

Identifying and Prioritizing Critical Success Factors (CSFs) in Retaining and Developing Knowledge Workers in Oil and Gas Project-based Companies

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Abstract

Background/Objectives: Voluntary turnover and early retirement request by specialists and experienced people in Project-Based Organizations (PBO) has caused many problems in finding suitable experts to execute the projects. **Methods/Statistical Analysis:** The present study is a descriptive and applied research. Research population consists of KWs in oil and gas PBO. The engineers in these organizations were considered as research sample. Interviews and questionnaire were used to gather information. Interviews with experts were used to identify factors and questionnaires were utilized to identify the importance and prioritization. 72 factors were identified and categorized into 9 groups within organizational and HR initiative levels. **Results:** Results of the research indicates the priority of each group of factors according to the proposed model in the view of KWs in oil, gas and petrochemical industries. On this basis, the following factors have the highest effect ratio based on the respondents' point of view: 1. Knowledge management 2. Performance appraisal system 3. Communication 4. Training and development 5. Job design and analysis 6. Employment policies 7. Career planning 8. Project/organizational factors 9. Salary and rewards. Additionally, in each group the priority of effective sub-factors has been identified as the result of the research. The results support the definitions of KWs and influence of factors examined and specified by similar studies in retention and development of KWs. The high importance of knowledge management and low rank for salary and rewards can be mentioned as example in this regard. Despite the priority of each group of factors the uniqueness of the result is due to identification of effective factors in the specific industry (oil and gas) and type of organization (PBO). **Conclusion/Application:** The findings of present study can be used to devise plans for retaining and developing KWs in PBO especially in oil and gas industry.

Keywords: HR Management, Knowledge Workers, Project-Based Organizations, Retaining and Developing Employees, Turnover

1. Introduction

Rapid changes in business environments and the need for more specialization, has made specialized knowledge not only a competitive advantage but also a necessity¹. Additionally, increasing professionalism in different jobs has led to expansion of PBO as one of the forms of contemporary organizations. Temporary nature of jobs in these organizations, which is a direct consequence

of the temporary nature of projects, has caused explicit differences between traditional functional organizations and these ones². The basis of PBO is on professionalism and KWs³. Although nowadays, all organizations and jobs require certain level of knowledge for their operations, the necessity of retaining KWs in these organizations is not only for giving them competitive advantage, it is critical for their survival⁴. Despite different definitions of KWs, all of them include creativity,

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dissemination and theoretical/analytical application of knowledge⁵.

Key factor in managing the projects at PBO is the existence of a certain level of specialized knowledge among KWs so that the competition is shaped on this basis and, for the same reason, attracting and retaining KWs is seen as a strategic factor⁶. Those organizations are successful in competition that outperform in attracting and retaining expert people and can make their performance effective in terms of delivering their products and services⁷. However, explicit differences among PBO and non-project organizations, on the one hand, and explicit differences among KWs and others on the other, has made their retaining in organizations complicated⁸. Temporary nature of jobs in PBO plays a vital role in accelerating turnover especially by KWs upon ending the projects⁹. Additionally, explicit differences between motivational factors for retaining KWs (authority, main priorities, nature of job, etc.) and other workers have made ineffective common methods in retaining human resources¹⁰. Turnover of KWs who are the main pillars of PBO as well as uncertainties and conflicts in the ways of retaining them have led to awareness of the necessity of the critical factors in retaining such workers in this type of organizations¹¹.

2. Problem Description

Lack of plans on retaining and developing active KWs in oil, gas and petrochemical PBO and losing these workers have caused that active organizations in these industries accept annual costs of training and employing alternatives¹². Besides, concerning their investments on grooming and training specialized forces and holding training courses in high levels of oil industry losing each employee would lead into human capital reduction and lack of extracting the costs to train them¹³.

3. Literature

3.1 Knowledge Workers

The term “knowledge worker” refers to those people who have knowledge and are powerful resource for owner of such knowledge¹⁴. In fact, one can consider KWs as individuals responsible for knowledge works¹⁵. Knowledge work can be defined as mental activity which involves knowledge creation and analysis¹⁶. In his book *Management Challenges for 21st Century* (1999), Peter Drucker notes the importance of KWs’ productivity and the guidelines to

increase it. He says that KWs are not subordinates; rather, they are associates¹⁷. KWs know about their job more than their boss. In fact, a part of KWs’ definition is that they have more information on their jobs than anyone else in the organization¹⁸. Tom Davenport has defined KWs as people whose initial aims are to create, disseminate and use knowledge¹⁹. Drucker believes that another trait of KWs is their high rate of turnover²⁰. He says that KWs can leave organizations easily and they possess what they produce²¹. Additionally, concerning what motivates them, he challenges Hertzberg’s theory of health-motivational factors in his book *the motivation to Work* (1959) and believes that money is not an important factor in KWs’ motivation; rather, they need to be aware of organizational mission, to believe it and to learn continuously²².

3.2 Knowledge – Intensive and PBO

Gareis (1990, 2005) asserts that PBO are those ones that their members:

1. Define management by projects as organizational strategy.
2. Use projects and plans to conduct mixed processes.
3. Manage a project portfolio of different internal and external projects.
4. Have permanent structures such as portfolio group or project management office to provide integrated functions.
5. See organization a project-oriented one²³.

One may say that in a simple definition, project-based organizations are those ones that put the project as the basis of their operations to achieve organizational goals. Based on Project Management Body of Knowledge Guide (PMBOK), project is defined as:

Project is temporary effort to produce a product, service or single result.

On this basis, project characteristics include (ibid: 5 –7):

1. Temporary nature.
2. Singularity of product, service or result.
3. Progressive elaboration, that is, projects are usually begun by simple and uncomplicated steps and then their complexity is gradually added which would yield into its progress²⁴.

A PBO is usually a flat organization (structurally) with powerful project management. In fact, what defines a

PBO is that such organizations consider themselves as project-oriented and devise their policies and operations for organizational culture and the strategy particularly in the project management area²⁵. PBO may be found in many industries especially governmental ones. In terms of their propensity to project, these organizations are varied and it depends on such factors as size, quantity and types of their conducted projects²⁶. These factors impact on the relationship between Stable Line Organization and Temporary Organizations used in PBO by which PBO are shaped²⁷. An organization may select that project propensity (project orientation) is a proper manner of its job (i.e. building companies), or for a part of their organizational units (i.e. development units in manufacturing companies and or organizational development unit in Municipality)²⁸.

3.3 Effective Factors in Retention and Development of KWs

In organizational studies, knowledge has become a sensitive issue and current studies have focused on organizational knowledge, knowledge organizations and KWs. Governments, universities, consultants and industrialists have stated that knowledge management is necessary in new environment²⁹. Rich (1991) points that companies are increasingly depended on KWs since they compete through know-how. It indicates that companies should take account of KWs in their efforts to obtain primary resources in order to achieve competitive advantage³⁰.

Different factors influence the retaining and developing KWs in organizations, which based on current literature, cover a wide range of factors from retaining and developing KWs in urban areas to their role in macro developmental models and organizational environment. In Table 1 below, factors which are important for retaining and developing KWs are shown by reviewing similar studies in this regard. These factors are categorized in 9 groups: compensation and benefits, employment policies, career planning, training and development, communications, Job design and analysis, organizational/project factors, performance appraisal system and knowledge management. These factors have shaped the basis for designing questions in deep interviews with experts and relevant questionnaire³¹.

3.4 Research Background

Research by Lee and Maurer on “The retention of KWs with the unfolding model of voluntary turnover” describes

the reasons of voluntary turnover process for KWs which cannot be explained by traditional turnover models, based on unfolding model of voluntary turnover which has been developed by Lee and Mitchell²⁹. In addition, it provides a solution for each identified type of KWs’ turnover. Four moods are recognized for turnover of KWs as three types of engineers (KWs) and guidelines are provided in five standard activities of HR management: Staffing, compensation, training and development, employee relations and career planning. Four matrixes have been presented for each type of KWs’ turnover³⁰.

Smith and Rupp in their study “communications and loyalty among KWs: a resource of the firm theory view,” studied the importance of communications and loyalty by resource-oriented view on organization. KWs are introduced as a competitive advantage, and loyalty and effective relations are introduced to retain them³¹. Personal and verbal relations are necessary to build trust and loyalty to develop sustainable competitive advantage. Due to technological progresses and excessive trust on technology, verbal and face-to-face communications, called “human moments,” are mitigating and it has resulted in wrong conception among people, which would affect both the individual and the organization in the long term³².

In their study titled “attracting, motivating and retaining KWs”, Horwitz, Heng and Quazi (2003) addressed the same issue. Undoubtedly, this study and another research in 2006 (explained below) are, in comparison with similar studies, the most detailed studies on the retention of KWs. In addition to, their motivation and attraction which studies three categories of HR strategies in knowledge oriented companies in Singapore³³. These categories include: the common strategies, the most efficient strategies and strategies with lowest efficiency. On this basis, this research diagnoses the most efficient and inefficient HR strategies in attracting, retaining and motivating KWs²⁷. These factors are mentioned in the section concerning factors affecting KWs retention and development. In their study titled “HR strategies for KWs management: an African – Asian comparative study”, Horwitz, Heng and Quazi (2003) addressed the issue with a cultural approach. This research uses culture fit to determine HR strategies to manage KWs in two African and Asian countries which are socially and culturally different: South Africa and Singapore. National culture of South Africa is more diverse in terms of value⁹. The environment of economic companies including their structure, unique ownership, organizational size and type of industry are

Table 1. Effective Factors in Retention and Development of KWs^{4,9,11,16,22,24,28}

Indicator	Source
Job flexible hours and flexible location (teleworking), autonomous	(Kennel, 2000; Belton, 1985; Donnelly, 2006)
The possibility to develop skills constantly	(Donnelly, 2006)
Improving work – life balance	(Donnelly, 2006)
Dependency to managers/clients	(Donnelly, 2006)
Organizational culture/internal work culture	(Horwitz et al, 2003, 2006)
Organizational structure	(Horwitz et al, 2003)
Control levels in organization	(Horwitz et al, 2003)
Work quality and group quality	(Horwitz et al, 2003)
Challenging work	(Horwitz et al, 2003; Thompson and Heron, 2002)
Work culture which disseminates autonomy and independence in decision making	(Horwitz et al, 2003; Thompson and Heron, 2002)
Encourage goals achievement and development of objective-orientation	(Horwitz et al, 2003; Thompson and Heron, 2002)
Sharing the results and achievements	(Horwitz et al, 2003; Thompson and Heron, 2002)
Effective communications and communicative networks	(Horwitz et al, 2003; Thompson and Heron, 2002)
Respecting people by their level of expertise	(Horwitz et al, 2003; Thompson and Heron, 2002)
Employing empowered staff and resources (as other members of the team)	(Robertson and Hemersly, 2000; Ulrich, 1998; Alosen, 2000; Thompson and Heron, 2002)
Proper job design/redesign	(Thompson and Heron, 2002)
Awarding knowledge sharing	Thompson & Heron, 2002; Hensen, 1999; Kigan, 1998; Robertson & Hemersly, 2002, Kelley et al, 2007
Performance – based financial award	(Horwitz et al, 2003; Cubu and Saka, 2002, Kerrer, 2002, Stol and Bents, 2002)
Access to modern technology	Kinnier & Saterland, 2000; Thompson & Heron, 2002
Challenging workplace	(Horwitz, 2003; Kapelli, 2001)
Top management supports	(Horwitz et al, 2003; Thompson & Heron, 2002; Barron and Henan, 2002)
Organizational traits such as size, business nature, foreign/local ownership	(Horwitz et al, 2003, 2006)
Contribution in decision making process	(Horwitz et al, 2003, 2006)
The feeling of pleasure and informality in workplace	(Horwitz et al, 2003, 2006)
Allowing the expression and execution new ideas	(Kelley et al, 2007)
Shared vision and alignment of personal and organizational vision.	(Kelley et al, 2007)
Team learning	(Kelley et al, 2007)
Team working and increasing team working as a member of a team.	(Kelley et al, 2007)
Stability and alignment of KWs' subjective models.	(Kelley et al, 2007)
Systemic thinking on organization, conceiving the organization as system with high cohesion	(Kelley et al, 2007)
Performance appraisal system capable to recognize and measure intangible deliverables.	(Kelley et al, 2007)
Devising and clarifying code of knowledge in organizational levels (divisions, subdivisions) which includes KWs' roles	(Kelley et al, 2007)
Compensation policies based on team results	(Kelley et al, 2007)
Periodical and non-annual awards	(Kelley et al, 2007)
Job security and no fear of losing the job	(Cubu and Saka, 2002)
internal promotion (with negative effect)	(Cubu and Saka, 2002)
Job turnover (with negative effect)	(Cubu and Saka, 2002)

more effective in Singapore than South Africa in terms of human resources. It also addresses the important role of cultural factors in setting strategies to attract, retain and motivate KWs. It concludes that strategies for motivating and retaining KWs are convergent in both countries whereas KWs attraction is divergent. In fact, it indicates that attracting, motivating and retaining KWs are highly dependent on national and organizational culture factors^{34,35}.

4. Research Hypotheses/ Questions

Since the study looked for identifying affecting factors on retaining and developing this group of employees in project – oriented organizations through reviewing the literature and exploratory interviews with elites, it had no hypotheses and instead of it, three main questions were raised to draw research framework:

1. What are general and key affecting factors on retaining and developing KWs in project – oriented organizations in oil, gas and petrochemical industries?
2. How are their priorities?

In answering these questions by reviewing current literature and exploratory interviews, research conceptual model (Figure 1) was proposed. Affecting factors gathered by reviewing the texts and interviews were categorized in 9 groups within organizational/project and HR initiatives levels. Each group has a unique title. These factors constitute a basis to identify and prioritize key factors. Freedman nonparametric test is used to deter-

mine the priority and importance rations concerning the distribution of factors.

5. Methodology

The present study is a descriptive and applied research since it considers retaining and developing KWs. It attempts to respond to the needs of organizations to retain and develop such employees by using the contextual knowledge obtained through previous basic research.

In the present study, interviews and questionnaire were used to gather information. Interviews were used to identify factors that affect retaining and developing KWs as well as understanding the opinions of managers and senior experts in oil, gas and petrochemical industries. To this end, 15 managers and senior expert in oil, gas and petrochemical industries that were mainly working in surveyed (project-oriented) organizations and had key positions in projects were selected for interviews. The affecting factors have been identified via content analysis method. However, since some mentioned factors already existed in literature, only those factors not mentioned in similar studies, or those that were local were added to indicators and factors which constitute the basis of conceptual model and questionnaire. Questionnaires were utilized to identify the importance and prioritization of affecting factors on retaining and developing KWs in oil, gas and petrochemical project-oriented organizations. Utilized questionnaire in present paper is Likert-type to identify and prioritize affecting Critical success factors. The questionnaire consists of 9 parts and each part addresses mentioned factors in proposed conceptual model and subset factors according to Table 1. Totally, the questionnaire studies the importance of each factor in the view of KWs in surveyed organization as research sample through 72 questions.

Research population consists of KWs in oil, gas and petrochemical project-oriented organizations. Since current definitions on KWs involve a wide range of employees with different specialties and there is a consensus in literature on the fact that engineers are seen as the distinguished example of KWs, the engineers in oil, gas and petrochemical project-oriented organizations were considered as research sample. The sample possessed the attributes of the population and KWs' traits as well as project-oriented organizations are fully respected in selected sample.

All selected organizations enjoy the attributes of project-oriented organizations and they were well-known

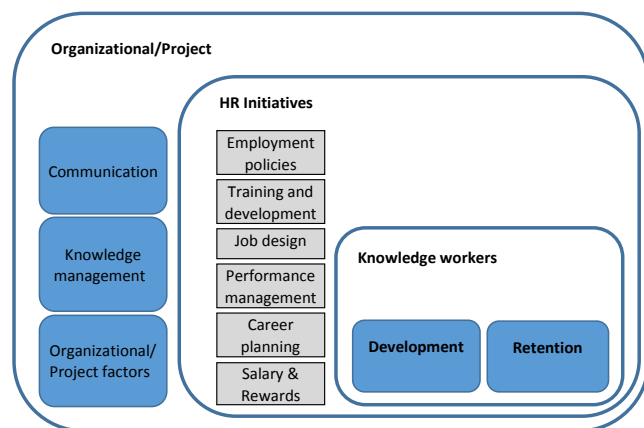


Figure 1. Research conceptual model.

companies in oil gas and petrochemical industries. By using the relevant formulation, 225 subjects were selected as research population and 300 questionnaires were distributed among managers and engineers. In total, 225 were returned and analyzed. SPSS software package was used to analyze data while Excel software package was utilized to draw the graphs.

6. Findings

To study the validity of proposed framework, Cronbach's alpha value for each factor is shown in Table 2. Computed alpha value by SPSS was 0.96 for all questions while for main factors, it was greater than the minimum of 0.7. On this basis, one can assert that the questionnaire enjoys sufficient validity. It means that responses were not by chance, but that they were due to tested changing effects. This is so, because all analyzed questionnaires were identically measured, and respondents had the same perceptions.

6.1 Studying Step 1: General Effective Factors in Retaining and Developing KWs

Table 3 and 4 and Figure 2 indicate descriptive general effective factors in retaining and developing by 9 determined groups in terms of their importance on average. In terms of significance level less than 0.05 in this table, there is a significant difference between the averages of affecting factors on retaining and developing KWs in active project-oriented organizations in oil, gas and petrochemical industries. According to Table 5, knowledge management has the highest importance ratio in the view

Table 2. Cronbach's alpha value by factors

Affecting factors	Cronbach's alpha value
Salary and Rewards	0.8861
Employment policies	0.7043
Career planning	0.8561
Training and development	0.8674
Communication	0.8015
Job designing and analysis	0.8618
Organizational/project factors	0.8728
Performance appraisal system	0.8693
Knowledge management	0.8552

Table 3. The results of Freedman test average ranks to prioritize affecting factors on retaining and developing KWs

Affecting factors on retaining and developing KWs in oil, gas and petrochemical industries	Average rank
Salary and rewards	4.04
Employment policies	4.56
Career planning	4.47
Training and development	5.39
Communication	5.44
Job designing and analysis	5.16
Organizational/project factors	4.11
Performance appraisal system	5.74
Knowledge management	6.09

Table 4. Freedman test analytical results

Quantity	225
Chi2	133/320
DF	8
Sig	0.000

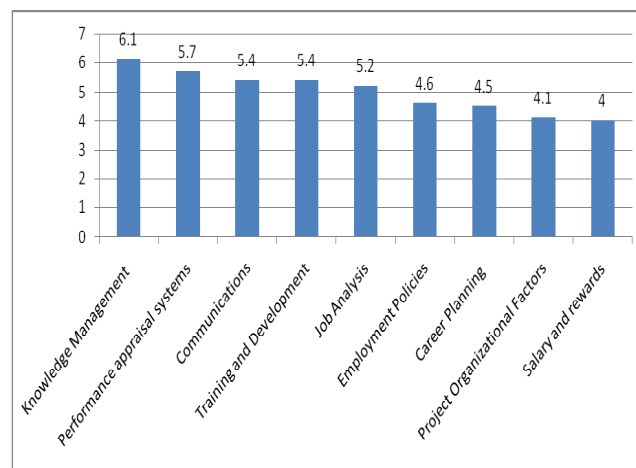


Figure 2. General factors of retaining and developing KWs.

of respondents followed by performance appraisal system, communication, training and development, job design and analysis, employment policies, career planning, organizational/project factors and, finally, compensation and benefit as the affecting factors on retaining and developing KWs in active project-oriented organizations in oil, gas and petrochemical industries.

Table 5. Key effective factors in retaining KWs (organizational level)

Level	General factor	Key factors	Priority by average	Average rank
Organization/Projects	Knowledge management	Senior management attitudes toward employee as organizational asset	First	2.81
		Utilizing modern knowledge	Second	2.57
		Establishing knowledge management system	Third	2.51
	Communication	senior Management's support	First	6.59
		Respect and value people	Second	6.19
		Having Competent immediate supervisors and other managers	Third	6.15
	Organization/ project factors	Organization brand or project title in terms of reputation	First	12.95
		Empirical and scientific value of projects	Second	12.93
		Accessibly to modern technology	Third	12.20

6.2 Studying Step 2: Key Effective Factors in Retaining and Developing KWs

In this step, effective factors in retaining and developing KWs by considering research framework have been evaluated with more precise sub-factors in each group (based on identified factors in Table 1) to find the impact and its priority compared to other factors in project/organizational levels and HR initiatives. Based on significance level among relevant factors in 9 groups in organizational and HR initiatives less which is less than 0.05, we conclude that there is a significant difference between the average ranks of factors. The results of Freedman test are shown in Tables 5, 6 and 7.

7. Conclusion, Discussion and Recommendations

A review of results indicates that the priority of each group in the view of KWs in oil, gas and petrochemical industries. On this basis, the following factors have the highest effect ratio based on the respondents' point of view:

- 1) Knowledge management
- 2) Performance appraisal system
- 3) Communication
- 4) Training and development
- 5) Job design and analysis
- 6) Employment policies
- 7) Career planning
- 8) Project/organizational factors
- 9) Salary and rewards

By analyzing the results, based on above definitions of KWs and the importance of knowledge in their job as well as the results of similar studies, knowledge management has the highest priority and it confirms the role of knowledge in KWs' views.

In describing why performance appraisal system has the second rank, it is concluded that in KWs' views, it is highly important to have a system in the organization which distinguishes desired performance from undesired ones, and provides relevant responses to foster desired performance and to amend undesired performance. The existence of measurement criteria based on team working and relevant factors related to the nature of the projects are too important in this regard. Another key factor in retaining and developing KWs is communication. The Role and importance of the way that KWs communicate with other employees in different levels of organization and the quality of communication between immediate project supervisor/manager and KWs have the high importance in this regard. It seems that the importance of this factor is ignored in similar studies or it is not seen as an effective and independent factor while results indicate that it play a vital role in retaining KWs. The need for training and development of KWs which is mentioned in the literature as the most important characteristic of KWs equals in rank with communication. There is a consensus in literature among most authors on KWs sensitivity to increase in specialized knowledge level; and the results clarify it well. As results show, due to project orientation of surveyed organizations, tendency to opt for short term training courses is more obvious.

Table 6. Key affecting factors in retaining KWs (HR actions level)

Level	General factor	Key factors	Priority by average	Average rank
HR initiatives	Performance appraisal system	Project based performance appraisal system	First	1.55
		Result Orientation	Second	1.45
	Training and development	Team learning and using current professional experiences in organization/project	First	2.61
		Existence of training opportunities and financial aids to participate in short term training courses on projects	Second	2.58
		The possibility of constant training and development through on the job training during career	Third	2.45
	Job designing and analysis	Delegation in the field of expertise	First	4.64
		Direct involvement in projects at specialized field	First	4.64
		Job description by professional standards	Second	4.06
		Team working improvement in Job design	Third	

Table 7. Key affecting factors in retaining KWs (HR actions level)

Level	General factor	Key factors	Priority by average	Average rank
HR initiatives	Employment policies	Job security	First	3.57
		Attracting capable employees team members	Second	3.50
		Transparent employment policies	Third	2.95
	Career planning	The possibility to achieve managerial positions in organization/project	First	5.36
		Career planning based on technical Knowledge progress and know-how level	Second	5.35
		Consider Personal goals in Career planning	Third	4.92
	Salary and rewards	Paying awards by innovation in projects	First	9.25
		Sharing Knowledge works in Financial out of projects	Second	8.63
		Paying salary or award based on technical leering	Third	8.43

Other critical success factors in retaining and developing KWs include:

- Job design and analysis
- Employment policies
- Career planning
- Organizational/project factors
- Salary and rewards

Although their ranking differences of these factors are ignorable, but the results can be interpreted as follows. About the importance of career planning from KWs point of view, whereas most of respondents are in the career level complied with their specialized and technical capabilities in the projects the career planning did not acquired the high rank of importance. Another analysis can be related to the technical seniority advancement system exists

in the oil and gas career ladders especially for projects. Concerning project/organizational factors, and contrary to similar studies, what can be mentioned is the lower importance of such factors compared to others. Describing such result needs more studies to determine its importance in retaining and developing KWs. In describing the rank of salary and rewards, this finding confirms the conclusion reached by other researches that financial impetus is not so important in retaining and developing KWs, however this factor should be investigated as a separated factor in determining its role in the processes of retaining and developing KWs. This finding confirms Drucker's⁵ definition on KWs. Last but not least, due to increasing need of oil, gas and petrochemical industries to attract expert workforces and to retain, develop and enhance the quality of these workforces, and owing to the fact that a remarkable part of organizations in oil, gas and petrochemical industries (both public and private) are project-oriented organizations, below recommendations are provided:

1. The findings of present study can be used to devise plans for retaining and developing KWs in project-oriented organizations.
2. Paying attention to critical success factors in retaining and developing KWs and current differences in programs for retaining and developing them compared to other forces.
3. The importance of the project and need to pay more attention to this new and growing template especially in the oil and gas organizations creates more possibilities for using the findings of this research.
4. Project-oriented organizations should pay more attention to knowledge management as the most important factor in retaining and developing KWs, given that senior management's approach on KWs as organizations' assets plays a vital role in retaining and developing them.
5. The necessity of performance management and appraisal system in general and for project-oriented organizations in particular should be considered for all employees.
6. The role of communication in retaining KWs particularly their need to have more authority and be more autonomous in their field of expertise should be considered in managing them.
7. Although salary and rewards are not a high priority in retaining KWs, organizations should recognize it as an effective factor for retaining KWs. They should also consider the necessity of standardizing payments to KWs at regional and international levels.

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