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(Research Paper)

Identifying and prioritizing activities of green project management based on lean-sustainable principles in Isfahan Parks and Green Space Organization

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Abstract

Purpose: Green Project Management (GPM) includes a set of management actions that enables the identification, evaluation, control, and improvement of the effect of activities on the environment. Accordingly, lean and sustainability can play a significant role in improving and enhancing the quality of the environment. Therefore, this study aims to identify and prioritize activities related to GPM based on lean and sustainability concepts.

Design/methodology/approach: First the lean and sustainability criteria have been identified in GPM. Then, the activities in terms of significance - and not in the order of performance - have been prioritized to achieve GPM with lean and sustainable goals in the Parks and Green Space Organization of Isfahan (PGSOI). The data has been obtained through the distribution of questionnaires among experts in the study area in two steps. In the first step, using the Delphi method, lean and sustainability criteria as well as GPM activities in the PGSOI have been identified. Then, in the next step, GPM activities have been prioritized using Analytic Hierarchy Process (AHP).

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Findings: Findings indicated three environmental, social, and processes and procedures criteria as the lean goals. Besides, sustainability goals included three social, economic, and environmental criteria. The priorities of GPM activities in terms of lean and sustainable goals, respectively, included executive activities, activities related to planning, initial activities, monitoring and control, and final activities.

Research limitations/implications: This study was conducted in the PGSOI. The lean-sustainable criteria were assumed independent in applying the AHP technique. Managers of PGSOI must consider executive activities, activities related to planning, initial activities, monitoring and control, and final activities, to have a lean-sustainable based GPM.

Originality/value: The novelty and originality of the methodology lies in the fact that the activities are identified and prioritized based on the three concepts of greenness, leanness, and sustainability in the projects of PGSOI.

Keywords: Green project management, Lean manufacturing, Sustainability, Parks and Green Space Organization of Isfahan (PGSOI), AHP technique, Delphi method

1. Introduction

Environmental effects, as well as social and economic factors, are a combination of Green Project Management (GPM) concepts for achieving sustainability and harmony in nature. Recently, there has been an increase in awareness about the significance of greening and the adoption of various environmental management techniques among business communities (Shoeb, 2015). The green project plays an important role in sustainable development. In this regard, a project manager has a key role in sustainable project management, which will subsequently affect various environmental aspects (Silvius & de Graaf, 2019). Since environmental problems are threats to the sustainable development of human societies, it is essential that organizations, as the largest members of societies, recognize the effects of their behaviors on the environment and take steps to reduce the negative effects of such behaviors on natural ecosystems. (Wagner, 2013). Continuous socio-economic development and economic globalization have caused a constant change in the management model. Therefore, with the increase of sustainable development and awareness of environmental concerns, attention to macroeconomic issues, environment, social responsibility, etc. has become significant. Therefore, the project management process system needs to pay attention to such issues. As a result, project management will demand the new title of GPM in which, the green structure is also considered. In the world of today, which is the arena of intense inter-organizational competition, attention has been paid to lean and sustainability models to satisfy customers, earn enough profit and improve the quality of products and services, continuously. Leanness requires sustainability, change, and transformation in all working steps and across organizational levels to enable the movement towards continuous improvement and achievement of perfection (Hussain, Al-Aomar & Melhem, 2019). Lean goals simultaneously promote a culture that encourages continuous review and evaluation.

Gradually, this stimulus is applied throughout the system, and the organization will periodically seek to evaluate how to implement lean principles in its internal processes. Thus, organizational readiness is one of the prerequisites for the beginning and continuation of lean goals (Gao & Gurd, 2019).

Numerous studies have addressed the issues of GPM, sustainability, and lean principles in project implementation. Al-Qassab, Paucar-Caceres & Wright (2019) examined the sustainability and management skills of green projects in the Dubai construction industry. Poston and Richardson (2019) designed the academic project management program. As they argued, project management skills were also needed in industry and project management training programs with new concepts of project management such as green concepts and sustainability is one of the undeniable needs in the real world. In their research, Lartey et al. (2020) referred to the concepts of greenness, lean-green sustainability strategy, and firm growth. According to their findings, the lean-green strategy had a positive relationship with firm growth, and this relationship was intensified at high levels of competition, management, and family ties. According to the literature review, a study considering the three concepts of GPM, sustainability, and the implementation of lean principles has not been done so far.

Urban green spaces are considered as an important part of public uses and one of the necessities of urban society and citizen life, which has various functions such as environmental function, aesthetic function, and promotion of urban appearance and landscape and addressing the physiological needs of citizens. Developing purposeful programs to achieve social vitality, softening the city air, and also creating unique landscapes are the requirements for creating a green city. Environmental sustainability depends on the development of urban green spaces and provides livability, which is one of the characteristics of human sustainability. An environmentally sustainable city has the least consumption of non-renewable energy, the least waste, and the least destructive impact on the environment, and can maintain its current function in the coming decades towards greater sustainability. A sustainable city is economically self-sufficient, efficient, and socially contributes to the environmental protection of all-natural species (Parks and Green Space Organization, 2019). Therefore, this study aims to identify and prioritize activities for achieving GPM with lean and sustainable goals in the Parks and Green Space Organization of Isfahan (PGSOI) to operationalize lean and sustainability concepts in GPM and take a step towards the fundamental goals of sustainable development. In this study, such concepts are examined in PGSOI because, in the present era, factors such as the proximity of nature to the workplace and human life, small green spaces in cities and their benefits for people, etc. are less respected. By achieving such goals, the least intervention in the environment will be created

and the physical and mental health of all human beings will be guaranteed. Moreover, the research results can reduce the costs and adverse consequences of projects and contribute to continuous and sustainable development.

In the following, first, the literature and background of GPM, lean management, and sustainability are described. Then, in the methodology section, the proposed method is presented for identifying and prioritizing GPM activities. In the data analysis section, the designed questionnaire is analyzed and finally, the study is summarized and suggestions are addressed for future study.

2. Literature review

2.1. Green project management (GPM)

GPM was invented by Mochal and Krasnoff (2010). It was formed to integrate the environmental aspects of the organization with the project management processes. GPM is practically and theoretically considerable (Maltzman & Shirley, 2012).

In recent decades, due to the increasing growth rate of resources despite the limited amounts of air, water, and food resources, and concerns about global warming as a focal point for the eco-friendly movement, steps have been taken to develop and use necessary standards for saving and rationalizing energy consumption as well as protecting the environment. Besides, a new field of environmental management has been established to observe the development and issues through the previous perspective (Dai & Xu, 2011). In this new concept, construction quality, safety, and space of ecology are the main determinants of project evaluation. Developing and developed countries give a priority to construction engineering and environmental development issues. In other words, the function of project management has changed to protecting the environment and resources as well as achieving harmony with nature (Kurland & Zell, 2011). Project management activities include five process groups, i.e., initial activities, planning-related activities, executive activities, monitoring and control activities, and final activities, and 10 areas of project management knowledge have been expanded. (PMBOK, 2017).

Dai & Xu (2011) believed that a project can take steps towards greening in different ways. Greening follows the effect of producing products and results from the effect of a project or the definition of green or the maximum project trend towards greening in the general case, which covers all aspects of the project. They consider the content of GPM to include several tasks in construction projects. Following project management procedures; identifying, designing, and structuring projects; reaching final agreements, following environmental protection management procedures; proposing projects; doing the environmental assessment,

and considering early management of environmental effects are among the activities discussed in GPM and pointed in their study. In Figure 1, the project and environment procedures of Dai & Xu (2011) research are illustrated. This model was developed by the country's Environmental Protection Agency and clarifies the provisions of China's infrastructure projects and environmental management procedures. In this GPM model, the criteria of environmental treatments in project management are demonstrated in two aspects of environment protection and evaluation.

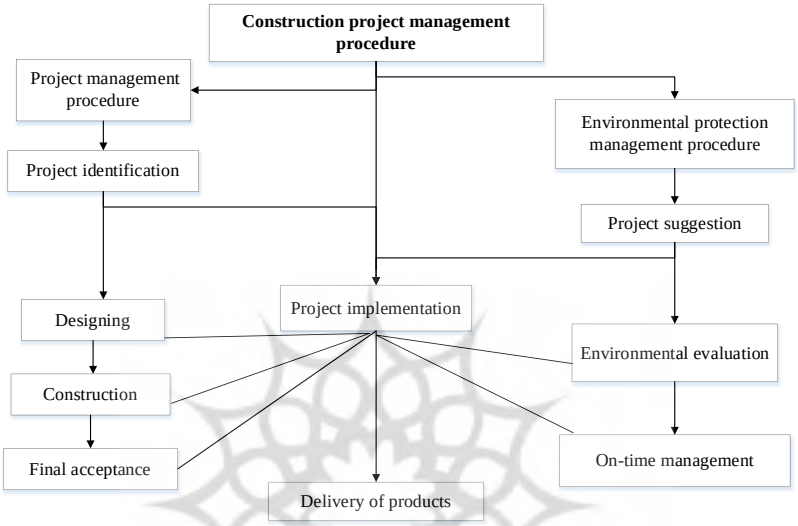

Fig 1. Project and environment procedure (Dai & Xu, 2011)

Khater, Ezeldin & Elshazly (2020) studied the critical success factors of green project management for sustainable housing. They introduced the Guide Model which was validated to ensure the integration of sustainability into the green project management (GPM) with the Egyptian housing sector as the case study. They assumed the green part of project management as an activity of "Green Building Check listing", solely.

2.2 Lean and sustainable management

In recent years, lean management, as a management philosophy, has seen rapid growth in the manufacturing sector and some countries in public, private, service, and executive organizations, with an emphasis on timely production, waste disposal, and continuous improvement. It aims to improve performance (Womack & Jones, 1996). Lean thinking is not a toolbox or even a system, but a philosophy based on understanding employees and their motivation, promoting leadership, building teams and relationships, implementing strategies, and maintaining organizational learning (Alavi et al., 2014). This is rooted in mutual

commitments and continuous improvement because lean methods seek to develop and manage the project through relationships as well as shared knowledge and goals (Gort, 2008).

Understanding sustainability and lean integrity provide many benefits to organizations, including increased product quality, lower inventories, and shorter payback periods (Zhan et al., 2018). There are several tools available to contribute to developing and maintaining sustainability (Zehtab, Alavi, & Bagheri, 2019). These include value stream mapping, work teams, and analytical tools. Kováčová (2013) considered sustainability to be a lean form that has been generalized to a much broader purpose. In this way, familiarity with lean thinking can easily lead to sustainability. lean thinking works when individuals and teams across an organization ask questions such as how this adds value to the customer or how it can be done better. Sustainability works in the same way, with only a difference as a set of decision criteria. As a guide to waste reduction, lean thinking is implemented through its tools and techniques. Accordingly, it can also be used to understand and develop the concept of sustainability. Sustainability, moreover, has several incentives to achieve lean, in addition to the economic dimension and profitability resulting from the reduction of financial losses. Here, practical support for lean executors can be useful and available. Further, these two concepts can seek to support each other for various reasons, because in such a case, they can face mutual issues and problems.

Carvalho & Cruz-Machado (2011) described the relationship of lean and green thinking as integration of operations management and environmental management. They depicted that the integration of these two methods results in more positive achievements than the separate implementation of each of them. Lean thinking enhances the positive effects of green practices and emphasizes green practices to reduce waste and boost some of the lean principles. Many researchers, e.g., Lartey et al. (2020) and Hammadi & Herrou (2018), believed that those lean firms that seriously pay attention to environmental issues and implementation of green and lean methods may achieve better results than other lean firms. Franchetti et al (2009) stated that the only real difference between lean and green thinking is the approach to the environment. While lean methods view the environment as a valuable resource, green methods consider it as a limit to the design and production of goods and services. This difference shows a potential conflict between the lean principles and eco-friendly objectives. Firms may have to compromise some of their lean principles to achieve eco-friendly or green thinking. A lean model is considered to reduce waste and thus reduce costs, improve quality and productivity, ensure better use of resources, and provide value to customers. A green model, on the other hand, seeks to reduce negative environmental impacts and environmental hazards while eliminating waste and improving ecological efficiency

(Zhan et al., 2018). An ISO 14001 environmental management system is a valuable tool for identifying and reducing wasteful activities. While ISO 14001 only guarantees that environmental performance improves, it does not provide specific guidance on how to achieve this goal or how to use the methods. Lean manufacturing specifies the methods and tools for implementing ISO 14001. Examples of lean integration methods and environmental management include identifying root causes, corrective action, preventing failures (jidoka/poka-yoke), and continuous improvement. 5S, TPM, and VSM are some examples of the tools (Souza & Alves 2018).

Activities performed according to lean principles have a supporting role for employees. This role maintains health and safety, motivates the staff, increases the scope of authority, and enhances the staff's satisfaction and capability. Studies have shown that 7S should be used instead of 5S for greater lean integration with social sustainability (Vinodh, Arvind & Somanaathan, 2011). OHSAS 18001, which is a supportive tool for lean manufacturing, also plays an important role in social sustainability. Another tool to support lean production of social sustainability is TQM, which strengthens ethical principles in the organization by emphasizing teamwork and creating a participatory culture (Borella & de Carvalho Borella, 2016). The supportive role of lean and sustainability is illustrated in Figure 2, according to which lean and sustainability reinforce and support each other. From the integration of lean and sustainable principles, four main criteria are extracted, i.e., lean and sustainable synergy. These criteria included:

i) economic criteria (increase production, efficiency, and profitability);

ii) social criteria (increase safety, reduce stress, increase satisfaction and employee commitment);

iii) environmental criteria (waste reduction, optimal use of energy resources); and

iv) managing processes and procedures.

Table 1 summarizes the articles related to the present study, describing their addressed dimensions. As addressed in the last row of the table, all of the dimensions are studied in this paper.

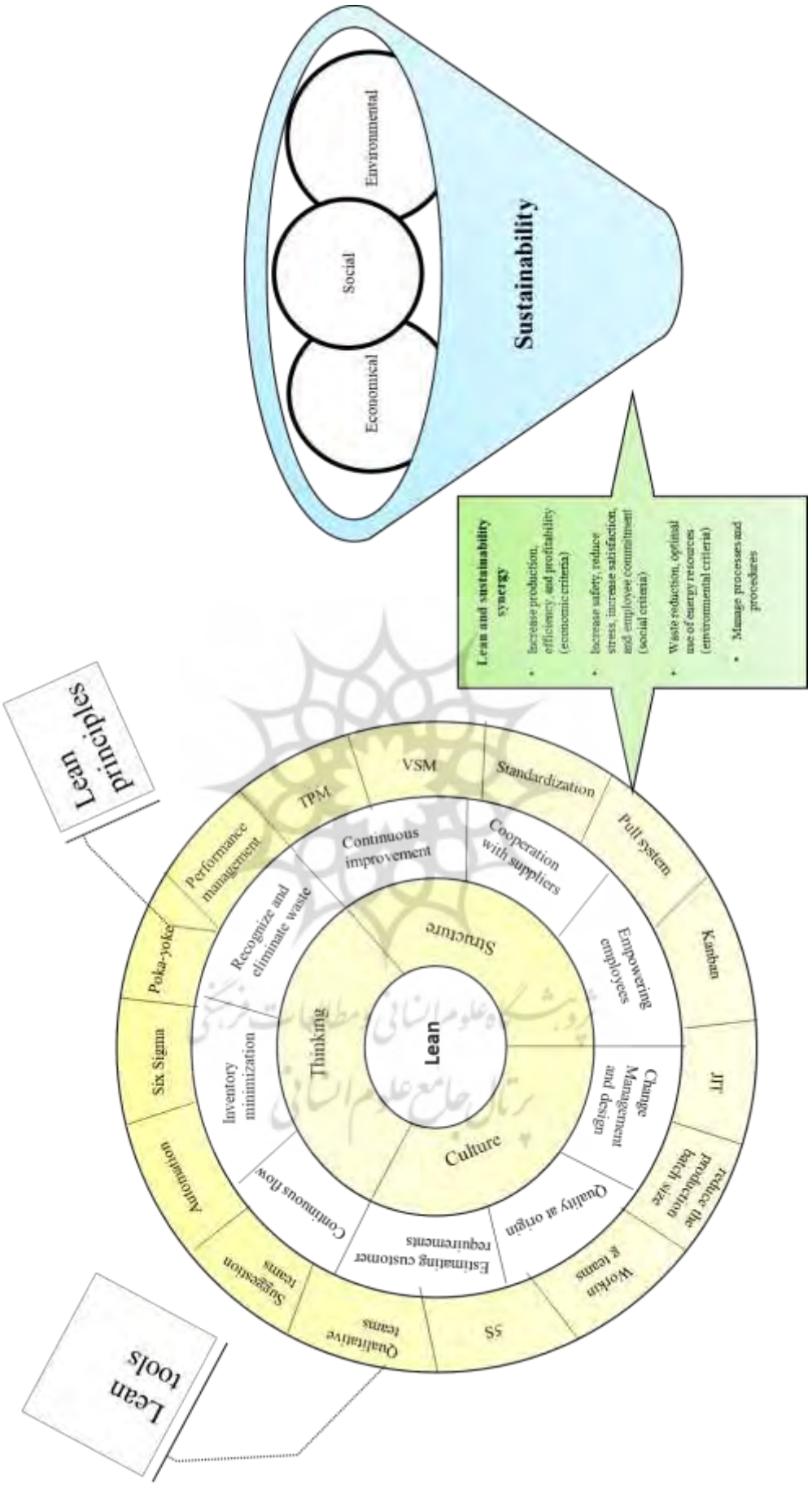

Fig. 2. The synergy of lean and sustainability

Table 1. A summary of the articles related to this study

Authors	Green management	Project management	GPM	Lean	Sustainability	Green
Bapat et al. (2021)		*			*	
Mashwama et al. (2021)		*			*	
Abualfaraa et al. (2020)				*	*	*
Francis & Thomas (2020)				*	*	
Mellado & Lou (2020)				*	*	*
Naji, Gunduz & Salat (2020)		*			*	
Liu et al. (2020)		*			*	
Severo et al. (2020)		*			*	
Rosli et al. (2020)		*		*		
Dallasega et al. (2020)		*		*		
Lartey et al. (2020)				*	*	*
Al-Qassab et al. (2019)			*		*	
Poston & Richardson (2019)		*				
Lambrechts et al. (2019)				*	*	*
Jamali & Karimi (2018)				*	*	
Tasdemir & Gazo (2018)				*	*	
Zaid Ahmad, Ayham, & Tali Bon (2018)	*				*	*
Marodin et al. (2018)				*		
Hammadi & Herrou (2018)				*	*	*
Chou et al. (2017)			*			
Kivilä et al. (2017)		*			*	
Khodeir & Othman (2016)				*	*	
Mutajwaa et al. (2016)		*			*	*
Mourtzis, Papathanasiou & Fotia (2016)				*		
Garza-Reyes (2015)				*		*
Shokohyar & Akbari (2016)					*	
Hartini & Ciptomulyono (2015)				*	*	
Dombrowski & Mielke (2014)				*	*	
Carvalho & Cruz-Machado (2011)				*		*
Gort (2008)				*	*	
Jørgensen et al. (2007)					*	*
The present study	*	*	*	*	*	*

3. Research methodology

This study aimed to identify and prioritize the significance of activities for achieving GPM with lean and sustainable objectives. Based on the lean-sustainability subject, the managers of the organization must be familiar with the concept and work to achieve and improve it. Therefore, the integration of the aspect of a sustainable and lean environment should be recognized as a model of management and production philosophy that should be done continuously in the entire organization. The supportive role of lean and sustainability is illustrated in Figure 1 wherein, lean and sustainability reinforce and support each other.

In addition to Figure 1, the lean-sustainable criteria for this evaluation are listed in Table 2. These criteria are categorized into four major groups i.e., environmental, social, economic, and processes and procedures aspects (as mentioned in section 2.2.). The activities in GPM were identified through the literature of GPM (PMBOK instructions and Dai & Xu (2011) (Table 3).

Table 2. Classification of lean-sustainability criteria in green project management

Main criterion	Sub-criteria	Code
Environmental dimension	Awareness of the benefits of using renewable energy (Østergaard et al., 2020)	(EV1)
	Waste material and recycling management, use of recyclable materials (Sakai et al., 2011)	(EV2)
	Awareness of the significance of the energy management system and energy consumption management (Da Silva Gonçalves & dos Santos 2019)	(EV3)
	Evaluation of life cycle and optimal material consumption (Tsang, et al., 2020)	(EV4)
	Motivating and training employees to maintain environmental principles and reduce pollution (Kováčová et al., 2013)	(EV5)
	Avoiding unnecessary transportation and transportation management (Shi et al, 2019)	(EV6)
	Reducing greenhouse gas emissions (Watabe et al., 2019)	(EV7)
Social dimension	Creating a culture for continuous improvement and change in behavior and thinking (Backlund & Sundqvist, 2018)	(SC1)
	Changing attitudes and flexibility in organizational culture and structure (Kováčová, 2013; Da Silva et al., 2019)	(SC2)
	Using people with a high level of knowledge, continuous learning, and knowledge management (Alavi & Aghakhani, 2011)	(SC3)
	Increase productivity and optimal performance (Hammadi & Herrou, 2018)	(SC4)
	Education and awareness of environmental and social responsibilities (Tasdemir & Gazo, 2018)	(SC5)
	Safety and Health (Khalid, Sagoo & Benachir, 2021)	(SC6)
	Commitment to the sustainable development approach and ethical requirements (Alavi & Mirmohammadsadeghi, 2021)	(SC7)
	Attitudes towards green project management activities (Yadav & Sagar, 2021)	(SC8)
	Understanding project features (Da Silva et al., 2019)	(SC9)
Economic dimension	Time, Cost and Budget Management (Kováčová, 2013; Al-Qassab et al., 2019)	(EC1)
	Flexibility in services and the increase in the level of service (Alavi, 2016)	(EC2)
	Flexibility in production and increasing the level of production (Alavi, 2016)	(EC3)
Processes and procedures dimension	Use of intelligent control systems, automation, and appropriate equipment for process optimization (Alavi & Aghakhani, 2011)	(PP1)
	Creation of appropriate processes to achieve the desired result (Kováčová, 2013)	(PP2)
	Design for rapid change and change management (Vedel & Kokshagina, 2021)	(PP3)
	In-process inspection and root causes analysis of defects (Lisovsky, 2019)	(PP4)
	Maintenance and repairs (Opoku, 2019)	(PP5)
	The efficiency of space and use of available spaces	(PP6)
	Focus on Business Process Management (BPM)	(PP7)

Table 3. Classification of GPM activities

Main activity	Sub-activities	Code
Initial activities (GPMA1)	Compilation and documentation of the project charter	GPMA1.1
	Defining the objectives in the project charter	GPMA1.2
	Identifying a team capable of aligning the project with environmental policies	GPMA1.3
Design and planning activities (GPMA2)	Preparing the GPM plans	GPMA2.1
	Environmental assessment (analysis of the project impact on the environment and identification of potential project risks for the environment)	GPMA2.2
	Temporal planning for implementation of activities	GPMA2.3
	Planning for environmental measures	GPMA2.4
	Planning for project cost management	GPMA2.5
	Procurement management planning and required resource management	GPMA2.6
	Green project quality management planning	GPMA2.7
	Green human resource management planning	GPMA2.8
Executive activities and work management (GPMA3)	Work guidance and management	GPMA3.1
	Execution of logistics	GPMA3.2
	Stakeholder participation management	GPMA3.3
Monitoring and control activities (GPMA4)	Quality control, cost, scheduling, and safety of activities	GPMA4.1
	Quality control, cost, scheduling, and safety of environmental activities	GPMA4.2
Termination activities (GPMA5)	Delivery of products or services	GPMA5.1
	Updating the organization's green process capital	GPMA5.2

In this study, the Delphi method has been used to identify green project management activities in the management of parks and green spaces in Isfahan. The Delphi method is based on the principle that the opinions of experts in each field about predicting the future are mostly correct. Therefore, the validity of this method depends on the scientific validity of the experts participating in the research. A Delphi technique comprises the steps of consulting a mature field of experts, anonymously. In different rounds with feedback on the results, it will be possible for the participants to reconsider their position (Almaiah & Almulhem, 2018).

In this study, after identifying the activities and criteria, the AHP technique is used to prioritize the activities and reveal more important activities. AHP was created by Saaty (1980) for decision-making problems in multicriteria situations. AHP assists in making decisions that are characterized by several interrelated and often competing criteria, and it establishes priorities amongst decision criteria when set within the context of the goal. A key aspect is those decision criteria are assessed concerning their relative importance to allow trade-offs between them (Darko et al., 2019). The process of AHP technique could be summarized in four steps (Figure 3):

i) hierarchy formation – the first level of the hierarchy contains the decision goal; the next levels are decision criteria, sub-criteria, and the alternatives for deciding the last level;

ii) pairwise comparisons – decision-makers complete pairwise comparisons of the elements at each level of the hierarchy, assuming the elements are independent of each other;

iii) verification of consistency – expert judgments are necessary for determining the relative importance of each criterion and any alternative to achieving the decision goal; and

iv) calculating the total score of each alternative and ranking them (Darko et al., 2019). These steps are shown in Figure 3.

The above steps are illustrated in more detail in Figure 4.

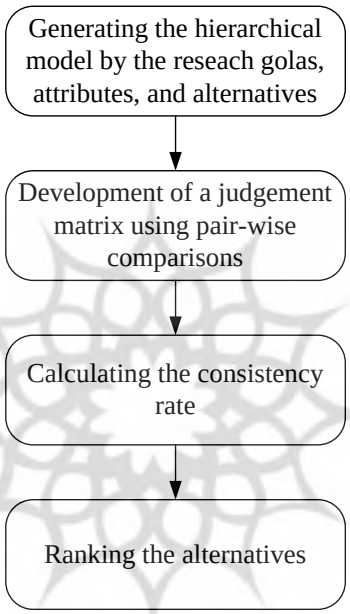

Fig 3. The process of the AHP technique (Darko et al., 2019)

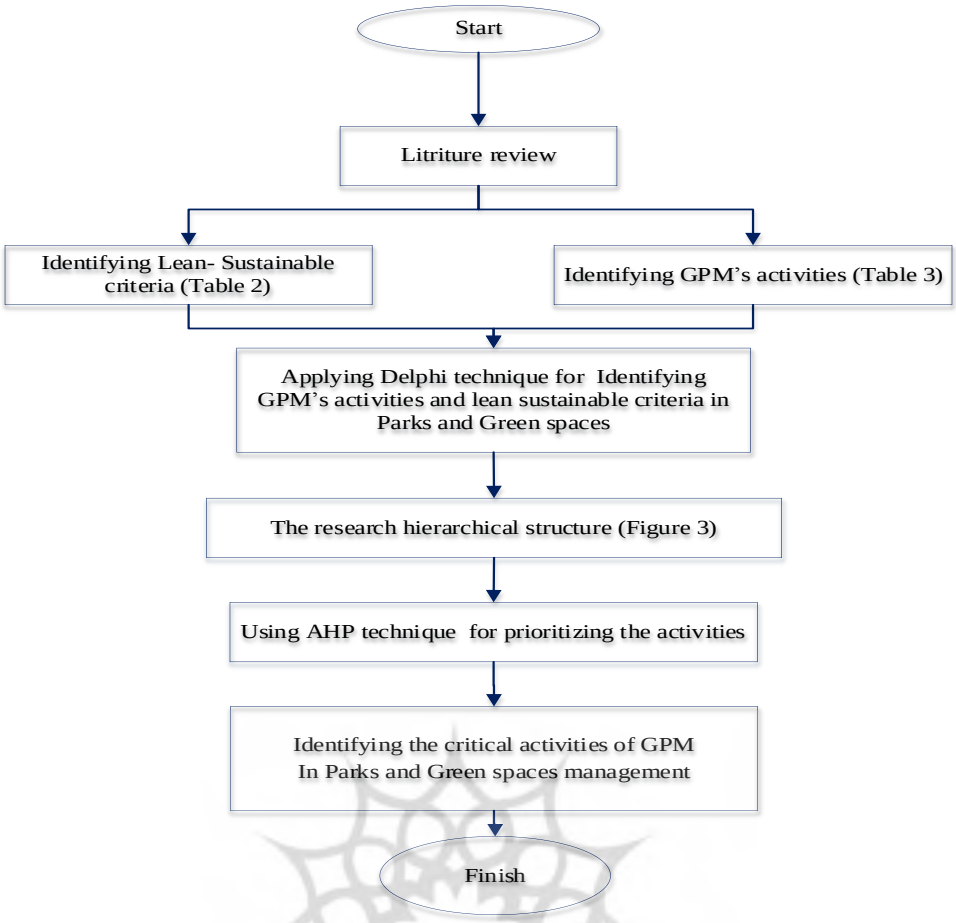

Fig 4. The steps of research methodology

4. Case study and findings

To identify more important activities of GPM, the research statistical population consisted of the project managers of the Isfahan Parks and Green Space Organization. Managers of different departments of the organization were selected to collect their opinions through field study. In the first step, the Delphi questionnaires were distributed to the experts and they were asked to comment on the significance of the criteria of lean, sustainability, and green management activities in the organization.

Increasing population growth and the need for housing and mass production have significantly reduced the share of green space in cities. The most important parameter that must be considered to increase the quantity and quality of green space is the lack of available resources. Therefore, today, low consumption of natural resources, including water is in priority (about 90% of which is used in agriculture and green space). The use of 100% recycled materials in parks and green spaces, energy conservation, and the use of clean energy led to a 50% reduction in environmental damage, and the use of appropriate and recyclable materials in the prevention of environmental degradation and pollution, and waste management are highly regarded.

The creation of green cities is tied to urban sustainability. The increasing development of green spaces in the city is directly related to increasing the social vitality of citizens, and all of such activities are necessary for the sustainable development of cities with high population density. Given the needs of Isfahan's population of two million and the presence of various industries near Isfahan, the city's migration and transportation pollution should not only highlight the preservation of green space but also strive for its development. Therefore, all the plans and actions of the Parks and Green Space Organization of Isfahan Municipality are based on reaching a sustainable and livable city and developing environmental plans.

After three rounds of the Delphi method, a consensus was reached among the experts. The results of Delphi indicators led to the elimination of flexibility in production and increased production (Alavi, 2016) for the Isfahan Parks and Green Space Organization.

Regarding the initial activities, according to the experts, "identifying the group interested in the alignment of the project with the environmental policies" was replaced by "identifying the group capable of aligning the project with the environmental policies". Similarly, "time planning for the implementation of activities" was merged with "planning for environmental considerations", expressed in the form of "time and financial planning for the implementation of activities in line with environmental considerations".

After reaching a consensus on the indicators, the AHP questionnaires extracted from the indicators were distributed to the research participants, namely, the members of the Delphi panel. Before performing pairwise comparisons, a decision tree was drawn to identify options for comparison. In this study, a comparison was made between green project management activities in the Isfahan Parks and Green Space Organization and they were prioritized based on lean and sustainable objectives. Figure 5 illustrates the hierarchical structure of the research. Accordingly, GPM activities can be prioritized based on each of the lean and sustainable objectives.

After the questionnaires were returned, the geometric mean of activities was calculated via pairwise correlation. Thus, first, pairwise comparisons were made between the four environmental, social, economic, and processes and procedures criteria to calculate the weight of each criterion concerning the purpose of the research. In the next step, a pairwise comparison was performed among the sub-criteria of each dimension to obtain the weight of each sub-criterion. In the last step, a pairwise comparison was made between the hierarchical structure options with 18 GPM activities in the Isfahan Parks and Green Space Organization for each sub-criterion.

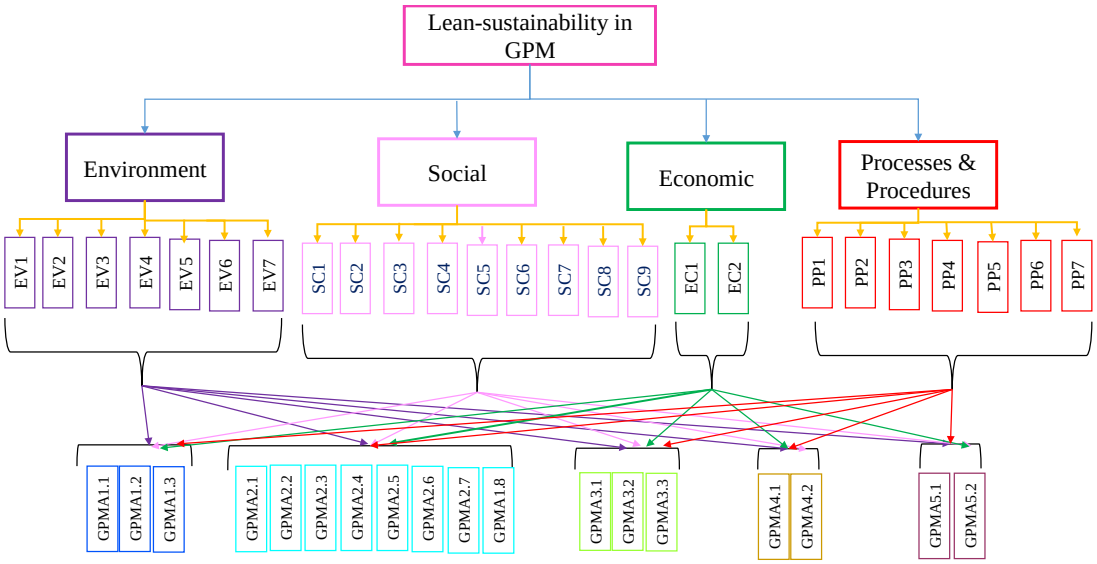

Fig 5. The research hierarchical structure

After obtaining the geometric mean, using Expert Choice 11 software and by entering the data obtained from the collected questionnaires, the weight of each activity was obtained based on lean and sustainable objectives. Then, the priority of each activity was determined based on the obtained weights.

Thus, based on the viewpoints of the experts of the Isfahan Parks and Green Space Organization, the GPM activities are addressed in Table 4 in terms of lean and sustainability.

Table 4. Prioritization of GPM activities based on the obtained weights

Priority	Activity	Activity code	Weight
1	Work guidance and management	GPMA3.1	0.12
2	Defining the objectives in the project charter	GPMA1.2	0.1
3	Execution of logistics	GPMA3.2	0.096
4	Quality control, cost, scheduling, and safety of the environmental activities	GPMA4.2	0.095
5	Updating the organization's green process capital	GPMA5.2	0.082
6	Quality control, cost, scheduling, and safety of activities	GPMA4.1	0.08
7	Identification of a capable group to align the project with environmental policies	GPMA1.3	0.058
8	Compilation and documentation of the project charter	GPMA1.1	0.052
9	Stakeholder participation management	GPMA3.3	0.05
10	Delivery of products or services	GPMA5.1	0.048
11	Planning for environmental measures	GPMA2.4	0.043
12	Planning for GPM	GPMA2.1	0.035
13	Planning for project cost management	GPMA2.5	0.031
14	Planning for green project quality management	GPMA2.7	0.03
15	Planning for green human resource management	GPMA2.8	0.025
16	Temporal planning for implementation of activities	GPMA2.3	0.023
17	Environmental assessment (analysis of the project impact on the environment and identification of potential project risks for the environment)	GPMA2.2	0.021
18	Procurement management planning and required resource management	GPMA2.6	0.02

Work guidance and management with a weight of 0.02 was the most significant sub-dimension, while procurement management planning and resource management with a weight of 0.02 were the least significant activities. Figure 6 depicts the results of activity prioritization via a horizontal bar graph. By considering the sum of the weights of each main activity, the main activity is prioritized in Table 5, wherein the executive activities (GMA3) with the highest weight (0.267) had the highest priority and the final activities (GMA5) with the weight of 0.132 was the least significant item.

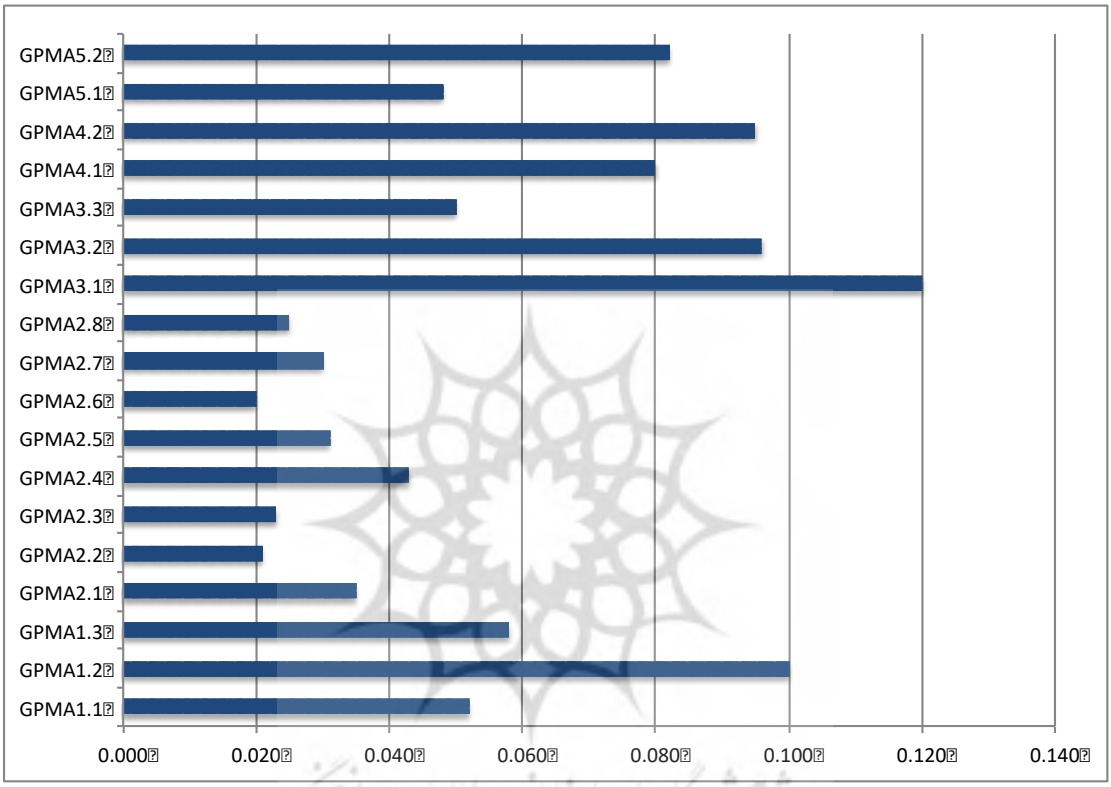

Fig 6. Prioritization of GPM activities based on lean and sustainable objectives

Table 5. Prioritization of the main GMP activities in the Isfahan Parks and Green Space Organization based on the lean and sustainability criteria

Priority	Main activity	Activity code	Final weight
1	Executive activities	GPMA3	0.267
2	Activities related to planning	GPMA2	0.229
3	Initial activities	GPMA1	0.200
4	Monitoring and control	GPMA4	0.177
5	Final activities	GPMA5	0.132

Figure 7 also illustrates the priority and significance of the main activities.

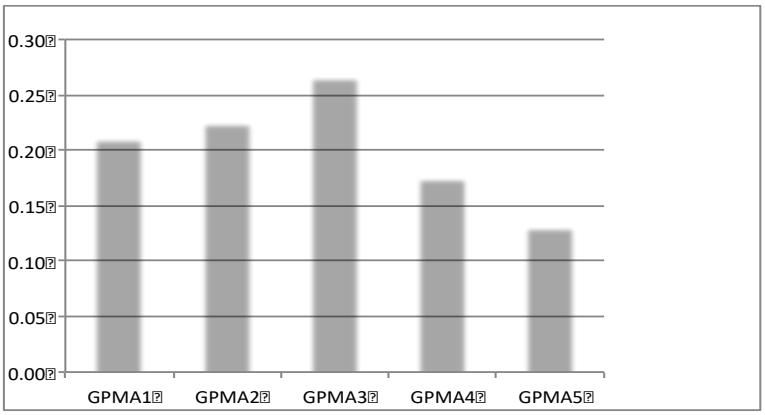

Figure 7. Prioritization of the main GMP activities in the Isfahan Parks and Green Space Organization based on the lean and sustainability criteria

5. Discussion

In this research, 18 green project management activities in the Parks and Green Space Organization were identified. These activities were categorized into five main groups i.e., initial activities, design and planning activities, executive activities and work management, monitoring and control activities, and termination activities. In all five groups of GPM activities, environmental and green aspects were considered. Also, the lean and sustainable criteria were integrated and categorized into four groups of environmental, social, economic, and processes and procedures which, according to the literature review, have not been studied yet. Prioritizing the GPM activities based on the integrated lean sustainable criteria was done by the AHP technique. The results indicated that executive activities achieved the first rank of importance.

5.1. Theoretical implications

In this study, the GPM activities were identified and all of the activities in PMBOK were modified and customized with the green concept. Such identification was done by literature review and based on the studies of researchers like Dai & Xu (2011). In Dia and Zhu (2011) model, the criteria of environmental treatments in project management were demonstrated in two activities of environment protection and evaluation. the Dia and Zhu (2011) model was suitable for the construction sector and they did not consider the green aspect in the entire activities of project management. Also, Khater, Ezeldin& Elshazly (2020) introduced a model which was validated to ensure the integration of sustainability in the green project management (GPM) with the Egyptian housing sector as the case study. They assumed the green part of project management as an activity “Green Building Check listing”, solely at the

end of the project. In this new model, the green concepts were penetrated in all phases of project management, and the green concept was considered from strategic planning and initial activities to the final activities.

5.2. Managerial implications

Parks need an appropriate level of standards such as safety standards, equipment standards, and other welfare standards, primarily. Such standards can be determined only through the full implementation of the management cycle and with executive and economic support. Therefore, it is suggested that organizations, in addition to emphasizing the environmental aspects of projects, consider training programs to recognize the environment and create a culture and awareness of individual relationships with the natural environment, as well as socio-economic support for taking steps towards achieving lean and sustainable goals.

Moreover, due to the activities associated with planning such as analyzing the green project objectives; determining ecological goals; providing project management plan for GPM in terms of the lean and sustainable goals; analyzing the effect of the project on the environment, and identification of potential project risks for the environment; doing temporal and financial planning for the implementation of activities consistent with environmental considerations; analyzing the required costs, supplies, and resources; planning for the provision of supplies and resources; and cost management in the next significance levels, it seems that appointing specialized teams in the field of planning and analysis can be an effective step towards achieving lean and sustainable organizational goals. Such teams should include people with environmental and financial knowledge to be able to identify the needs and activities of the project based on the objectives set.

Due to population growth and technology, ecological goals are sometimes overlooked. For environmental protection to become a reality, communities must make progress in such areas and make environmental decisions, respectively. A lack of commitment to aligning projects with sustainable development goals and environmental issues, on the one hand, and limiting costs, on the other, is often accompanied by poor and unfavorable results. Since the protection of local green space and natural attractions is one of the important GPM goals, using specialized and committed people can be a solution to overcome this problem.

Finally, the results suggested that project managers should design and follow their plans based on environmental considerations, and then the economic and financial aspects of the project. Given the role of public participation and supervision in sustainable development and the protection of environmental and natural values, identifying capable groups interested in

environmental and ecological issues and adhering to lean and sustainable goals can help project managers in the success of organizational goals. Also, project managers should not neglect to monitor and control the full implementation of lean goals and sustainability during the project implementation period, and in case of deviation from the desired goals, they should seek to identify and remove obstacles. If the emphasis on lean sustainable goals is weak in the design, implementation, and control stages, it would be practically impossible to implement the principles of the final activities.

6. Conclusions

Despite the importance of constant attention to environmental issues in today's world, green project management as a key tool with an emphasis on lean and sustainable concepts can play a significant role in improving and enhancing the quality of the environment. Therefore, identifying activities related to green project management is valuable. Identifying and prioritizing such activities can be an incentive for project managers and organizations to pay attention to the environment.

The novelty of this study is threefold. First, each of the lean and sustainability criteria was extracted from previous studies, separately. Then, by implementing the Delphi method among the experts of the Isfahan Parks and Green Space Organization, the significance of each criterion in the field of GPM was determined. Second, the same process was done to identify GPM activities in the Parks and Green Space Organization, according to the experts. Third, to prioritize GPM activities based on lean and sustainable goals, the implementation of hierarchical analysis and the expert consensus was applied. Finally, the activities were prioritized to consider their significance in spending sufficient budget and time compared to other activities.

According to the research results, the first rank of GPM activities based on lean and sustainable goals was the executive activities, which included the economic, social, and environmental pursuit of the project, full implementation of the management cycle from goal setting to implementation, the pursuit of ecological goals, support of environmental policies, and the implementation of training programs. This finding indicates that although the achievement of lean and sustainable goals needs planning, research, and initial design if the two principles are ignored in the implementation phase, it is impossible to achieve the set goals. Although there is currently an emphasis on supporting environmental policies, its implementation in practice requires more financial and managerial support and the provision of appropriate training. Parks and green spaces, as well as their equipment with a variety of

desirable and productive entertainment, can play an important role in allocating leisure time to the citizens.

6.1. Research limitations and future study agenda

Since this study was done in the Isfahan province, according to the different conditions and cultures of this province with other provinces, the generalization of the results to other provinces with different conditions and cultures should be done with caution. Also, due to the limitations in collecting data and tools used in the research, there may be factors that have not been considered in this paper. This study assumed that all the lean-sustainability criteria were independent to justify the use of the AHP technique. Therefore, it is suggested to perform a correlation test and determine the correlation among criteria before selecting the decision-making approach. In the future, a similar study can be conducted in other organizations and in other contexts to examine the proposed approach in different cultural and geographical contexts. Since in the present study, only lean and sustainability criteria were studied, consideration of other criteria such as agility and resilience is also suggested for future study.

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