Int. J. Hum. Capital Urban Manage., 3(4): 325-334, Autumn 2018

International Journal of Human Capital in Urban Management
(IJHCUM)

Homepage: http://www.ijhcum.net/

CASE STUDY

Impact of human resources measures on organizational ambidexterity of smart city projects

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ARTICLE INFO

Article History:
Received 25 July 2018
Revised 20 August 2018
Accepted 25 September 2018

Keywords:
Ambidexterity
Exploitative Human Resource Measures
Explorative
Smart City Projects

ABSTRACT

Dealing with the tension between explorative and exploitative activities is a key issue for firms. Literature suggests that ambidexterity allows firms to manage this issue properly and provides firms with specific competitive advantages. This study was conducted aiming at investigating the impact of Human Resources measures on organizational ambidexterity in smart city projects. Method used is descriptive-survey. The statistical society of the study consisted of 460 employees of District 13 of Municipality of Tehran, out of them 210 subjects were identified as the sample volume and were selected by simple random sampling method. The tool used for measurement was a standard questionnaire whose reliability was estimated as Alpha 0.924. In order to analyze the data, descriptive and inferential statistical indicators especially structural equation modeling by Amus software, K-S test and Bartlett were used. The results of structural equation modeling showed that the explorative Human Resources have significant effect on exploration (Cr=14.533, B=0.95) of smart city projects, and exploitative Human Resources have significant effect on exploitation (Cr=12.204, B=0.81) of smart city projects In the other words, strengthening the measures of Human Resources and its various dimensions increases the ambidexterity of smart city projects.

DOI:10.22034/IJHCUM.2018.04.06

INTRODUCTION

21st century urban model is understandable by exploiting the potentials of Communication and Information Technology (IT) (Sarkar, 2015). The rapid growth of cities is not proportional to the capacity to expand their infrastructure, imposing an ever-increasing pressure on urban infrastructures. Therefore, they always suffer from undesirable consequences . The situation is more complicated in developing countries including Iran that face increasing pressure to provide more and better basic services to the growing population. Hence, cities are inherently facing the interconnected complex and widespread challenges which can only be solved through a systematic approach (Poor Ahmad *et al*., 2017). One of the new concepts to cope with the current challenges of cities in the urban planning area is the development of smart city (Ibis). The concept of "smart city" has attracted a lot of attention among the scientists and experts (Ferraris, 2018). Increase the performance of innovation is one of the properties of smart cities because the innovation and problem-solving are the main characteristic of intelligence (Khanna, 2015).

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In this regard, coping with the tensions between exploitative and explorative activities is a key issue for organizations (Ferraris, 2018). Literature shows that ambidexterity allows organizations to properly manage their projects and provide them with specific competitive advantages (Ferraris, 2014; Junni *et al*., 2013). However, it is often difficult to achieve ambidexterity, because companies do not properly manage exploration and exploitation activities and do not have the necessary resources and competencies to do so continuously (Ferraris, 2018). In such cases, ambidexterity may be more successful by development through alliance and the Human Resources Management Network (Vrontis *et al*., 2017). By focusing on innovation, ambidexterity prepares the company for new business models and new technologies (Tardivo *et al*., 2017). On the other hand, in every city, organizations should provide the tools, time and opportunities to increase the knowledge of personnel, growth of knowledge assets and application of knowledge in organizational processes (Ziyari *et al*., 2014). In order to develop the explorative and exploitative activities in the smart cities, companies need collaborate with different stakeholders in the city and support of local governments (Sandulli *et al*., 2017). The contrast of heuristic and exploitation coalitions in intelligent cities is not an easy task. In this paper, it is suggested that one of the factors contributing to empowerment in exploration and exploitation activities is HR management practices, meaning all decisions made by the company's management that affect the relationship between the company and its employees. In fact, ambidexterity requires human resource practices (Campanella *et al*., 2016). Meanwhile, despite the fact that the concept of smart city has become a very popular topic in the all scientific fields and despite widespread use of this term and attempt at explaining it, there isn't still a clear understanding and consensus among professional's and academics about the factors affecting its success. Also here it is necessary to refer to the fact that urban management in developing countries isn't desirable for various reasons. In this research, we are looking for answering the question that what effect HR measures have on ambidexterity of smart city projects?

Smart city concept

The term "smart city" and its root should be traced of smart growth movement at the end of the decade 1980s and early 1990 and of new urban planning policies. (Harrison and Donnelly, 2012). Based on the smart growth approach, development decisions affect everything from personal life to communities and nations. In order to overcome the side factors of development, intelligent growth strategies can help maintain and develop healthy, safe, comfortable and attractive urban environments (Caird , 2017). The term Smart City was used for the first time in Brisbane, Australia and Blacksburg, USA where ICT supports social participation, reducing the digital gap and accessing to services and information (Poor Ahmad *et al*., 2018). Development and commercialization of new "smart" technologies, collaboration with public partners, collaboration with other city partners and the need to invent new services for citizens make smart city projects different from projects of different classical companies and has compelled the executives of companies to review their strategies and approaches (Ferraris, 2018). Innovative internal advance systems compose the smart cities where organizational mechanisms are facilitated through digital spaces and online tools for communications and knowledge management (Khanna, 2015).

Ambidexterity concept

The word "ambidexterity" is composed of two words: Ambi (double side) and Dexterity (mastery and skill). In psychology and behavior level, people who are capable to use both hands with equal skills are called ambidexterity. Roots of ambidexterity have been confirmed as an organizational concept. Robert Duncan (1976) for the first time used ambidexterity structure as a way to describe a dual structure. Twenty years later, Tushman, and O'Reilly (1996), in an article focused on how companies can manage the evolutionary change process and revolutionary. Gibson and Birkinshaw (2004) focused on ambidexterity and in an article studied it at individual level. The organizations must simultaneously consistent to exploration and exploitation**.** Ambidexterity is defined as an organizational ability in alignment with response to market demands and at the same time adaptation to changes in the environment (Junni *et al.,* 2013). Ambidexterity organization is said to be an organization which simultaneously has the ability to focus on current responsibilities (exploration) as

well as future opportunities (exploitation). (Bolivar *et al*., 2012; quoted by Ebrahim Pour *et al.,* 2015).

Human resource measures

The concept of human resource management was introduced in the mid-eighties and was aimed at offering the strategies to manage employees and help to improve the organizational performance (Ahmad and Schroeder, 2003). Human resource management is considered as management decisions that affect the relationship between the company and the employees (Ferraris, 2018). Human Resources Management Systems reflect various investments made by the organizations for human resources, with the expectation that they will see certain behaviors of employees (*Chiang et al.,* 2011). The Ferraris *et al*., (2018) paper suggests that human resource management practices affecting ambidexterity include two types of actions; the first category that can be effective on exploratory activities are:

- The motivation for collectivism (creating collective motivation and teamwork among members through Rewards).
- Multi-skill staff (emphasis on the development of multi-skill staff through job rotation, etc.).
- Knowledge (acquisition of knowledge and learning from current jobs for future occupations).
- The second category reinforces exploratory activities, they include:
- Social Integration (a group of activities that create a collaborative and supportive culture among members of the team).
- Competency training (refers to the activities of "individual and organizational training related to current internal processes of the organization).
- Objectivity (the mechanism that brings a common view of the organization's ultimate goal between the members) (Ferraris *et al.,* 2018).

Research background

Given the growing importance of human capital in the function of organizations, evaluation and measurement of HR measures have been recently have recently taken into consideration by researchers. Researches and investigations done in this field have different approaches to the effects of HR measures. But in studying the impact of human resource practices on ambidexterity in smart city projects, significant research has not been done. Hence, studies that are more similar to the present study are mentioned. Rahimi *et al.,* (2016) explored the impact of commitment-based HR management measures on flexibility of HR and competitive advantage with modifying role of environment dynamic. The research method was descriptive survey and data was collected by using a questionnaire. The statistical society comprised of manufacturing companies of Khuzestan Province. The statistical sample included 100 large manufacturing companies of Khuzestan province, and in order to analyze the data analysis, structural equation modeling and least squares algorithm have been used. The reliability of the study was confirmed by content validity method and its stability was confirmed by using Cronbach's alpha coefficient. The results of the study showed that commitment-based Human Resource Management (HRM) practices impact on competitive advantage through flexibility of human resources. But the moderating role of environmental dynamism in the relationship between HR flexibility and competitive advantage in manufacturing companies wasn't confirmed. Ziari and colleagues (2014) examined the role of intellectual capital in increasing the efficiency of HR in educational applications. The research method is descriptive - analytical and statistical society comprised of staff and members of scientific board of Payam Noor University of Guilan (as one of the most important educational applications) and the number of samples was 112 based on group sampling. Pearson test and regression analysis were used to answer the research questions. The results show that there is a positive and significant relationship between intellectual capital and its various aspects (human capital, structural and relational) with HR efficiency. In the other words, the increasing (decreasing) the intellectual capital and its different aspects increases (decreases) the efficiency of HR of the educational facilities. Shirazi and Hosseini (2014) examined the impact of HRM practices on employee retention through job satisfaction and organizational commitment. Hypotheses of research were tested in two steps for modeling in partial least squares method by using software PLS for 72 employees of Touss Water Engineering Consultancy in Mashhad through simple random sampling by using questionnaire tool. The feasibility of the research was confirmed by content

validity and its stability was confirmed by using Cronbach's alpha coefficient. The results of the research showed that HRM measures have an impact on employee retention through organizational commitment, but the mediator role of job satisfaction was not confirmed. Also, in each of the studied activities, attraction, training and performance evaluation, with the exception of redress through job satisfaction and organizational commitment, had a significant effect on employee retention. Ferraris *et al.*, (2018) examined the impact of HR on exploration and exploitation activities in smart city projects. In this paper, the authors used the explorative and qualitative approach based on multiple case studies through interviewing 21 managers of active companies of smart city. The results show that HR practices (scholarship, collectivist motivation, and multi-skill staff) have an impact on exploratory activities, and HR practices (social integrity, skill training, and targeting) are effective on exploitative activities. Vivares, Castro and Valencia (2016) examined the impact of HRM on performance in the competitive priorities of mid-sized and large companies in Colombia. The results showed that there is a significant relationship between HRM and performance in competitive priorities. With regard to the factors related to employees, they found that when companies involve personal characteristics (motivations, personal goals, abilities, etc.) in the strategic decision of operation, better performance can be seen in competitive priorities. Also, when they achieve a higher level of job satisfaction and performance, performance will improve in competitive priorities. Dominguez and Martin Santana (2016) conducted a study entitled "Human resources management and performance in the hotel industry: the role of commitment and satisfaction of managers and supervisors". Their results showed that the commitment-based HR practices had a positive and significant effect on the commitment and satisfaction of both groups. The commitment and satisfaction of managers don't lead to improved organizational performance. However, the commitment and satisfaction of supervisors lead to better economic outcomes. *Zhang et al.* (2016) investigated the impact of HRM and entrepreneurship tendency on performance, as well as the mediator role of ambidexterity. The results showed that the interaction between human resource management and entrepreneurial tendency facilitates the innovation ambidexterity process and innovation ambidexterity mediates the relationship between efficiency-based HRM and entrepreneurial tendency and performance. Lu and Zhu (2015) investigated the impact of commitment-based HRM on the company's performance with innovation as a mediator in China. The results show that the effects of high-performance HRM on company performance are significant. In addition, innovation plays the role of a partial mediator between them. Training, job analysis and employee participation are not significant. In general, it can be said that HR practices can be effective in building social relationships among employees and increasing opportunities, motivation and ability to access knowledge. HR systems are effective in coping with the challenges they face. In addition, according to Medcof and Song (2013), HR practices are properly coordinated and collaborated with exploration or exploitation paradigms. In general, studies show the relationship between HR practices and positive results for the organization. A brief overview of literature shows that exploration and exploitation management has been studied repeatedly in previous studies (Levi *et al.*, 2010), but there is no significant specified research on smart cities (Ferraris, 2018). After explaining each of the variables in the conceptual model and literature review, at this stage we tried to illustrate the mentioned relationships in a conceptual model. In sum, according to the mentioned materials, the present research intends to investigate the impact of HR measures on ambidexterity projects of smart cities in the form of a model. It is believed that the above mentioned variables can play an important role in increasing the competitive advantage of the company. This research has been carried out in Tehran- Iran in 2018. The basis of this research sample is the result of the research Performed by Ferraris (2018). Accordingly, the conceptual model is showed in Fig. 1.

According to the conceptual model of research, the hypotheses are presented as follows:

Hypothesis 1: HR practices toward exploration have an impact on to explorative activities of smart city projects.

Hypothesis 2: HR practices toward exploitation activities impact the smart city projects.

This study has been carried out in District 13 of Municipality of Tehran in fall 2018.

MATERIALS AND METHODS

Since this research looks for analyzing one or more hypothetical propositions about the cause-and-effect relationships between the two or more variables and testing these relationships, it is one of the quantitative studies that are applied in term of purpose and can be considered as survey (analytical) investigations. In order to analyze the data, two methods of descriptive and inferential statistics (structural equation sample) was used by Amus Software. The statistical population of the present study is composed of 460 employees of the municipality of district 13 of Tehran out of them 210 subjects were determined as sample volume according to Morgan table. Sampling method used in this research was simple random sampling due to access to the members list. Library studies and field studies have been used to collect the required data. The tool used in this study was standard questionnaire based on Ferraris's (2018). In the first stage, the questioner was made available to the experts in order to examine the validity of the questionnaire. Their opinions including a qualitative assessment of the validity of the content, the compliance with grammar, using the right words, etc. were enforced as partial changes to the questionnaire. In the second stage, feasibility study was used to assess the content validity in the view of experts regarding the degree of coordination of the content of the instrument and the purpose of the research. So the questionnaire was given to 6 specialists and experts and they were asked to respond helpfully and usefully to any of the 28 question tools. Answers were calculated based on the formula CVR and adapted with the table. Numbers more than 0. 99 were accepted. After feasibility evaluation, the internal consistency method (Cranach's Alpha coefficient) was used to assess the reliability of the research tool. In the present study, after pilot study in a sample of 20 subjects and returning the questionnaires, collected data was entered in software Spss 21 and their Cronbach alphas were calculated. In addition to reliability of Cronbach alpha, reliability of measurement samples was also evaluated by using confirmatory factor analysis. According to Table 1 , the amount of factor loads is higher than 0.4, which indicates that all of the items have been correctly loaded and have good correlation with the relevant variables and eventually shows the significance and approval of sample. The source of each indicator, load factor and alpha are given in Table 1.

RESULTS AND DISCUSSION

The results of the survey show that female respondents were 9.2 % (19 people) and male respondents were 90.8 % (188 people) of the sample. Accordingly, the majority of the members are men. The results indicate that among the respondent people, 7.7 percent (n = 16) were between 20-30 years of age,47.3 percent (98) were between 30-40 years old, 30.4 percent (63) were between 40-50 years old and 14.5 percent (30 persons) were over 50 years of age. The results of the study show that among the

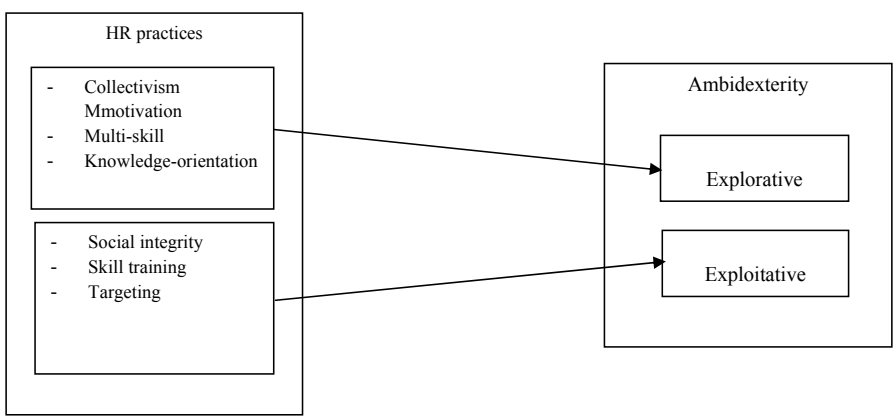

Fig. 1. Conceptual model of research based on research by Ferraris (2018)

Table 1. Relationship between variables and questionnaire questions

Variable	Indicator	Factor load	Critical ratio	Source	Cronbach's alpha
HR practices toward exploration	Knowledge-orientation	0.895			
	Multilevel staff	0.916	20.854		0.918
	The motivation of collectivism	0.928	21.544		
HR measures toward exploitation	Goal-oriented	0.855			
	Skill training	0.881	23.943		0.955
	Social integration	0.862	17.170		
Exploration activities	Question 19	0.808		Ferraris (2018)	
	Question 20	0.799	13.243		
	Question 21	0.842	14.278		0.941
	Question 22	0.849	14.440		
	Question 23	0.818	13.691		
Exploitation activities	Question 24	0.796			
	Question 25	0.829	15.394		
	Question 26	0.819	15.160		0.910
	Question 27	0.840	15.674		
	Question 28	0.854	16.011		

Table 2. Normality of variables (Kolmogorov- Smirnov test)

Variable	Human resources measures for exploration	Human resources measures for exploitation	Exploratory activities	exploitation activities
Kolmogorov - Smirnov statistics	0.634	1.038	0.905	0.930
The significance level	0.742	0.321	0.441	0.450
Test result	Normal	Normal	Normal	Normal

respondents, 6.8%(n=14) had diploma, 6.3%(n=13) had associate degree, 67.6%(n=140) had bachelor degree, 17.9%(n=37) had master degree and 1.4%(n=3) had doctoral degree. Therefore, the majority of members had moderate academic education. The results of the survey show that among respondents, 66.7 % (n=138) are married and 33.3 % (n=69) are single. Accordingly, the majority of the members are married.

Investigation of normality of variables (Kolmogorov - smirnov test)

In order to analyze the data and choose the type of the related tests, we must first study the normality of variables. Because if variables are normal, we will allow to use both parametric and non-parametric tests. But if variables aren't normal, we only will be allowed to make use of nonparametric tests. Kolmogorov - Smirnov (KS) test will be used to examine the normality of the variables (Table 2).

Based on the results of Kolmogrov - Smirnov test, the significance level of the test for research variables is greater than 0.05, so the distribution of variables is normal.

Structural Equation Modeling Method (SEM)

To study the hypotheses, Structural equation modeling was used. The following hypothesis test is performed to determine the significance of path coefficients. If the obtained coefficient is related to path coefficients greater than +1.96, this means that the test statistic is in the rejection domain of the zero assumption and, therefore, the zero assumption of no effect is rejected and it can be accepted that the obtained path coefficient is meaningful. In SEM modeling, a cluster of indicators are introduced. The status of fitness indicators for the conceptual model of research is presented in Table 3. The fitness situation of the present research model regarding the data obtained from the results of Amus software is as Table 3.

As shown in the table, all fitness model indicators are in a good status. For example, the significance level of the chi-square model is more than 5 percent, indicating that the experimental data adequately support the conceptual model of the research. Also, the root mean square error estimate is less than 10 % and this index confirms the fitness of the model.

Table 3. Model fitness indices

Indicator	AGFI	GFI	CFI	NFI	TLI	IFI	PCFI	PNFI	PRATIO	RMSEA
Recommended criteria	0.9 <	0.9 <	0.9 <	0.9 <	0.9 <	0.9 <	0.5 <	0.5 <	0.5 <	0.08>
Structural model	0.948	0.936	0.946	0.932	0.901	0.947	0.634	0.622	0.850	0.072

Table 4. Results of hypothesis test

Relationship	Standard coefficient	Critical ratio CR	Significance level	Result of hypothesis
Human resources actions to explore toward exploratory activities	0.000	14.533	0.95	Not rejecting the hypothesis
Human resources actions to exploit exploitation activities	0.000	12.204	0.81	Not rejecting the hypothesis

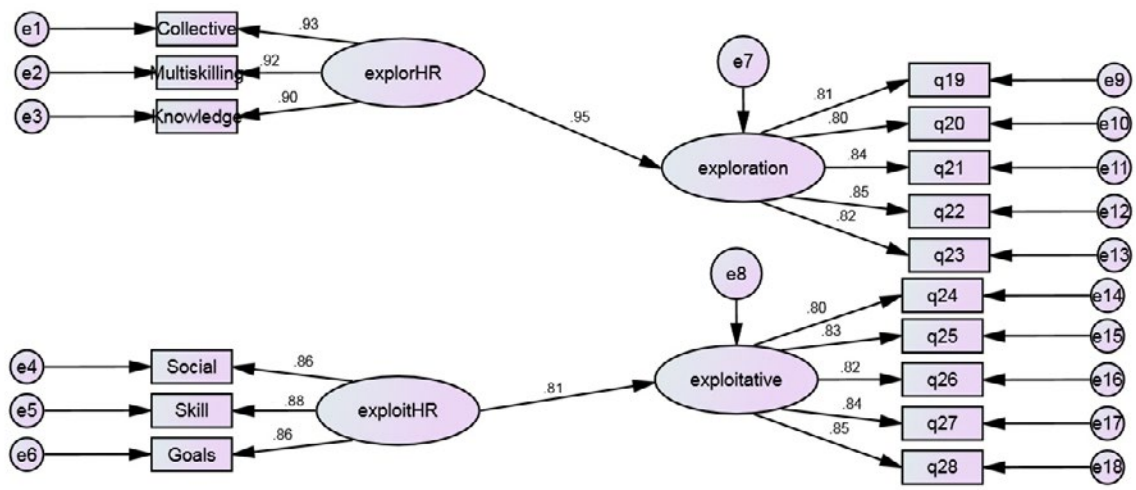

Fig. 2. Conceptual model of research along with factor load

Acceptability of other model's indices is also seen in software outputs. In order to test the hypotheses of research, the structural equations (SEM) modeling was used through application of the maximum likelihood method Amos software, which covariance matrix was criterion in all stages of analysis. Fig. 2, shows the structural relationships of the research model.

Table 4 illustrates the impact of HRM measures on exploration of exploratory activities and the impact of HRM measures on exploitation activities. As can be seen, the path coefficient for HR measures toward exploration on explorative activities is 0.95 and the critical ratio is 14.533 which is statistically significant (greater than 1.96) is significant and path coefficient of human resource practices toward exploitation activities equals to 0.95 and the critical ratio is 14.533 , which is statistically significant.

CONCLUSION

Today, urban planners around the world try to develop the models for development of the 21st century cities through seamlessly insight at all aspects of urbanization in order to meet the demands and new expectations of today world. In other words, the necessity and the requirements of these challenges have prompted many cities in the world to find smarter ways to manage those (Pourahmad *et al*., 2017). The aim of this study was to examine the impact of human resource practices on ambidexterity in smart city projects. Results of first hypothesis showed that HRM measures for exploration including collective motivation, multidisciplinary staff

and knowledge-orientation have a direct and strong impact on the success of exploratory activities. Based on these results, it can be deduced that when there is collectivism motivation among project team members and existence and development of multi-level employees are emphasized, there is also a tendency to knowledge and learning for future occupations in the organization. It can be expected that explorative activities including upgrading the relationships with potential innovators, updating and exchanging ideas, and building a flexible structure for the culture of sharing knowledge between members within the organization will be shaped. In this regard, among the studies more similar to the present study, the study by Rahimi *et al*., (2016); Ziarai *et al.,* (2016); Shirazi and Hosseini (2014); Dominguez and Martin Santana, (2016); Zhang *et al*., (2016); Lu and Zu (2015) also show the positive outcomes of human resource measures. But in particular, the above hypothesis was investigated in the Ferraris (2018), which results confirm that the results of the research are consistent with the results of this study. According to our findings, need to pay serious attention to the issue of HR measures in operation of organization's activities appears more than ever. To achieve this, it is necessary to shift from traditional human resource management to strategic human resource management in all organizations involved in the urban integrated management. The second hypothesis test showed that HR actions toward exploitation have a direct and strong impact on exploitation activities. Based on this result, it can be said that measures for social integration, including the category of activities that create cooperative and supportive culture among the members of the team, training of skills for individual and organizational activities related to the internal processes of the organization as well as targeting which includes the mechanism for creating a shared vision of the organization's ultimate goal between members leads to the exploitation of available opportunity. These measures can stimulate employees to establish strong social relationships together, creating key relationships between employees and key partners that ensure the effectiveness of project development, creating formal mechanisms for sharing knowledge internally and externally and emphasizing on developing common goals and values to facilitate organizational consistency and coordination among different parties. So it is recommended that the municipality of cities take some steps toward HR training and manage it well because it is human resources today HR is considered as an important indicator the growth and development of cities and regions both in term of nature and in terms of increasing importance.

In order to strengthen human resources for exploration activities, the following strategies are suggested:

- Performance evaluation and rewarding employees based on collective motivation
- Emphasis on training in different fields of technology and different job fields for employees
- Stimulating and motivating employees to learn from new jobs for use in future projects
- Adopting a strategic plan to identify the opportunities and threats in urban management system.

In order to strengthen human resources for the exploitation activities, the following recommendations are suggested:

- Emplacing on internal and external coordination between employees to create social relationships
- Creating a common view of organizational goals for members
- Having a systematic approach to it and analyzing the data derived from the measurement of employee performance and comparing it with the performance standards
- Using teamwork and collaborative structures and the use of technology proportional to the needs and budget and allocating more time on research and development

In other research, problems and constraints are encountered by the researcher. In the current research, the researcher has encountered some limitations, which are referred in the following:

- The studied variables cannot explain all the changes in organizational ambidexterity, meaning that there are other factors that affect the ambidexterity of intelligent city projects, but because of the limiting factors of the research, it was not possible to examine all these variables and effective factors. This could provide an opportunity for further research by other researcher.
- Since the research was conducted in the municipality of Tehran's district 13, it would not be possible to generalize the results to other statistical

societies and it should be done with caution and sufficient knowledge if societies are to be generalized. Therefore, it is recommended that this study be implemented in other communities and its results should be compared with the results of this study.

- The time limitation of research and the short duration of sampling are among the limitations of any academic research that reduces the accuracy of the study, and the present study will not be except. Therefore, it is suggested that the research be carried out in a longitudinal fashion.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the managers in District 13 of Municipality of Tehran for their cooperation and support.

CONFLICT OF INTREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. In addition, the ethical issues; including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy have been completely observed by the authors.

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HOW TO CITE THIS ARTICLE

Torbatjoo, S.R., (2018). Impact of human resources measures on organizational ambidexterity of smart city projects. Int. J. Hum. Capital Urban Manage., 3(4): 325-334.

DOI: 10.22034/IJHCUM.2018.04.06

url: http://www.ijhcum.net/article_34046.html