent 11	Senior Vice President, Human Resources	22	48
Respondent 12	Vice President, Human Capital	28	58

Table 2.
Participants demographics

4.1 Results on the main enablers

A pairwise comparison matrix of the six main enablers was established using the judgments of the participants. Subsequently, the AHP was used to determine the weighing of the relative importance for each enabler, in accordance with Daim *et al.* (2013). Table 5 presents the geometric means of pairwise comparisons and priority weighing for the six main enablers in the right-most column.

The results indicated that strategic was the most important enabler for GBPM, with a priority weight of 0.41. This also indicated that the set of subenablers within this category might be considered the most influential for GBPM integration. Conversely, governance was the lowest-ranked enabler, with a priority weight of 0.03. Managers' role in GBPM integration

was ranked second, with a priority weight of 0.23. This was followed by people and culture, IT and methods, with a priority weight of 0.31, 0.11 and 0.08, respectively. The CR value of this matrix was 0.01, and hence it was considered consistent.

4.2 Subenablers results

To better understand the priorities for the main enabler categories reported in Table 5, we conducted a pairwise comparison of the subenablers. Prioritizing the subenablers was important for developing a more effective GBPM integration and for enriching the discussion and recommendations of this study.

Five strategic subenablers were identified and analyzed (Table 6). The results suggested that having a green policy and strategy and measuring and reporting were the two subenablers with the highest ranking, with a priority weight of 0.30 each; this was followed by implementing GBPM without impacting an existing BPM and strategy alignment, at 0.19 and 0.15, respectively. Implementing GBPM without additional cost was the lowest ranked subenabler, at 0.06. The CR value was 0.01, below 0.1, indicating that the matrix was consistent.

Three subenablers were identified under the managerial category (Table 6). Managerial involvement in strategy development had the highest priority, with a priority weight of 0.47. This was followed by managers' knowledge and managerial, with a priority weight of 0.31

Importance	Definition	Explanation
1	Equal importance	Two criteria contribute equally to the objective
3	Moderate importance	Judgment slightly favors one factor over the other
5	Strong importance	Judgment strongly favors one factor over the other
7	Very strong importance	A criterion is strongly favored, and its dominance is demonstrated in practice
9	Absolute importance	Importance of one factor over the other is affirmed on the highest possible order
2, 4, 6, 8	Intermediate importance	Used to show a compromise between the priorities above

Table 3. 1–9 AHP scale of preference

N	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.48

Note(s): *N* is the number of enablers

Table 4. Random index

Priority	Strategic	Managerial	People and culture	IT	Method	Governance	Priority weighting
Strategic	0.64	0.72	0.37	0.42	0.22	0.10	0.41
Managerial	0.10	0.14	0.51	0.30	0.27	0.07	0.23
People and culture	0.07	0.02	0.07	0.19	0.21	0.24	0.13
IT	0.06	0.03	0.02	0.06	0.25	0.24	0.11
Method	0.06	0.02	0.02	0.01	0.04	0.31	0.08
Governance	0.06	0.07	0.01	0.01	0.00	0.03	0.03

Note(s): CR = 0.06 < 0.01 (acceptable)

Table 5. Geometric means of the pairwise comparisons of the main enablers

Priority	Green policy and strategy	Strategy alignment	Implementing without impacting BPM	Measuring and reporting green metrics	Implementing GBPM without cost	Priority weighting
Strategy						
Green policy and strategy	0.64	0.72	0.37	0.42	0.22	0.30
Strategy alignment	0.10	0.14	0.51	0.30	0.27	0.15
Implementing without impacting BPM	0.07	0.02	0.07	0.19	0.21	0.19
Measuring and reporting green metrics	0.06	0.03	0.02	0.06	0.25	0.30
Implementing GBPM without cost	0.06	0.02	0.02	0.01	0.04	0.06

Priority	Knowledge of managers	Managers' commitment	Managerial involvement	Priority weighting
Managerial				
Knowledge of managers	0.23	0.29	0.42	0.31
Managers' commitment	0.08	0.12	0.45	0.22
Managerial involvement	0.69	0.59	0.14	0.47

Priority	Creating green culture	Individual positive attitude toward change	Individual positive green attitude	Staff training	Staff participation	Priority weighting
People and culture						
Creating green culture	0.06	0.54	0.23	0.24	0.15	0.24
Individual positive attitude toward change	0.43	0.11	0.68	0.60	0.23	0.41
Individual positive green attitude	0.49	0.32	0.08	0.02	0.01	0.18
Staff training	0.01	0.01	0.01	0.12	0.53	0.14
Staff participation	0.01	0.02	0.01	0.02	0.08	0.03

Priority	Implementing green IT	Re-engineering existing IT process	Automated green metrics measures	Redesigning existing IT systems	Priority weighting
Information technology (IT)					
Implementing green IT	0.24	0.42	0.49	0.39	0.38

Table 6.
Pairwise comparison for sub-enablers

(*continued*)

Priority	Implementing green IT	Re-engineering existing IT process	Automated green metrics measures	Redesigning existing IT systems	Priority weighting
Re-engineering existing IT process	0.71	0.14	0.37	0.39	0.40
Automated green metrics measures	0.03	0.42	0.12	0.02	0.15
Redesigning existing IT systems	0.03	0.02	0.02	0.20	0.06

Priority	Development of environmental metrics	Development of measuring methods	Green process viewing tool	Green process practice	Priority weighting
Methods					
Development of environmental metrics	0.07	0.25	0.40	0.20	0.23
Development of measuring methods	0.20	0.08	0.30	0.20	0.20
Green process viewing tool	0.40	0.42	0.10	0.50	0.35
Green process practice	0.33	0.25	0.20	0.10	0.22

Priority	Designing green decision-making standard	Revising roles and responsibility	Establishing a sustainability office	Priority weighting
Governance				
Designing green decision-making standards	0.12	0.63	0.25	0.33
Revising roles and responsibilities	0.82	0.31	0.63	0.59
Establishing a sustainability office	0.06	0.06	0.13	0.08

Note(s): CR = 0.07 < 0.01 (acceptable)
Note(s): CR = 0.09 < 0.01 (acceptable)
Note(s): CR = 0.07 < 0.01 (acceptable)
Note(s): CR = 0.06 < 0.01 (acceptable)
Note(s): CR = 0.03 < 0.01 (acceptable)
Note(s): CR = 0.07 < 0.01 (acceptable)

Table 6.

and 0.22, respectively. The matrix CR value was 0.09, which demonstrated the matrix as consistent.

Under the main category of people and culture, five subenablers were analyzed (Table 6). Individual positive attitude toward organizational change was the highest-ranked subenabler, with a priority weight of 0.41; this was followed by creating green culture, positive green attitude, staff training and staff participation in strategy development, with a priority weight of 0.24, 0.18, 0.14 and 0.03, respectively. The CR of the matrix was below (0.1), and hence it was identified as consistent.

Four subenablers were analyzed relative to IT (Table 6). The results suggested that re-engineering existing IT processes for GBPM is the highest-ranked subenabler at 0.4, followed

by the implementation of green IT, with a priority weight of 0.33. The development of automated green metrics measures came third, at 0.15. Finally, redesigning existing IT infrastructure to allow lower energy consumption was the lowest-ranked subenabler, at 0.06. This matrix was also consistent, with a CR value of below 0.1. The four subenablers for methods were analyzed in Table 6. The development of the green process viewing tool was ranked as the highest-ranked subenabler, at 0.35; this was followed by the development of environmental metrics, green process practice and development of methods of measurement, with a priority weight of 0.23, 0.22 and 0.20, respectively. Since the CR of the matrix was below 0.1, it was judged to be consistent. Finally, in relation to the main category of governance, three subenablers were analyzed in Table 6. Revising roles and responsibilities was the highest-ranked subenabler, with a priority weighting of 0.59; this was followed by designing green decision-making and establishing a sustainability office, with a priority weight of 0.33 and 0.08, respectively. The CR value for this group was 0.07, below 0.1, indicating that the matrix was also consistent.

5. Discussion

This study identified enablers and subenablers for successful GBPM integration in the GCC OGS and prioritized them on the basis of data collected from strategy experts in the GCC OGS. This prioritization clarified the factors inhibiting effective or successful GBPM integration. This study analyzed six main enablers and 24 subenablers and prioritized them in three phases, utilizing AHP to rank the enablers. Figure 2 shows the priority weighting of different kinds of subenablers that can promote the GBPM in GCC OGS. All subenablers are highlighted depending on their criticality, ranging from 0 to 0.7.

5.1 First enabler: strategy

The following key findings were made clear. First, strategy was rated the most important enabler of GBPM integration in the GCC OGS because it had the highest priority weight. This

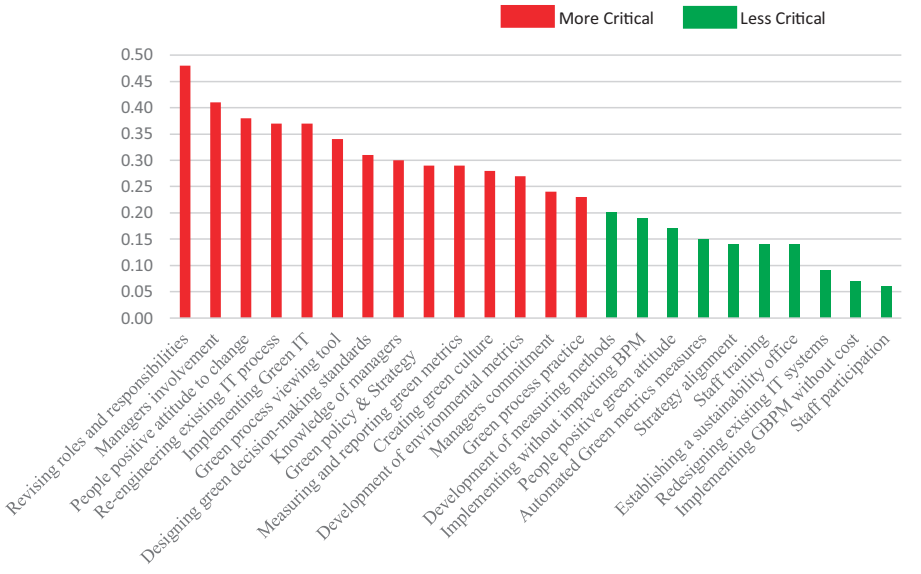

Figure 2.
Priority weighings for all subenablers

finding is in line with the literature (Opitz *et al.*, 2014a; Gallotta *et al.*, 2016; Jakobi *et al.*, 2016) and suggests that although GCC governments have invested in sustainability, O&G companies must focus on developing winning green strategies and monitoring their integration and progress. This aspect was addressed by George *et al.* (2016), in relation to the OGS. The study concluded that, in the integration stage of the green strategy, the companies must drastically improve and modify processes in response to the influence of other organizational factors. Nevertheless, although strategy was the top main enabler, surprisingly, its subenablers did not have higher scores than other subenablers (Figure 2). This is alarming and contradicts previous studies, suggesting that strategic subenablers like having a green policy and strategy alignment are important enablers for GBPM integration. This finding may be attributed to the low maturity level of BPM in the GCC OGS, as suggested by Alshathry (2016) who concluded that GCC OGS organizations have either no clear business strategy or a strategy that is too complicated to be integrated into their existing BPM systems. The implementation of green IT can also act as an important subenabler for O&G companies. However, to implement this strategy, organizations must take steps to eliminate hazardous materials from the oil and gas field and encourage the utilization of bio-degradable commodities (Van Bussel and Smit, 2014). Moreover, Epstein and Buhovac (2014) suggested that management knowledge is also quite critical as it eventually impacts the practices of the workers. Although staff training is highlighted as less critical in the figure below, this factor can play an important role in maintaining the sustainability of the overall environment.

5.2 Second enabler: management

Management was rated second in importance among the main enablers, ranking ahead of the remaining four. Related to this main factor, managerial involvement in strategy development was rated the second-highest subenabler, and the other subenablers within this category were ranked in the top half of the ranking, as shown in Figure 2. This supports some results in the literature, which found that management was the most important enabler for implementing GBPM, and it illustrated the vital role played by top management in ensuring the effective integration of GBPM (Houy *et al.*, 2012; Vujičić *et al.*, 2013; George *et al.*, 2016). In addition, these findings indicate that the role of management may be considered equivalent to or even more important than strategy. Moreover, a recent study suggested that although most of the managers in the GCC OGS have an awareness of carbon footprint and sustainability, they should be educated about the environmental challenges related to their work. It is important to bring all managers to the same level of awareness, supporting their commitment (Rana and Alayed, 2018). The management of O&G companies is also responsible for developing sustainable environmental metrics to ensure that the organizational staff members can implement green practices. However, to introduce such practices, OGS management should focus on developing reliable and strict policies and strategies within the organizational settings.

5.3 Third enabler: people and culture

People and culture were ranked the third most important enabler for GBPM integration in the GCC OGS. In this study, people and culture enablers comprised creating green culture, individual positive attitude toward organizational change, environmental issues, staff training and participation in strategy development. It was found that individual positive attitude toward organizational change was the most important enabler within this category, which needs to be accounted for and further examined here. Recent studies have indicated that employees in the United Arab Emirates tend to resist change, and hence many initiatives and projects are at a standstill in the GCC (Bin Taher *et al.*, 2015; Al-

Ali *et al.*, 2017). In addition, Alshathry (2016) investigated the maturity of the BPM of organizations in Saudi Arabia and reported a lack of end-to-end holistic accounting for BPM. Therefore, O&G companies must look at GBPM adoption with a holistic bottom-up view, instead of enforcing process changes on employees to increase their level of knowledge and commitment (Alshathry, 2016; Jakobi *et al.*, 2016). In addition, the remaining subfactors in this category fell in the lower half of the priority ranking (Figure 2). Finally, in the GCC OGS, results indicate that a lack of commitment to organizational change overshadows all other cultural and social enablers regarding GBPM. Therefore, O&G companies in GCC have been suggested to re-establish informal social control by hiring personnel with sustainability values and using organizational socialization processes to prompt the cognitive enabling of sustainability integration (George *et al.*, 2016). However, the attitude of people and their training within the OGS was pointed less critical because these practices will prove to be useful when the managers will become aware of the significance of environmental sustainability within the organization. In this regard, it must be noted that providing training to staff members regarding waste management can prove quite crucial in changing their attitude and building a greener environment (Mandip, 2012).

5.4 Fourth enabler: information technology

IT was ranked the fourth enabler. Two of its subenablers (implementing green IT and re-engineering existing IT processes) were ranked at the top of the subenablers chart (Figure 2). This supports the literature (Sayeed and Onetti, 2018; Reiter *et al.*, 2014; Opitz *et al.*, 2014a). Opitz *et al.* (2014b) took this further, recommending that organizations adopt green IS (which includes green IT) to include all IS-based initiatives that support sustainable business practices and adapt old processes and other connected artifacts, such as organizational structures. A recent study on the Saudi Arabia OGS showed a sharp disjunction between IT and business strategy (Alshathry, 2016). In addition, although the other subenablers in this category were ranked the lowest of all the 24 subenablers, if organizations were to implement green IT, it could lead to a reduction in the consumptions and emissions of IT itself (Opitz *et al.*, 2014b) and an improvement in the organizational performance through automated metrics. This could lead to positive tangible (cost savings) and intangible (environmental) gains for organizations (Molla and Abareshi, 2012). By critically evaluating this enabler, it can be identified that other subenablers had much lower scores than expected. This can be attributed to the fact that the participants from different companies might consider IT a hurdle, especially during the process of integrating it for the purpose of achieving sustainable results. However, much of the related literature has identified IT as a challenge as it develops the fear of job insecurity among employees. This argument is an exaggeration since integrating IT can result in some hard work, yet it inevitably leads to the greater good for the company as well as the society.

5.5 Fifth enabler: methods

Methods comprised the fifth-ranking enabler. However, the rankings of its subenablers were in the top or middle of all subenablers, which was in line with previous findings (Larsch *et al.*, 2017; Gallotta *et al.*, 2016; Gohar and Indulska, 2015; Pádua and Jabbour, 2015). These results indicate the importance of this category in that they could help drive other enablers and subenablers in the GCC OGS. In this regard, it was found that, in the GCC, some organizations neither have defined process owners for their main core business processes nor have measurable goals for their performance; in the GCC mainly, the BPM focused on process activities rather than the process output and performance (Alshathry, 2016). Therefore, more comprehensive environmental reporting methods in the organization were

found to facilitate improvements in the overall sustainability performance (George *et al.*, 2016). Finally, although most O&G companies in the GCC have implemented BPM (Alshathry, 2016), they feature methods and processes. It has been suggested that green strategy cannot be widely integrated into organizations without internal robust green processes and methods to support integration (George *et al.*, 2016). Although this finding is in line with the previous literature, it can be argued that the scores of subenablers reflect that the companies operating in GCC had no specific method of carrying out the green process management. This is because of the direction and scope of operations, where much focus is given to the process instead of outcomes and performance. For the green process management, the methods must be radically and fundamentally changed; this can help the business in moving ahead with the implementation while ensuring sustainable and eco-friendly future.

5.6 Sixth enabler: governance

Finally, governance was the lowest-ranked enabler, which was not surprising. During the survey phase, it was found that governance was the most challenging enabler to address. In the GCC OGS, it was deduced that governance varied from one country to another. Some organizations referred to governance only in relation to internal accountability, while the others considered it to involve governmental supervision. However, the subenabler revising roles and responsibilities were determined to be the highest-ranking subenabler. In addition, introduction strategies to support green decision-making were ranked at the top half of the chart (Figure 2). These findings have not been extensively addressed in the previous literature and require further investigation. However, it was clearly seen that the GCC OGS continues to struggle to identify roles and responsibilities in regard to green implementation. This supports the findings of Rana and Alayed (2018) that, in Saudi Arabia's O&G companies, executives and top management apply multiple sustainability policies and rules in their departments due to their limited authority. Finally, our results indicate that changes to the organizational structure and the implementation of proper green governance are vital for GBPM integration. The most crucial enabler has been ranked the lowest, which reveals the challenges that are faced with addressing this enabler. However, this can be promoted by helping the stakeholders understand the value and importance of governance, with the intention of implementing green process management, which can bring about a change in their approach.

6. Implications

This study suggests measures that are economically feasible and commercially viable in promoting a greener environment. By incorporating GBPM, O&G companies will become capable of generating better revenues as the carbon-emitting machinery will be replaced by eco-friendly ones (Singh and Trivedi, 2016). This study will also increase awareness regarding low energy consumption practices at home and workplace, which will eventually boost the economy. Hazardous petroleum products like crude oil, sulphur, benzene and kerosene can significantly contaminate water sources and can disrupt the lives of people (Lam and Bates, 2012). Hence, the important enablers of GBPM mentioned in this study will help in reducing such type of contaminations in the future. This study will also provide thorough guidance to the O&G companies to conserve forests and natural resources as most of the oil and gas fields are located in remote areas where there is a high risk of damage to such habitats (Harhara *et al.*, 2015). The results derived in this study may assist in identifying factors that can help in reducing pollution and carbon emissions. This aspect will directly impact the income generation and employment practices within the economy.

From a managerial perspective, the findings can be beneficial, especially for managers intending to introduce and implement green process management within their respective organizations. For instance, the results of this research have identified the key enablers, which they can capitalize upon to conduct a comparative analysis and find missing elements or lagging elements that must be improved or changed. The managers can further review the strategic intention and direction of their companies to gauge whether there is a scope of integration of green process management. A lack of such scope might lead them to resist change, withdraw their participation and their motivation toward integration.

7. Limitations and future scope

Although the objectives of the study were achieved, some limitations remain worth mentioning. First, this longitudinal study was limited by its small sample size of 12 strategy experts from four O&G companies in the GCC. Although the sample was adequate for AHP analysis, it was insufficient to reflect the entire GCC OGS. Increasing the sample and conducting quantitative analysis using surveys could improve the results. Future quantitative research on these lines would be useful for checking the results of this study. Finally, future studies could assess differences between this study's findings from the GCC OGS and those from more developed countries to better understand the issues and determine market-specific solutions.

8. Conclusion

This study investigated the enablers that can influence GBPM integration in the GCC OGS, by critically examining key enablers and subenablers of this integration according to the literature and prioritizing them through AHP. The results of this study indicate that although strategy is considered the main enabler of GBPM integration, the most important subenabler was revising the roles and responsibilities of green processes. This study can enhance and improve GCC companies' ability to implement green process management efficiently. Though several prior studies, such as Vom Brocke and Rosemann (2014) and Isaksson (2015), have also reflected on the importance of green process management, the information related to GCC has often always remained beyond their approach. This research, however, considers this aspect explicitly. Further, organizations should not undermine enablers related to people and culture, such as commitment to change or green attitude. These factors should be considered by O&G companies pursuing green strategy development. Therefore, the following recommendations are made for the practitioners:

(1) Although GCC countries have national policies to promote green agendas in the OGS, the low maturity of BPM in that area is holding back the integration of green processes. Therefore, O&G companies must invest in optimizing existing BPM for better process-based decision-making before starting GBPM adoption.

(2) The move toward better GBPM integration would entail embracing the various enablers discussed in the study. However, the implementation of green strategy is delayed due to the lack of governance in such organizations. Therefore, the formation of a sustainability council or office at the highest levels of an organization could bring these enablers together and significantly improve sustainability performance.

(3) O&G companies in the GCC must promote pro-environmental values and align them with the organization's identity through training and seminars. They must motivate green practices and address environmental issues at every opportunity, showing increased commitment to green strategy.

(4) Top management and government officials must reevaluate their personal values and commitment to certain issues as they participate in drafting policies, rules, regulations and training programs for top managers at O&G companies in the GCC.

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