



Identifying organizational variables affecting project management office characteristics and analyzing their correlations in the Iranian project-oriented organizations of the construction industry

M. Parchami Jalal, S. Matin Koosha *

Department of Project & Construction Management, School of Architecture, College of Fine Arts, University of Tehran, 16 Azar Street, Enghelab Square, Tehran, Iran

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Abstract

Today, applying project management knowledge by project oriented organizations for optimal use of resource and increasing productivity is inevitable. An organizational entity generally called “Project Management Office” can be responsible for project management knowledge and systematic developer of it which can centralize and coordinate management of those projects under its domain. Since organizations have different contextual and structural dimensions, we expect different project management offices in terms of their structural and functional characteristics. This article is searching for variables in the context of organizations in construction industry which have significant relationships with project management offices’ characteristics. So that by analyzing these relations we can design and implement more efficient project management offices. Finally, from 29 organizational context variables which had been thought to have decisive impact on project management offices’ characteristics only 9 variables had significant impact on them in which this paper focuses on.

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1. Introduction

There are several definitions for “Project Management Office”; one of the most respectable is the one provided by Project Management Institute of America in PMBOK 2013. According to this definition a project management office (PMO) is a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. The responsibilities of a PMO can range from providing project management support functions to actually being responsible for the direct management of one or more projects (PMBOK, 2013).

The most important results of the PMO implementation regarding the survey which was conducted by Project Management Solutions in 2010 are as follows (PM Solutions, 2010):

- Decreasing failed projects.....31%
- Delivering projects ahead of schedule.....19%
- Delivering projects under budget.....30%
- Improving productivity.....21%
- Increasing resource capacity.....13%.

Obviously the attainment of the above objectives depends a lot on PMO’s performance and its maturity. The more the project management offices improve to higher level of capability and maturity, the more the achievement of the above mentioned objectives increases. However, due to the different structural and

* Corresponding author. Tel.: +98 21 88741966; fax: +98 21 88536625.

E-mail addresses: parchamijalal@ut.ac.ir (M. Parchami Jalal), matinkoosha.sanaz@gmail.com (S. Matin Koosha).

contextual dimensions of organizations it is expected that their PMOs are different in terms of structural and functional characteristics (Matin Koosha, 2012). Being aware of these differences and their impacts is indispensable for having efficient project management offices in organizations. Therefore, in this article, correlations of two groups of PMOs’ characteristics and organizational context variables are examined. PMOs’ characteristic variables (its features and properties) are explained in Section 1–2 and organizational context variables which impact on PMOs’ characteristics are explained in Section 1–3.

1.1. Project management offices' characteristics

PMOs are compared based on various characteristics in different references. This research classifies the general characteristics of PMOs in functional and structural groups. Functional characteristics are those functions and duties that PMO is potentially expected to do in an organization. Structural characteristics are defined as the age of PMO, staff composition and its authority in the organization. This article compares and classifies PMOs’ characteristics from various references (Brown, 2007; Crawford, 2002; Gartner, 2002; Hill, 2008; Hobbs, 2006; Kerzner, 2009; Rad and Ginger, 2002; Wisocki, 2009). These classifications are shown in Tables 1 and 2.

1.2. Organizational context variables

This section is about organizational context variables which are supposed to have impact on PMOs’ characteristics. These variables can be searched in two internal and external environments of an organization as depicted in Fig. 1. Since these variables are not classified and mentioned in related literature clearly, researchers of this article had to complete and adapt them to the characteristics of the Iran’s construction industry by the use of related researches and also a questionnaire which was answered by 51 experts in construction industry wherein its result is shown in Table 3. Construction industry in this research is defined as a series of agents, including organizations, individuals and entities within the framework of conventional technical system, engineering, and executive which interact to create an artificial construction or facilities that intended to operate. Construction industry includes

Table 1
Classification of PMOs’ functions from the perspective of this study.

Item	Functions
1	Development of project management methodologies
2	Development of project management tools and software
3	Knowledge and lesson learned management
4	Training and developing project management competency
5	Mentoring and coaching in project management
6	Governance and human resource development
7	Monitoring and controlling projects
8	Portfolio management
9	Participate in strategic planning
10	Management customer interfaces
11	Management vendor and contractor interfaces

Table 2
PMOs’ structural characteristics from the perspective of this study.

Structural characteristics	
(Classes of data)	(Elements of data)
Age of PMO in organization	<ul style="list-style-type: none"> • Under 5 years • 5 to 10 years • More than 10 years
PMOs’ staff composition	<ul style="list-style-type: none"> • Staff of PMO (other than project/program managers) • Presence of project managers within the PMO • Experience of the staff • Specialty of the staff
The status and authority of the PMO	<ul style="list-style-type: none"> • Location of PMO within the organizational hierarchy • Percentage of projects within the mandate of the PMO • Decision-making authority of the PMO about projects and project managers • Amount of supportive role of PMO • Amount of managerial role of PMO

housing construction, building construction, engineering construction and industrial construction.

2. Research method

This research includes two distinct stages after classifying PMOs’ characteristics. The first stage includes prioritizing organizational context variables from the perspective of experts and the second one includes the evaluation of correlation between organizational context variables and project management offices’ characteristics. These stages are discussed in details, as follows.

2.1. The stage of prioritizing organizational context variables from the perspective of experts

2.1.1. Data gathering tool and statistical population

At this stage to prioritize organizational context variables and to select the most important variables to participate in the next stage of this research, questionnaire was used in which respondents ranked the impact of organizational context variables on the project management office characteristics in quintuple Likert scale. To check the reliability of the questionnaire, Cronbach’s alpha test in SPSS software was used and the alpha 0.818 was calculated. So the reliability of the questionnaire is satisfying.

At the beginning of the research in the initial stages, the authors started specifying organizations with PMO in the field of construction industry with related personnel and other PMO’s professional experts and consultants. Since the statistical population of this stage was comprised of the project management office’s experts, in total 105 persons were recognized as potential experts for PMO wherein the questionnaire and its guide were sent to all of them. In addition they were put on the most visited project management websites in Iran to be filled.

The criteria for the selection of PMO experts for this research were determined as below:

- 1 Being a member or manager of PMO in a project oriented organization in construction industry or a professional PMO consultant in implementing PMO in these organizations.

- 2 Having more than 5 years of experience in the field of project management in the construction industry.
- 3 At least attained a bachelor’s degree.
- 4 Having a professional project management license or university/college academic education in project management is preferred.

Finally from the respondents 51 persons conformed in accordance to the specified criteria. Their specifications are shown in Fig. 2.

2.1.2. Method of analyzing in this stage

To prioritize organizational context variables after collecting responses from the first questionnaire scores they were calculated based on the following formula and have been prioritized accordingly.

$$N = \sum_{t=1}^{i=1,2,3,4,5} \text{The frequency of votes for each option} (t \times i) \quad (1)$$

Then the percentage of the total points for each variable was calculated and according to the Pareto principle those variables which have a cumulative percentage of impact of 80% were selected as the most important and other variables to reduce the number of questions in the next stage were excluded.

According to what was mentioned, 18 variables of 29 were chosen as the most important organizational context variables which affect PMOs’ characteristics. These variables are prioritized as depicted in Table 4.

2.2. The stage of evaluating of correlation between organizational context variables and project management offices' characteristics

2.2.1. Data collection approach and research sample in this stage

To evaluate the correlation between organizational context variables and PMOs’ characteristics, the second questionnaire with 73 questions was designed and its reliability was calculated by SPSS software. Cronbach’s alpha for this questionnaire is calculated to be 0.821 which indicates good reliability. The statistical population of the research in this stage was project-

oriented organizations active in the construction industry which had PMO in their structure and enough variety in respect of organizational context variables. It is worth mentioning that the PMO in the related organization refers to organizational entity, assigned with various responsibilities related to the centralized and coordinated management of multiple projects under its domain. Project management offices which have been examined in this study were not necessarily named as such in their related organizations. The authors specified these organizations according to the following criteria:

- 1 Being a project oriented organization.
- 2 Working in construction industry.
- 3 Having PMO as the definition above.

As PMO is a new developing entity in Iranian organizations, the total identified organizations with these mentioned properties were estimated to be nearly 50. Even if there were double project-oriented organizations active in construction industry with PMOs throughout Iran (N = 100), sample size for this research by Cochran’s formula with acceptable error rate, i.e. 0.15 and confidence level of 95% was estimated to be 30 organizations. 33 organizations have participated in the research which indicates that the sample size is sufficient to generalize the results based on the formula that was used and its parameters that are as follows:

$$n = \frac{Nz^2pq}{Nd^2 + z^2pq} = \frac{100 \times (1/96)^2 \times 0/5 \times 0/5}{100 \times 0/15^2 + (1/96)^2 \times 0/5 \times 0/5} = 30 \quad (2)$$

N	statistical population
n	sample size
P	the estimated proportion of an attribute that is present in the population
q	the estimated proportion of an attribute that is not present in the population
d	level of precision
z	desired confidence level

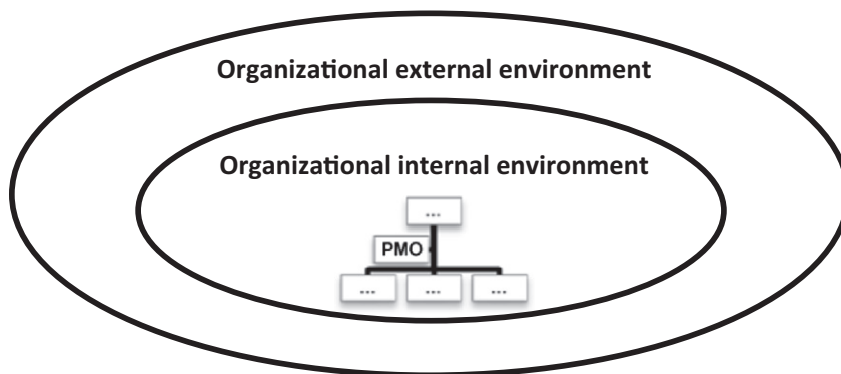


Fig. 1. Organizational context variables.

The organizations' specifications in the sample with respect to the nature of their business are as follows:

- 1 The sector in which organization works in:
27% work in public sectors, 40% work in semiprivate sectors and 34% work in private sectors.
- 2 Organizational level of working:
70% work in national level only and 30% work in both national and international levels.

- 3 The role of organization in the project:
33% have employer role, 33% have consultant role and 33% have contractor role.

2.2.2. Technique and outcome of correlation evaluation between research variables

At this stage, correlation research methods have been used. Since the choice of correlation research methods is strongly influenced by the measurement scale of variables in the

Table 3

Organizational context variables affecting project management office characteristics in Iranian construction industry.

Affective factors in internal organizational environment		
Factors related to the nature of the business (experts' opinion)	The sector that organization works in (public or private) (Aubry et al., 2010b; Hobbs and Aubry, 2008) Organizational level of working (national or international) The role of organization in the project (employer, consultant, contractor)	
Factors related to contextual organizational dimensions (Daft, 2010b)	Relation between organization strategies with PM development (Arbabi and Nazari, 2010; Aubry et al., 2010a, b; Atashfaraz et al., 2011; Daft, 2010b) Organizational size (Aubry et al., 2010a; Daft, 2010a, 2010b; Hobbs and Aubry, 2008) Organizational culture (Arbabi and Nazari, 2010; Atashfaraz et al., 2011; Aubry et al., 2010a, b; Kerzner, 2005) Level of organizational project management maturity (Atashfaraz et al., 2011; Aubry et al., 2010a, b; Hobbs and Aubry, 2008) Existence of information management systems in organization (Arbabi, 2007; Daft, 2010a, 2010b) Project management processes required by the organization (Arbabi, 2007; Atashfaraz et al., 2011) Presence of project management professionals in the organization (Arbabi, 2007; Atashfaraz et al., 2011) Recruitment and allocation of human resource policy, especially project managers (Arbabi, 2007) State of organizational projects (Arbabi, 2007)	Supportiveness of organizational senior managers Supportiveness of organizational culture Supportiveness of organizational middle managers (experts' opinion)
Factors related to structural organizational dimensions (Aubry et al., 2010a, b; Daft, 2010a, 2010b; Hobbs and Aubry, 2008)	The level of complexity of the organization Delegation of authority in the organization (Arbabi and Nazari, 2010) Project management structure in the organization (experts' opinion)	Organizational projects size (Aubry et al., 2010a) Number of simultaneous projects in the organization (experts' opinion) Geographical distribution of the organization projects (Arbabi, 2007) Type of constructional projects Number of departments in organization (horizontal complexity) The number of branches and agencies of the organization (space complexity)
Affective factors in external organizational environment (Daft, 2010b, experts' opinion)		
The organization competitive situation (Aubry et al., 2010a, b)	External competitive environment of organization	
The number and diversity of suppliers Labor force status	As contractors, sub-contractors, consultants and vendors Existence of human resources and required specialties at affordable prices	
Conditions and financial facilities Status of the organization customers (Atashfaraz et al., 2011)	Stock markets, banks and foreign investors received The number and variety of the organization customers	
Status of technology	Methods and technologies used in the project	
Status of laws	Laws imposed by the government and other regulatory to the organization	
Status of culture	Cultural status in which the organization is involved	

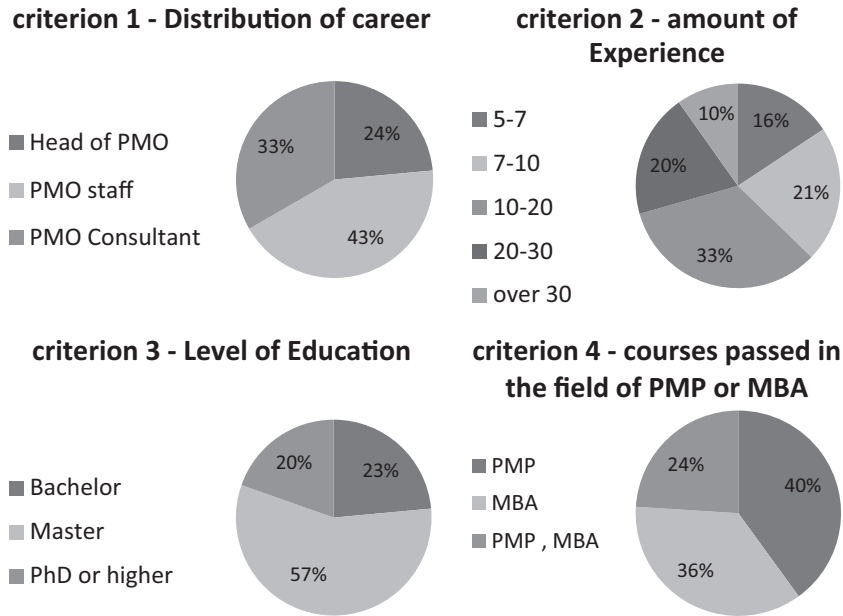


Fig. 2. Specifications of respondents in stage 1.

questionnaire, the type of measurement scales are now briefly described. Qualitative measurement scales work like quantitative measurement scales (meter, minute, cubic meters, etc.) that allow us to assess the qualitative facts more accurately. These scales are divided into the following levels (Habibpour and Safari, 2011):

1. Nominal scale: a scale that determines the classes and then people, things or events. For example gender is determined into two groups: men and women are in this scale.
2. Ordinal scale: a scale in which classes represent order or sequence. Here variables can be prioritized. That is in addition to having or not having a property, they can also be arranged in terms of the relative intensity, such as Likert scale.
3. Interval scale: a scale that has the properties of nominal and ordinal scales. Order and value of numbers have meaning. Moreover the distance between the classes is known. For example, where a person who is 23 years of age, compared to a person who is 18 year old, is 5 years older. In this scale zero does not indicate absolute zero.
4. Ratio scale: this scale is the most complete and the highest level of measurement where the values in it are in the same order and size and can be used to create ratio. True zero indicates the absence of items for measurement.

In this research since most of the questions in the questionnaire measured in ordinal level and some of them measured in nominal level Spearman correlation test has been used for ordinal variables together and Kramer’s V coefficient has been used for nominal variables together and with ordinal variables to assess the significant correlations between.

In the Spearman test, correlation coefficient is between the range of 1 and –1 indicating a linear relationship between the variables. The closer the coefficient is to 1, the stronger the correlation is, zero means no correlation positive and negative

signs indicate the direction of the correlation. In this study, the maximum acceptable error level of 0.05 with 95% confidence level was used. Since three variables in this research (role of organization in the project, the sector in which organization works in and type of constructional projects) were in nominal scale for assessing the correlations between these variables together and with other ordinal variables, Kramer’s V coefficient was used. The interpretation of this indicator, which has fluctuated between zero and one, is such as the Spearman correlation coefficient except that the direction of correlation does not have meaning. The significance level for the index is 0.05 with 95% confidence level as well.

At this stage, it was found that among 18 organizational context variables selected by experts, correlations of 10 variables with PMOs’ characteristics are not significant. These variables include:

- level of organizational project management maturity
- supportiveness of organizational culture
- supportiveness of organizational middle managers
- existence of information management systems in organization
- the role of organization in the project (employer, consultant, contractor)
- organizational level of working (national or international)
- type of constructional projects
- the sector in which organization works (public or private)
- external competitive environment of organization
- organizational size.

The fact that the mentioned organizational context variables contrary to expectations had no direct significant correlation with PMOs’ characteristics has several reasons wherein some of them are as follows:

1. The similarities of surveyed organizations in the variable: For example, the variable “level of organizational project

Table 4
Prioritizing results in terms of organizational context variables from perspective of experts.

Ranking number	Organizational context variables	Ranking number	Organizational context variables
1	Supportiveness of organizational senior managers	10	Organizational projects size
2	Level of organizational project management maturity	11	Number of simultaneous projects in the organization
3	Project management structure in the organization	12	The role of organization in the project (employer, consultant, contractor)
4	Presence of project management professionals in the organization	13	Organizational level of working (national or international)
5	Supportiveness of organizational culture	14	Type of constructional projects
6	Project management processes required by the organization	15	The sector in which organization works in (public or private)
7	Relation between organization strategies with PM development	16	External competitive environment of organization
8	Supportiveness of organizational middle managers	17	Geographical distribution of the organization projects
9	Existence of information management systems in organization	18	Organizational size

management maturity” to be named, since most of the population and the sample project management maturity have been in levels 1 and 2 no difference has been found between the characteristics of their PMOs.

- Not to address PMOs’ characteristics in detail due to the limited scope of the study: For example, variable “role of organization in the project”. Definitely if the project management offices’ functions were studied in more detailed levels we could find significant correlation with PMO’s functions.
- Existence of indirect relationship with the PMOs’ characteristics: Although some of these variables are not directly related to the project management office characteristics, they have a significant relationship with other organizational context variables. For example, the variable “Supportiveness of organizational culture” doesn’t have any significant correlation with any of the PMOs’ characteristics but it has significant correlation with “Supportiveness of organizational senior managers” and “Project management structure in the organization” that themselves have significant correlation with “Percentage of projects within the mandate of the PMO”, “Extent of its functions” and “Location of PMO within the organizational hierarchy” from PMOs’ characteristics.

In Table 5 matrix of significant correlations found between the organizational context variables and PMOs’ characteristics is shown. Fig. 3 also describes how the data in Table 5 is displayed.

3. Results and discussion

As it was mentioned, 18 variables of 29 organizational context variables were chosen as the most important for PMOs’ characteristics by the first questionnaire. Then in the next stage, the correlations of these variables with PMOs’ characteristics were measured (Table 5). In the result, it was found that 9 variables of those 18 variables have direct correlation in confidence level of 95% with PMOs’ characteristics. Knowing

these relations is important to develop Iranian PMOs’ typology and even contingency model of PMO to fit them with these kinds of organizations in which this research intends to generate in the next phase. The founded correlations are described as follows:(See Fig. 4.)

3.1. Supportiveness of organizational senior managers

Supportiveness of organizational senior managers is definitely one of the main and important success factors in developing and upgrading any system in the organization. Regarding the PMO, the supportiveness of all organizational senior managers, especially the managing director as the highest decision-making authority in the organization is very important. This variable has direct relation with the extent of project management office functions and percentage of projects within the mandate of the PMO. As it was observed in this research, in organizations in which project management offices were more supported by organizational senior managers, a suitable environment has been developed for activities of project management office which enabled it to perform more functions for greater percent of organization projects.

3.2. Project management structure in the organization

Project management structure in the organization is a very important factor which has correlation with the location of PMO within the organizational hierarchy and percentage of projects within the mandate of the PMO. As observed in this research that more projects are managed as project-based and strong matrix-based, the PMO will be located in a higher organizational hierarchy and it will mandate higher percent of projects. In such organizations, the reporting lines of PMO will be closer to the managing director, and more comprehensive reports regarding the organization projects will be reported to him. In these organizations, PMO will have a more acceptable level.

Table 5
Correlation coefficients and their error rate measurement.

Correlation analysis results		PMO characteristics					
		Extent of PMO functions	PMO age	Presence of project managers within the PMO	Experience of the staff	Diversity of staffs' specialties	
Organizational context variables	Supportiveness of organizational senior managers	0.419 0.015	0.278 0.117	0.128 0.476	0.131 0.468	0.307 0.082	
	Project management processes required by the organization	-0.116 0.519	-0.196 0.274	-0.133 0.462	-0.032 0.859	0.358 0.041	
	Presence of project management professionals in the organization	0.250 0.161	0.006 0.975	0.186 0.301	0.539 0.001	0.433 0.012	
	Size of project in terms of its duration	-0.058 0.748	0.358 0.041	0.084 0.643	0.155 0.389	-0.090 0.619	
	Geographical distribution of the organization projects	-0.102 0.572	0.058 0.747	-0.409 0.018	0.126 0.484	-0.263 0.140	
	PMO characteristics {	Location of PMO within the organizational hierarchy		Percentage of projects within the mandate of the PMO	Level of authority	Level of supportive role	Level of managerial role
		Supportiveness of organizational senior managers	0.066 0.715	0.375 0.032	-0.124 0.419	0.298 0.092	0.038 0.832
	Relation between organization strategies with PM development	0.042 0.829	0.182 0.490	-0.141 0.435	0.369 0.034	0.315 0.074	
	Size of projects in terms of number of staffs	0.308 0.081	-0.043 0.811	0.419 0.015	0.131 0.466	-0.162 0.367	
	Number of simultaneous projects in the organization	-0.361 0.039	-0.432 0.012	-0.068 0.706	-0.055 0.761	-0.122 0.498	

Non bold numbers present the level of measurement error.
 Bold numbers present correlation coefficient.
 Bold and underline numbers present significant correlations.

3.3. Presence of project management professionals in the organization

The presence of project management professionals in the organization has a direct relation with PMO staff average working experience and the variety of their specialties. It means that, if there are project management professionals in the organization, the PMO will use more experienced people (with average experience of 5 to 10 years) and more specialty varieties. It means that PMOs

tend to act professionally and use more experienced people in their team.

3.4. The extent of project management processes required by the organization

The organization's need for project management processes in terms of variety and depth has a direct relation with a variety of specialties required by PMO. The extent of PM processes

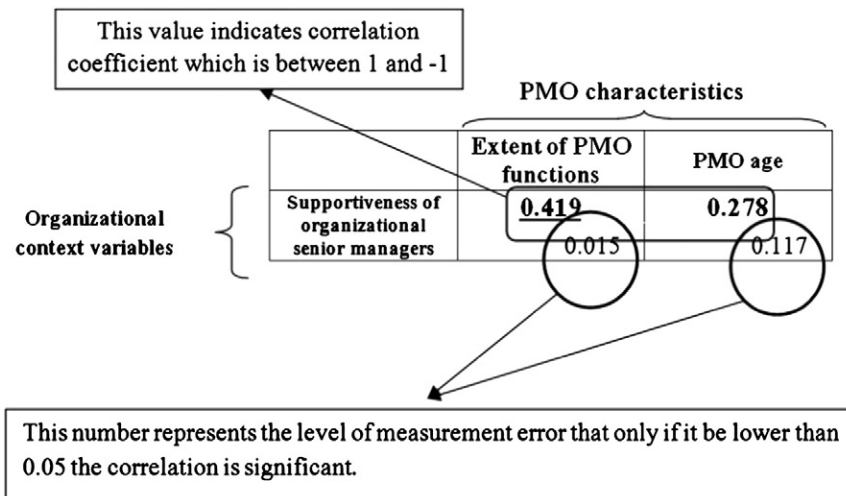


Fig. 3. Guide to Table 5.

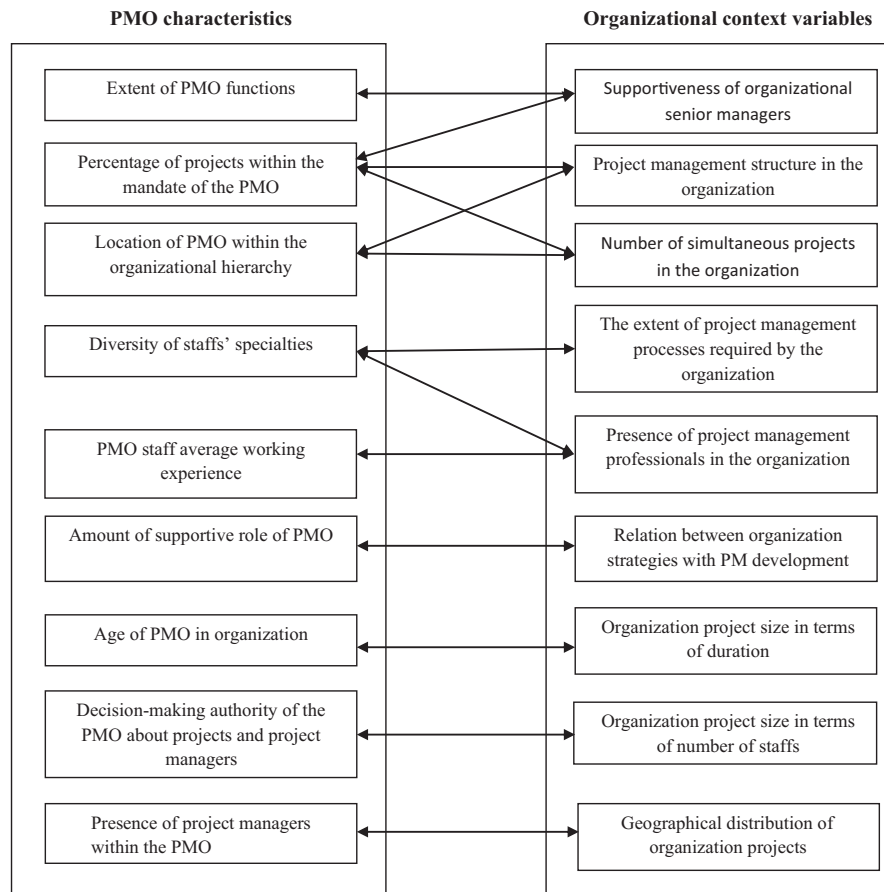


Fig. 4. Significant correlation was found between the organizational context variables and project management office characteristics.

required by organizations in this research was examined by measuring the importance of 14 knowledge areas including 10 areas of PMBOK guide and 4 areas in the construction extension to this guide, in quintuple Likert scale. There is a direct relation between an increase in the amount of organization's needs to different types of these processes and the presence of different professionals in the PMO.

3.5. Relation between organization's strategies with project management development

It was observed in organizations which have announced that the development of project management has been considered in the organization strategies and visions; the supporting role of PMO is more. It means that PMOs in such organizations have more decision-making ability. In fact, by developing strong relations between organization strategies and project management development, we can justify the necessity of developing and upgrading the PMO in the organization as well as acquiring authorities and other requirements for this department for decision-making. On the other hand, aligning the functions and capabilities of PMO, proportional to organization strategies, will clarify the results and achievements of this department.

3.6. Organization's project size in terms of duration

It was observed in this research that in organizations, in which most of the projects have a long duration (4 to 8 years), such as industrial or constructional projects with non-clear scope like underground projects, the PMO's age is more. It means that these organizations would need the PMO sooner and implement it.

3.7. Organization's project size in terms of number of staffs

In organizations in which a great number of staffs work on projects and projects are huge in this term, it is observed that the authorities of PMO regarding the projects and project managers are more and these 2 variables have positive correlation.

3.8. Number of simultaneous projects in the organization

This variable has reverse relation with the location of PMO within the organizational hierarchy and the percent of projects within the mandate of PMO. It means that in organizations which have many simultaneous projects, PMOs are distributed in lower levels of organizational hierarchy and each of them are supervising smaller percent of projects of the organization. Usually in such organizations, a PMO in a higher organizational

hierarchy level will be used for coordinating and directing the activities of PMOs in lower organization levels.

3.9. Geographical distribution of organization's projects

In general, in the statistical sample of this research, of the Iranian project-oriented organizations of the construction industry, in none of these cases, all project managers were located in the PMO. In some cases, it was observed that some project managers were PMO staff (21% of organizations). In organizations that the geographical distribution of their projects is more, the possibility of the presence of project managers in the PMO is less. It means that this variable has reverse relation with the presence of project managers in the PMO. Project managers of construction industry, are usually considered as valuable personnel for the organization, which their main work is in the project and it was observed in this industry that PMOs usually have a supporting role for project managers. The described correlations have been shown in Fig. 4.

4. Conclusion

PMOs have been accepted as an effective solution for centralized management of projects in project-oriented organizations in the world. Since these offices are a part of the organization body, their characteristics are affected by their organizations and they affect them. Thus it is expected that different organizations would have different PMOs. This research reviewed the most important organizational context variables related to PMO characteristics in order to find suitable characteristics of PMO that fit different organizations and as a result, it identified the most important organizational context variables related to PMO characteristics as supportiveness of organizational senior managers and their beliefs in project management knowledge, project management structure in the organization, presence of project management professionals in the organization, project management processes required by the organization, relation between organization's strategies with PM development, organization's project size in terms of duration and number of staffs, number of simultaneous projects in the organization and geographical distribution of organization's projects.

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