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Prioritisation of GPM Activities from Lean-Agile-Resilience Perspective Using Fuzzy Analytic Hierarchy Process

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Abstract

Green Project Management (GPM) involves a set of management actions to identify and evaluate the impact of activities on the environment and to control and improve performance. Accordingly, the concepts of lean, agility and resilience have a special place as driving forces because they can play an important role in improving the environment. Therefore, the present study is conducted with the aim of identifying and prioritizing GPM activities. They are introduced based on the principles of project management knowledge set and considering the concept of green. Then, by considering the concepts of resilience, agility and purity as research criteria using Fuzzy Analytic Hierarchy Process (FAHP), activities are prioritized. This study has a pairwise comparison questionnaire that data are collected from construction industry experts. The incompatibility rate index is used to determine the reliability of the questionnaire. The results show that the five activities of GPM are identifying a team that can align the project with environmental policies. Development, documentation of the project charter, setting goals in the project charter, quality control, cost, planning, safety of environmental activities, and preparation of GPM programs, respectively, should be given more attention.

Keywords: Fuzzy analytic hierarchy process, Project management body of knowledge, Green project management, agility, Lean, Resilience.

1 | Introduction

Undoubtedly, one of the most critical challenges for humanity and future generations is protecting the environment. Today, life has created environmental problems such as limited natural resources, greenhouse gas emissions, pollution, waste, and global warming [48]. Since environmental problems are a threat to the sustainable development of human societies, organisations, as the largest members of societies, should recognise the effects of their behaviours on the environment and take the necessary actions to reduce the negative effects of these behaviours on natural ecosystems [55].

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Given the problems mentioned above and the human need to protect the environment, it is necessary to focus on the concept of GPM. It should be noted that project managers will be persuaded to conduct GPM activities when they are sure to achieve organisational agility, reduce costs and waste, and obtain flexibility while adhering to environmental principles. Lean means minimising waste and making the best use of resources to improve quality [57]. Agility means that the organisation should anticipate changes, overcome the environment, and respond to environmental threats [6]. In general, there are two different perspectives on the concept of organisational resilience. In unexpected, stressful, or unfavourable conditions, organisational resilience is regarded as the ability to return to the first place. The second perspective considers organisational resilience beyond restoration and defines it as the development of new capabilities and the ability to create new opportunities and move in line with it [45]. Familiarity with such concepts is essential for a project manager to control the market [4].

The main question of the present study is "what are the indicators of GPM and what the prioritisation of GPM activities is?" Awareness of such factors and their prioritisation will significantly help project managers preserve the environment. Due to the need to achieve lean-agile-resilience with preserving the environmental principles in project management, this study aims to identify and prioritise GPM activities from a lean-agile-resilience perspective in the construction industry. Despite the significance of identifying and prioritizing Green Project Management (GPM) activities from a lean-agile-resilience perspective, no study was found in this field despite the efforts made by the researcher.

The structure of this paper is organised as follows. Section 2 presents a review of related literature, which culminates with identifying the knowledge gap. Section 3 describes the methodology used in the present study. Section 4 and Section 5 provide a data analysis and discussion of the research findings. Section 6 concludes the study and recommends the potential research directions.

2 | Literature Review

2.1 | Project Management

Project management is an integrated task that makes each project and product process align with other processes appropriately to create coordination. PMBOK standard describes the nature of project management processes according to the integration and coordination between processes and their two-way communication, and the intended objectives. These processes are classified into the following five groups as project management process groups [6].

I. Initial processes group: it defines and confirms a project or phase.
II. The planning processes group defines and refines the goals and plans the required actions to achieve the project scope.
III. Executing processes group: it creates coordination and integrity between people and other resources to execute the project management program.
IV. Controlling processes group: it regularly measures and monitors the progress to identify deviations from the project management plan to take corrective action required for meeting the project objectives.

2.2 | Green Project Management (GPM)

Green management refers to the effective and efficient use of all material and human resources to guide and control the organisation to achieve environmental goals through organisation and planning. The manager should be present in all social, economic and cultural fields, and organisations should benefit from the concepts and indicators of green management to achieve a green status, one of the examples of which is optimal consumption of energy [7], [23]. Green management is not a new style of business management but a structural process of business in a more accurate definition. In other words, green management produces the techniques of generating profit. Green management can be defined in three parts of green building, green energy, and green waste. Indeed, green management is a kind of intellectual

review in the work of different institutions and organisations with respect for the environment [36]. Apart from the inherent benefit of preserving the environment, the greatest favour of this management to large corporations is that it has made their brand more popular in public. In general, the advantages of this management can be seen in three parts: environmental benefits, positive economic effects, and social aspects. The companies, organisations, and institutions committed to green management can enjoy economic savings, environmental service, and social status. Based on a report, the companies with stronger standards in green management have an employee with a higher spirit. On the other hand, the companies that support such management could save their costs. Starbucks is one of the most famous companies that could save up to 25% on its costs by adopting green management standards [65].

The project can take steps towards greening in different ways and be green in general [58]. The management model is changing with the continuous development of socio-economic and economic globalisation. It can be concluded that although the management model is in continuous optimisation, the main focus of management is not on environmental problems. For project management, the management tools and methods focus specifically on quality, time, and control of safety objectives, while objective objectives are highly rare in controlling the environment [3].

GPM is about considering the environment in all project management decisions. The solution for creating a "green thing" is to consider this issue in all project management processes [13]. Part of the integration of management is to combine green think and control integrated change. In this process, all changes are evaluated and affect other project management decisions while making decisions. Environmental issues are considered in all decision-making processes [15].

The concept of GPM is in the early stages to combine the organisation's environmental aspects with the project management processes. Project management innovation is of great practical and theoretical significance. From a micro perspective, the GPM aims to succeed in the project, improve the economic efficiency of the organisation, and achieve sustainable development in the organization [58]. From a macro perspective, the GPM aims to improve human living standards and support the environment while the quality of human life is improved to achieve sustainable and harmonious development between nature and human society [20]. Accordingly, the importance of the need for project management processes to the green structure of the project is obvious. Organisations can extend their environmental responsibilities throughout the organisation. Organisations in all projects can achieve the same level of environmental benefits by executing a new management model.

This model aims to encourage green thinking in project management processes that how to execute it in organisations by following the following two general principles [2]:

I. Supporting the ISO 14000 standard through project management processes.
II. Implementing green think in project management processes.

Table 1 is suggested to link between project management activities based on PMBOK and GPM.

2.3 | Agile Project Management

Agile project management has caused a revolution in project management and is one of the latest project management strategies mainly used to develop project management software. There have been several processes from the beginning of software development, such as the cascading model. However, traditional techniques and models are no longer strong enough to meet their needs with software development. Thus, the software development models have better flexibility and better results. Since the agile development model is different from conventional models, agile project management is a specialised part of project management. In agile projects, all individuals, such as developers, quality assurance engineers, and designers, are responsible for managing the project to achieve the project goals [62].

There are many differences in the agile project management model compared to traditional models [42]:

- *The agile model emphasises that the whole team should be an integrated unit including developers, quality assurance, project management and the customer [9].*
- *An increase in communication is one of the key factors which makes this integration possible. Thus, daily meetings are held for setting the daily work and affiliations.*
- *It normally includes a one to four-week delivery cycle, which is a short cycle.*
- *The agile project team looks for the communication techniques and tools which enable team members (including the customer) to express their opinions clearly and quickly.*

Then, these comments are considered while forming the requirements and running the software.

Table 1. GPM activities.

Sub-factors	Activity
Developing and documenting the project charter.	Initial processes group
Defining objectives in the project charter.	
Identifying a team that can align the project with environmental policies.	
Preparing GPM programs.	Planning processes group
Environmental assessment.	
Timing to run activities.	
Planning for environmental measures.	
Planning for project cost management.	
Planning for procurement management and required resource management.	
Planning for green projects quality management.	
Planning for green human resource management.	
Work guidance and management.	Executing processes group
Executing the procurement.	
Managing the shareholder participation.	
Controlling the quality, cost, planning and safety of activities.	Controlling processes group
Controlling the quality, cost, planning and safety of environmental activities.	
Delivering products or services.	Closing processes group
Updating the organisation's green trend capital.	

2.4 | Resiliency

Organisational resilience refers to the organisation's ability to anticipate, prepare, and respond to continuous environmental changes. The organisation environment is chaotic and changing. In this stormy sea, the organisation which is better able to adapt to environmental changes can survive. Better response to events and changes guarantees the survival of organisations, particularly in the present age. Resilient organisations have a high readiness and flexibility due to effective planning. Such organisations can overcome crises at a low cost [8], [21].

They are promoting resilience results in the growth of individuals and the acquisition of better thinking and self-management skills, and more knowledge. Organisational resilience is defined as the ability of an organisation to anticipate, avoid, and positively adapt to environmental disturbances and changes. This ability combines the organisational capacity to restore post-disruption performance and create the necessary capabilities before responding to a crisis [12]. Organisational resilience can be defined as the ability of an organisation to anticipate, avoid, and positively adapt to environmental changes. This ability combines the organisational capacity to restore post-disruption performance and create the necessary capabilities before responding to a crisis [28]. The research [21] considered three main dimensions of organisational resilience (situational awareness, keystone vulnerabilities, adaptive capacity), generally accepted.

Table 2 presents the similarities and difference between lean, agile and resilient project management based on literature. Summary of research on GPM and lean, agile and resilience concepts in the construction industry is presented in *Table 3*. *Table 4*, focuses on the literature, elaborates the research gap.

Table 2. Comparision between lean, agile and resiliency.

Similarities/Differences	Lean	Agile	Resiliency
Aim	Maximizing value while minimizing waste.	Be flexible and allow change even at the end of the process. Quick response to customer demands.	The better management of uncertainties during the project life-cycle and ability to recover the desired state after experiencing unexpected disruption.
Enablers	-Empowerment. -People Knowledge. - Flow orientation. - Change acceptance. - Leadership. - Technology [40], [63].	- People. - Innovation. -Organization. -Technology [64].	- Collaborative planning. - Knowledge sharing. - Using information technology. -Process integration. -Leadership. -Flow of information. -People knowledge. - Technology [10], [30], [33].
Process	- Identify customers and specify value. - Map the value stream. - Create flow by eliminating Project waste. - Respond to customer pull. - Pursue perfection [16], [18].	Evaluation of the company strategy. Suggestion for improvement. Design. Implementation Evaluation and correction [24].	Baseline assessment. Risk awareness. Co-creation of resilience strategy. Evaluation and reporting [37].
Advantages	-Waste reduction. -Inventory control. - Better efficiency. -Add value. -Productivity raise [54], [59].	-High flexibility of the project. -High customer satisfaction. -Constant interaction. - Continuous quality assurance [19], [47].	-Renewal. -Adaption. -Learning [29].
Tools	Value stream mapping, JIT, Kanban, respect for employees, automated mistake proofing, 5S SMED and cellular manufacturing [50].	Collaborative relationships, process and information integration, customer/market sensitivity analysis [14].	Reengineering, collaboration, agility and risk management culture [35], [52].
Responsiveness	Identify value and map the value stream.	Proactive attitude. Rapidly value creation [39].	Reactive attitude. Value conservation [39].
Inventory strategy	Decrease inventory level [26].	Demand driven [34].	Increase inventory level [26].
Energy	Increase energy consumption [26].	There is no evidence regarding agility and energy.	Increase energy consumption [26].

Table 3. Summary of literature.

Result	Method	Objective	Author (year)
Lean objectives included three dimensions of environmental, social, processes, procedures. Sustainability goals were social, economic, and environmental. The prioritisation of GPM activities in terms of lean, sustainable goals were administrative activities, planning activities, initial activities, monitoring, control, final activities.	Analytic Hierarchy Process (AHP)	Identifying prioritising activities to achieve lean, sustainable GPM in Isfahan according to Parks, Green Space Organization.	Alavi and Janatian [6]
Economic indicators were finalised as 27. In addition, 18 items were included for the environmental dimension, 37 indicators for the social / management dimension.	Systematic literature review	Integrating sustainability indicators into project management, case study: construction industry.	Stanistas et al. [56]
Smartsheet has the best rating according to the users.	MARCOS	Evaluating project management software.	Puška et al. [46]
Risks of low-quality materials, equipment, resistance by stakeholders to adopt green ideas, the lack of realistic goals are of great significance. The proposed framework can help green building project stakeholders in developing countries better manage project risks.	Step-Wise Weight Assessment Ratio Analysis (SWARA)	Identifying rating the risks of green construction projects using the SWARA-COPRAS approach (case study: Amol).	Fazli et al. [22]
The risks related to low material quality equipment inadequacy are of great significance. The lack of scale for the cost of activities is the least important.	AHP, Dematel technique	Identifying and prioritising the risks of green construction projects based on the combination of FDEMATEL, FANP methods (case study: Savadkuh).	Ghaobadi et al. [25]
Six dimensions, 24 criteria of GPM were identified based on related studies in the fields of environmental sustainability, supply chain management.	DERMATOL, ANP	Developing the construction criteria to evaluate GPM: an integrated approach.	Chou et al. [15]
Surveys, interviews with project managers. This study will help create a knowledge base for project managers to be competitive, employ sustainable projects effectively.	Literature review	Identifying the challenges facing project managers implementing green construction projects, determining the knowledge, skills needed to meet such challenges.	Hwang and Ng [31]
Although project cost is the most significant barrier to managing construction in green buildings, there is no shortage of sustainable knowledge in the Singaporean construction industry.	Interview	Identifying common barriers created during the management of green construction projects, providing some solutions to overcome the barriers.	Hwang and Tan [32]
Project management adopted in the construction of green buildings involves both its operation, its process. Although this practice - which is mainly provided through the knowledge project management set.	Comparison between LEED, Green Globes, BCA Green Mark	Project management, green buildings: lessons from rating systems.	Wu and Low [61]

Table 4. Studies related to lean, agile and resilient dimensions in green project management.

Resilient	Agile	Lean	Author (year)
		✓	Alavi and Janatian [6]
	✓		Oprins et al. [44]
		✓	Schmitz [5]
		✓	Opoku [43]
✓			Ruiz-Benítez et al. [49]
		✓	Ahuja et al. [2]
		✓	Ahuja et al. [1]
		✓	Mourtzis et al. [41]
✓			Sharifi and Yamagata [53]
		✓	Verrier et al. [60]

Based on the review of the research literature, no study has been conducted so far for examining the lean, agile and resilient dimensions of GPM simultaneously. Thus, this study aimed to investigate the GPM model from the perspective of lean, agile and resilient in the Iranian construction industry.

3 | Research Methodology

After reviewing the literature and research background, the factors affecting GPM from three perspectives of lean, agile and resilient were identified. Then, the interviews with experts were held, and the identified factors and measures were localised based on the conditions of the Isfahan construction industry (*Table 5*). *Fig. 2* illustrates the hierarchical tree of the research. In addition, GPM measures are coded in *Table 6*. In order to collect data and identify GPM measures based on agility, lean and resilience approaches, library studies (English and Persian books and articles, dissertations, websites) were used. In addition, a questionnaire was used to collect data. This study had a pairwise comparison questionnaire related to the FAHP approach. Due to the fact that in most cases, issues are fraught with uncertainty, the use of exact numerical values and classical logic in pairwise comparisons may lead to a decrease in the accuracy of the results. The fuzzy set helps to eliminate uncertainty and inaccuracy in pairwise comparisons by quantifying ambiguous information by using the membership function. Since the present study uses qualitative concepts such as lean, agile and resilient in the construction industry, the application of the fuzzy concept allows for more accurate evaluation and comparison between criteria, sub-criteria and alternatives [17]. The incompatibility rate index was used to determine the reliability of the pairwise comparison questionnaires. If the incompatibility rate of matrix comparison matrices is less than 0.1, the consistency of expert judgments in prioritisation can be accepted.

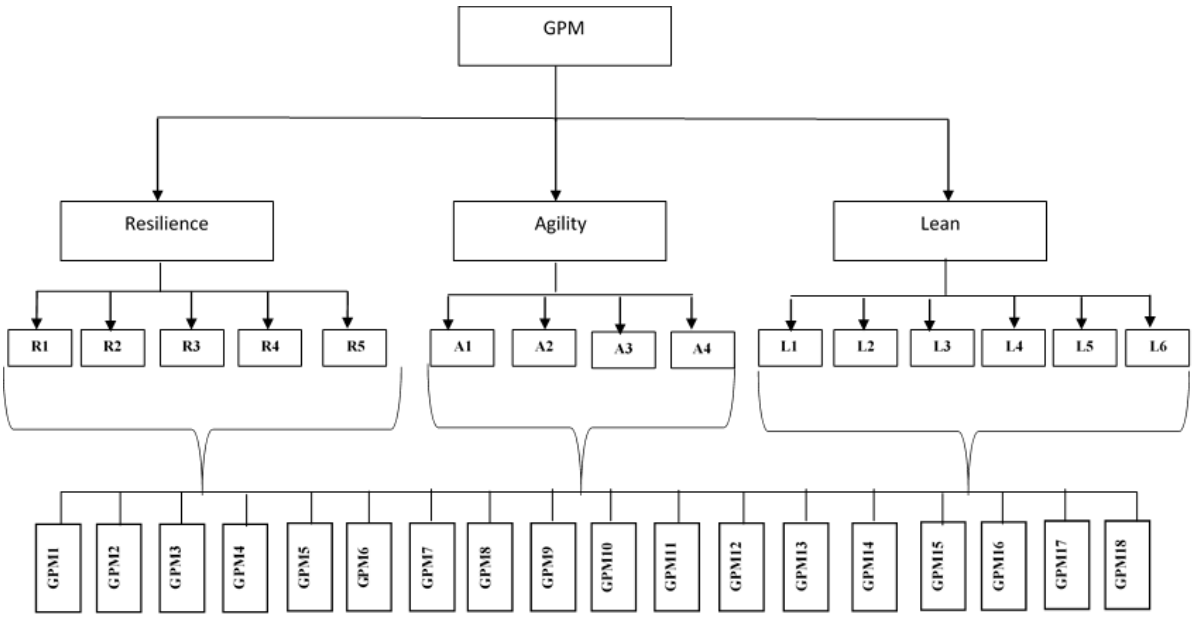

Fig. 2. Hierarchical tree.

Table 5. Localized factors of GPM from lean, agile and resilient dimensions in the construction industry.

Code	Reference	Factors		Row
R1	Duchek [21]	External resource (obtain resources and assistance from other organizations in the construction industry, which help to solve problems that are difficult to solve on their own or cost a lot to solve).	Resilience (R)	1
R2	He et al. [27]	Considering the risk factor in construction industry (some of these risks in the construction industry are Labor Shortages & Productivity Issues, Health & Safety Hazards, Subcontractor default and Change Orders).		2
R3	Zhu et al. [66]	Suitable construction materials, technology and techniques.		3
R4	Ruiz-Benítez et al. [49]	Leathership (He/She makes continuous assessment on project objectives and work procedures, as well as provide reliable management and decisions in times of crises).		4
R5	Sharifi and Yamagata [53]	Cooperation with owner, architect, engineers, general contractor, subcontractors, and suppliers.		5
L1	Mourtzis et al. [41]	Using intelligent control systems, automation, appropriate equipment to optimise the process.	Lean (L)	1
L2	Lešková and Kováčová [68]	Creating the right and continuous processes to achieve the desired result.		2
L3	Schmitz [51]	Designing for fast change, change management.		3
L4	Lisovsky [67]	Identifying value from the customer's point of view (It isn't just about what to build, but why).		4
L5	Opoku [43]	Maintenance, repairs.		5
L6	Bajjou and Chaf [11]	Managing Critical Waste Factors (Accidents on construction site, solid waste generation, materials damaged during construction time,time waste for transporting materials, labors rest and etc.).		6
A1	Oprins et al. [44]	Promoting teamwork (Development of team intelligence and know-how through teamwork and collaboration across different parts of the project).	Agility (A)	1
A2	Oprins et al. [44]	Creating continuous improvement thinking.		2
A3	Oprins et al. [44]	Creating a learning organisation.		3
A4	Mhetre et al. [38]	Quick response to changes in the construction industry.		4

Table 6. Coding of alternatives.

Code	Factors	Row
GPM1	Compilation, documentation of the project charter.	1
GPM2	Defining objectives in the project charter.	2
GPM3	Identifying a team that can align the project with environmental policies.	3
GPM4	Preparing the GPM programs.	4
GPM5	Environmental assessment.	5
GPM6	Scheduling to running activities.	6
GPM7	Planning for environmental measures.	7
GPM8	Planning for project cost management.	8
GPM9	Planning for procurement management, resource management.	9
GPM10	Planning for green project quality management.	10
GPM11	Planning for green human resource management.	11
GPM12	Work guidance, management.	12
GPM13	Logistics execution.	13
GPM14	Shareholder participation management.	14
GPM15	Quality control, cost, planning, safety of activities.	15
GPM16	Quality control, cost, planning, safety of environmental activities.	16
GPM17	Delivery of products or services.	17
GPM18	Updating the organisation's green trend capital.	18

4 | Data Analysis

Based on each level of the matrix, pairwise comparisons are formed, and then the weight and significance of each factor in each level are determined. *Table 7* presents the pairwise comparisons of factors in the first level as a sample. The fuzzy weight of the criteria and sub-criteria of the decision tree is shown in *Table 9*. Finally, the normalised final weight of the criteria and sub-criteria are obtained through the defuzzification of the fuzzy numbers, as shown in *Table 8*.

Table 7. matrix of pairwise comparisons of factors in the first level.

	Resilience	Agility	Lean
Resilience	(1, 1, 1)	(1.21, 1.54, 1.83)	(1.07, 1.29, 1.67)
Agility	(0.55, 0.64, 0.82)	(1, 1, 1)	(0.65, 0.8, 0.94)
Lean	(0.59, 0.77, 0.93)	(1.06, 1.24, 1.52)	(1, 1, 1)

Finally, weighing the alternatives affecting the GPM based on the ongoing inspection and the main causes of failure are shown in *Table 9*.

Table 8. Fuzzy and normalised weights of criteria and sub-criteria.

Normalised Weight of Sub-Criteria	Fuzzy Weight of Sub-Criteria	Normalised Weight of Criteria	Fuzzy Weight of Criteria	Criteria	Row
0.004	(0.165, 0.119 , 0.092)	0.57	(0.55, 0.41 , 0.30)	Resilience	1
0.431	(0.397, 0.289 , 0.200)				
0.0866	(0.231, 0.166 , 0.119)				
0.184	(0.272, 0.193 , 0.139)				
0.292	(0.326, 0.230 , 0.164)				
0.309	(0.314, 0.231 , 0.170)	0.326	(0.42, 0.32 , 0.24)	Lean	2
0.151	(0.235, 0.167 , 0.120)				
0.297	(0.303, 0.229 , 0.163)				
0.013	(0.175, 0.122 , 0.089)				
0.145	(0.144, 0.104 , 0.076)				
0.083	(0.204, 0.142 , 0.103)				
0.356	(0.388, 0.30 , 0.208)	0.102	(0.33, 0.26 , 0.20)	Agility	3
0.442	(0.459, 0.335 , 0.209)				
0.101	(0.459, 0.335 , 0.209)				
0.1	(0.290, 0.160 , 0.114)				

Table 9. Weighting of the alternatives.

Rank	Weight	Factors affecting green project management	Row
2	0.102	GPM1	1
3	0.090	GPM2	2
1	0.65	GPM3	3
5	0.075	GPM4	4
9	0.058	GPM5	5
16	0.025	GPM6	6
15	0.030	GPM7	7
7	0.062	GPM8	8
14	0.036	GPM9	9
12	0.053	GPM10	10
10	0.056	GPM11	11
11	0.055	GPM12	12
17	0.023	GPM13	13
18	0.010	GPM14	14
6	0.063	GPM15	15
4	0.076	GPM16	16
8	0.060	GPM17	17
13	0.052	GPM18	18

5 | Disscussion

According to the pairwise comparisons matrix of the main criteria, the weight of resilience was 0.570, agility was 0.102, and lean was 0.326. As it is clear, the importance of the factors is as resilience, lean, and agile, respectively. Thus, considering resilience in GPM in the construction industry is the priority.

Based on the matrix of pairwise comparisons of resilience factors, the bargaining power of suppliers was 0.004, a risk factor in decision making was 0.431, supply chain structure was 0.0866, contingent planning was 0.184, and cooperation was 0.292. GPM measures based on resilience sub-factors has the highest importance based on the bargaining power of suppliers and the documentation of the project charter. Based on the supply chain structure, the documentation of the project charter is of the most significance. Based on contingent planning, defining objectives in the project charter is of the most importance. Based on the cooperation, defining the objectives in the project charter is of the most significance.

According to the matrix of pairwise comparisons of agility factors, promoting teamwork was 0.356, creating continuous improvement thinking was 0.442, creating a learning organisation was 0.101 and partnership with contractors and suppliers was 0.100. The priority of the significance of agility factors in GPM includes the use of intelligent automation control systems, design for rapid change and change management, creating appropriate processes to achieve the desired result, maintenance and repairs, space efficiency and using available spaces, as well as ongoing inspections and the main causes of failure. The results of this study are consistent with Alavi and Janatian [6]. In the study by Alavi and Janatian , in the lean dimension of GPM, the priority was using intelligent automation control systems. Their study was conducted in knowledge-based companies of Isfahan Scientific Research Town.

Based on the results of this study and the matrix of pairwise comparisons of GPM measures based on lean sub-factors is the most important based on the use of intelligent control systems, automation, appropriate equipment for process optimisation, and defining goals in the project charter. Based on creating the right processes to achieve the desired result, scheduling for the implementation of activities is of the most importance. According to the design for rapid change and change management, scheduling activities is of the utmost importance. Based on ongoing inspections and the main causes of failure, quality control, cost, planning and safety of activities are of the most importance. Based on the efficiency of the space and the use of available space, scheduling for the implementation of activities is the most significant.

Based on the results, the most important factor is promoting teamwork and identifying a team that can align the project with environmental policies. Based on continuous improvement, identifying a team that can align the project with environmental policies is of the most significance. According to the creation of the learning organisation, the documentation of the project charter is of the utmost importance. Based on partnerships with contractors and suppliers, defining goals is most significant in the project charter.

Weight the GPM measures, the final weighting was conducted based on the weight of the factors in the first and second levels, as well as the weight of GPM factors in the third level according to the indicators and criteria of resilience, lean, and agility of the final weighting of GPM measures. It was identified that the five measures of planning for GPM plans, environmental assessment, quality management of green projects, guidance and management of work and implementation of procurement are the most significant and should be considered more, respectively.

It should be noted that the compatibility of the pairwise comparison matrix completed by the experts was confirmed. The results of this study are consistent with Alavi and Janatian [6]. In Alavi and Janatyan [6] study, five measures of preparation of GPM programs, environmental assessment, quality management of green project planning, guidance and work management, and procurement implementation were identified as high priority factors.

6 | Conclusion

Continuous socio-economic development and economic globalisation have caused a continuous management model change. Thus, with the increase of sustainable development and awareness of environmental concerns, attention to macroeconomic issues, environment, and social responsibility has become significant. The project management process requires such factors since they systematically pay less attention to these issues. As a result, project management will require a new title called GPM, in which the green structure of the project is considered.

In this section, based on the main results of the fourth chapter of this study and GPM measures, the following practical suggestions for the construction industry field are presented.

I. Due to the significance of planning-related activities in the construction industry, green project goal analysis activities, setting ecological goals, providing a project management plan for GPM in terms of clean and sustainable goals, analysing the effect of the project on the environment, identifying potential project hazards to the environment, conducting time and financial planning for the implementation of activities consistent with environmental considerations, analysing the resource required costs, resource planning and cost management should be implemented at a significant level.
II. They are forming a green management working group. Seemingly, the appointment of specialised teams in planning and analysis of project management in the construction industry can be an effective step to achieve lean and sustainable organisational goals. Such teams should include individuals with environmental and financial knowledge, especially in the construction industry, to identify project needs and activities based on determined goals.
III. Due to population growth and technology, environmental goals are sometimes discarded. For environmental protection to become a reality, communities should make progress in such areas and make environmental decisions. The lack of commitment to coordinating projects with sustainable development goals and environmental issues and limiting costs are often related to poor and unfavourable results. Since the protection of local green space and natural attractions is one of the significant goals of project management in the construction industry, using professional people can be a solution to overcome this problem. Such people should be experts in environmental management and with a specialised degree, preferably in the field of construction and should be employed after doing an interview and confirming their practical and intellectual competence to the environment.
IV. Due to public participation and supervision in sustainable development and the protection of environmental and natural values, identifying capable groups interested in environmental and environmental issues and pursuing lean and sustainable goals can help project managers assist the success of construction project goals.
V. Construction industry project managers should not avoid monitoring and controlling the full implementation of lean and sustainable goals during the project implementation period. In case of deviation from the desired goals, they should identify and remove barriers. If the emphasis on lean sustainable goals is weak in the design, implementation and control stages, the implementation of the principles of final activities will be practically impossible.
VI. Scrumban is a mixture of Scrum and Kanban methods. This method, like Scrum, divides the project into smaller sections and, like Kanban, has a visual workflow. By dividing the project into smaller cycles, Scrumban speeds up the process of Scrum adaptation to project changes. In Scrumban, such cycles are called repetition. In the framework of Scrumban, first should have a planning session and create a list. This list should involve the issues which need to be addressed during the project. With each cycle, several such items must be completed until no more items are left. Scrumban takes Kanban's visual approach in order to improve processes. In other words, a significant and fundamental part of Kanban's method is visualising the flow of project activity to keep pace with the progress of each task.

VII. In most new construction projects, planning is conducted, and senior managers know that they should be more careful in controlling project planning, but still, many of these projects during implementation with different problems and challenges encounter such problems and lead to project failure. New approaches to project planning are now flexible planning and short-term planning. It means that the planning should have the potential to encounter unforeseen risks and be planned in such a way to carry out its activities at the lowest cost in the face of these challenges. On the other hand, considering the short-term planning on a quarterly, monthly, weekly, and daily basis can be fruitful in reducing the time pressure of the project. In some projects, the managers are not interested in developing planning in domestic projects, and if they propose a plan, they will take some resistance and oppose this issue. For this reason, it is recommended to first inform these managers of the benefits of planning, and the make the proper implementation of this program in these managers by involving these managers in the planning process.

VIII. The main focus of managers is on project delivery time, usually in most construction industry projects. This issue is regarded so significant and effective than providing business value in the project often becomes the next priority. Nevertheless, the presentation of the project in the specified period should be solved through appropriate planning, and the main focus and priority of the project should be the presentation of commercial value. However, it is critical to mention that determining the project execution time is one of the most complicated problems and challenges facing any project planner. With the development of new software technologies, using such new tools can be used to calculate the exact execution time to make the project useful.

Some activities should be assigned to individuals so that the required activities in the projects can be conducted properly. It is significant to note that the use of telecommuting individuals or teams should be under the strict control of the project manager to conduct the activities required in the project with appropriate efficiency.

6.1 | Limitations

Every research usually has some obstacles, problems and limitations, but it does not mean that the results of such studies cannot be used or have a significant effect on the value of those studies. However, since it is necessary to point out the study's problems and limitations, some cases are mentioned below:

- *Due to some uncontrollable factors, such as the mentality and attitude of individuals and some environmental factors and their effect on completing the questionnaire, the accuracy of the results may be affected.*
- *This study is related to the construction industry in Isfahan, and its generalisation to the whole country should be conducted with caution.*
- *This research is based on the assumption of independence of criteria and alternatives.*

6.2 | Suggestions for Future Research

According to the criteria identified in this study, it is recommended that the grey approach and Analytical Network Process (ANP) be used to rank GPM measures. Also, considering the ranking of GPM measures based on the perspective of resilience, lean and agility in this study, it is recommended that GPM measures are studied based on other management approach in future research.

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