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Impact of the cognitive learning factors on sustainable organizational development

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ABSTRACT

Background: Organizational cognition is a system and process aims at the improvement of organizational learning and development. It subsumes attention, leadership, culture, structure, empowerment, knowledge workers and decision-making and problem-solving processes.
Objective: The focus of this study is to assess the impact of the cognitive learning factors on sustainable Organizational development.
Methodology: Data was collected from 22 universities in Pakistan and 137 faculty members participated in the survey. Cross-sectional quantitative technique based on survey and convenient sampling was adopted for data collection. SPSS was used for data analysis.
Results: The results indicate significant impact of the cognitive factors on the Organizational development in the learning organizations like universities. Among all, knowledge workers and empowerment was found more significant as compared to other cognitive elements.
Recommendation: The study recommends further exploration of other cognitive and contextual elements for boosting learning and development.

1. Introduction

Organizational cognition is a complete system, an umbrella term, made of many related and co-related entities and objects. Some of them are core elements having direct and consistent relation with organizational learning and some are supporting elements and have different impacts and contribution to the organizational learning, development and effectiveness. They can be conceptualized in much broader and less mechanistic terms upon which knowledge and action are grounded (Marshall, 2007). Organizational cognitive theory sate that as opposed to human cognition, which is natural, organizational cognition is artificial made of technology, social networks and culture, structure and design, its elements and workers. Organizational cognition is a discipline which has its foundations based on multidisciplinary research areas that span from social sciences, economics, business administration, management, sociology, political science, anthropology, philosophy, psychology, information systems, cognitive sciences and computer sciences. Although, the researchers have not yet developed a consoladated definition of the organizational cognition but the research findings and theories of the organizational cognition state that, organizational cognition is a complete system, having consern with collective learning in the organization, focus on the detection and correction of organizational threats and problems (Alhabeeb and Rowley, 2017; Atwood et al., 2010; Belle, 2016). It is a discipline which contributes to improve the computational capacity of the organization along with its ability for knowledge and uncertainty management. Organizational cognition is a process or a set of processes that subsume attention, knowledge organization, decision-making and problem-solving. These processes are supported by organizational goals, environmental demands, threats and opportunities (Moon et al., 2017; Gino and Staats, 2015). It has been found that the most influencing cognitive factors of cognitive prospective are knowledge workers, leadership style and role, employees empowerment, organizational culture, organizational structure, organizational strategy, performance measurement system, training and development (Alalwan et al., 2016; Adcock, 2012; Coetzer et al., 2017). Therefore, the researchers have recommended that the role and impact of the theses cognitive factors should explored for the organizational learning development in various sectors. This empirical study is focussed on studying

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the impact of cognitive factors on sustainable organizational development in academia and universities by collecting and analysing the primary data from 22 universities in Pakistan.

2. Theory

2.1. Knowledge workers impacts on organizational development

Knowledge workers are named as a change agent in organizational cognition theory. Knowledge workers are considered as a backbone, capital and asset of any organization (Attwell, 2010). Knowledge workers remain motivated, agile, and strive to move towards self-actualization (Adcock, 2012). Presence of knowledge worker keeps the working environment charged emotionally and motivationally (Birmingham, 2015). Big companies around the world spend bigger portion of their budget on knowledge workers development and more on their retentions (Belle, 2016). They know the flow and order of organizational working, mechanism, norms, culture, values, nerve, target, assets and objective of the organizations therefore learning in organizations always remain at priority due their presence (XiaomiAn and Wang, 2010). If these worker leaves, it badly deteriorates organizational learning processes. Cultural cognitivism also called workers as a primary element of innate learning (Csikszentmihalyi, 2015).

Cognitive dissonance theory explains that knowledge at individual and organizational level is challenged, explored and exploited with accommodation and assimilation processes by the knowledge workers by introducing acceptable new behaviours (Adcock, 2012). Similarly, Human Capital Theory, Public Service Motivation Theory, General economic theory of production and Ducker's knowledge-worker productivity theory state and support knowledge worker as the asset, mind, soul and heart of the organization (Wong, 2012; Adcock, 2012).

2.2. Leadership impacts on organizational development

According to trait and organizational cognition theory, one aspect and ability of the leadership is cognitive domain and ability (Mumford et al., 2016; Dicle and Okan, 2015). Certain cognitive skills are a critical determinant of leader performance for problem definition, cause/goal analysis, constraint analysis, planning, forecasting, creative thinking, idea evaluation, wisdom, and sense-making/visioning (Mumford et al., 2017). Firm leadership in soul workers, provide new directions, new philosophy, new enthusiasm and new resolution to the follower (workers) and to make them ready to face all the expected and unexpected challenges (Cartwright, 2002). Supportive leadership promotes and encourages learning, create collaborative and facilitative environments inside the organization and create lesions with external environment (Atwood et al., 2010). Leaders provide fuel to induced learning. Leadership style also effect learning and transformational leadership style has been found the best one to promote learning among workers. It gives empowerment, decision making power and will, which promote intrinsic and practical learning skills in workers (Hsiao and Chang, 2011). Effective leadership style form cohesiveness, coherence and team work among workers and become familiar and open to one another and share their tacit and explicit knowledge (Kurland et al., 2010).

2.3. Employee's empowerment impacts on organizational development

Empowerment means awarding legal powers to perform certain decisions and work within the limit of certain organization and boundaries. Empowerment has been referred to as a practice, a set of strategies, a process, a goal, a product, a feeling, a capacity, a life force, a reflective activity, a potentially unifying approach to practice, and the central task of the profession (Ravangard et al., 2014). Empowerment comes through trust and involvement. It creates citizenship behaviour in workers, helps in retention of knowledge workers, promotes their decision power and involvement, gives moral, social, psychological, ethical and financial support to the workers (Bandura, 2002). It is a major source of cognitive, behavioural and psychological empowerment through organizational learning by provoking awareness to in workers regarding organizational aims and objectives and developing their competencies. It empowers workers, and involve them in organizational experiences, practices, functions and decision-making process, which create confidence, trust, mutuality and learning among workers (Rahimian et al., 2014).

Interpretive model explains empowerment as a core cognitive element and force, which enforces the worker and organization to think deeply, alter the situation and find out the solution for the problem (Thomas and Velthouse, 1990). Ahadi (2011) described empowerment as a method of social work, which get meaning and promotion from the oppressed Afro-Americans. Many researchers proposed empowerment as a way of improving the welfare services by means of mediating social institutions (Ahadi, 2011; Danish et al., 2015; Gino and Staats, 2015). Moreover, different researchers also worked on the concept theoretically and presented it as a world-view that includes a social policy and an approach to the solution of social problems stemming from powerlessness (Alsabbagh and Khalil, 2016; Jahmurataj, 2015).

2.4. Organizational culture impact on organizational development

Cultural cognitivism theory suggests that individual is the primary focus of control, power and learning in any organization. High performance requires a significant culture shift within an organization. It is primarily about culture and people, not the data and technology which promote coherence and learning in organization (Tomasello, 2010; Thakker and Durrant, 2011). Culture is the sum of shared vision, assumption, values, beliefs and norm, which govern organizational policies and people (Bandura, 2002). It is a kind of shared understanding, defined as a learned way of perceiving, thinking and feeling about problems that is transmitted to members in the organization (Dicle and Okan, 2015). Some organizational cultures are structured and controlled, governing employee behaviour through rules and standard operating procedures. Other cultures are characterized by creativity and individuality, encouraging high levels of risk taking (Gino and Staats, 2015).

Culture develops citizenship behaviour, and social and psychological safety among workers, which further encourage creativity, builds strategies for actions and reactions and all these promote learning, productivity and effectiveness (Bernstein, 2012). Many organizations believe in organizational learning culture (OLC) development to promote learning by in-depth acquisition, interpretation and distribution of tacit and explicit knowledge in a systematic and coherent way (Mehrabi et al., 2013). This helps in reusing the knowledge acquired through experience by other existing or previous organizational entities. “Living-learning environment” is another concept getting popularity to support and promote organizational learning in work environment and academia (Bandura, 2002). In today's’ technology era, organizational culture and strategies are shifted on the paperless modes, which has enhanced and harmonized organizational culture (Jahmurataj, 2015). Different research studies show inconsistencies among the findings regarding the impact of the culture on organizational learning and culture didn't prove itself as good moderator and mediator for organizational learning (Danish et al., 2015; Martin, 2014).

2.5. Organizational structure impact on organizational development

Structure means composition, design, hierarchy and every organization has some structure and composition. It is defined as formal system of task and authority relationships that controls how people cooperate and use resources to achieve organizations' goals (Martin, 2014). Typically, it is the hierarchical arrangement of lines of authorities, communications, rights and duties of an organization. Structure depends on the organization's objectives and strategy. In a centralized structure, the top layer of management has most of the decision-making power and rights and has

tight control over departments and divisions. In a decentralized structure, the decision-making power is distributed and the departments and divisions may have different degrees of independence Learning in organization varies and greatly depends upon its structure and design (Dicle and Okan, 2015). Organic structure with less formalization and centralization provides enthusiastic opportunities for organizational learning. It integrates knowledge from different pieces and parts, modularized them combine them in processes and forward it to the target groups and they learn from them, update the knowledge (Tran and Tian, 2013). Research also shows that modularization and decentralization in organization also promote learning among their employees. Less formal structure with democratic values promotes organizational learning and learning varies with the change in structure and form (Martínez-León and Martínez-García, 2011).Mechanistic structure has mixed results towards organizational learning and knowledge accumulation. Social structure cognitive theory, Computational organizational theory and new-institutional theory proclaims that structure plays fundamental role in organizational social and cognitive development (Ahadi, 2011).

2.6. Organizational strategy impact on organizational development

Organizational strategy is the collections of policies, guidelines, procedure for attaining organizational goals and objectives. It guides, train and educate organizational workers about the methods and techniques used to achieve organizational goals (Hotho et al., 2015). It plays vital role in developing learning organizations, by providing a complete map and model of working, keep the work force focused, therefore chance of error remains low and workers modify their pattern of work against the standard manuals, formats and model provided by organization (Moon et al., 2017). Strategic Cognition (SC) is a cognitive process of scanning, formulating, sense-making, decision making and implementing policies and play role in the cognitive construction of the organization (Kazmi and Naaranoja, 2015). Strategic policies include various modules for learning to produce better and efficiently, like training and development, field visits, seminars, webinar which pushes workers to learn more (Crossan and Berdrow, 2011).

Continuous process and quality improvement, meeting the changing demands and targets of the customers or organization, change in delivery methods and contents keeps the worker engage in new learning, and some time it may demand for strategic change and for survival and competition all the constraints are accepted and implemented (Morais--Storz and Nguyen, 2017). Strategy is not a one-spot information intensive mechanism. Due to the changing requirement of the external world, organization should keep changing its strategy, which need continuous information gathering and processing and these all are possible through continuous organizational learning (Pietrzak and Paliszkiewicz, 2013). Some-times strategy is based on assumptions, which proves false later therefore it needs continuous refinement and learning, social cognitive theory explains that strategy influence worker's learning and behaviour (Tang et al., 2016). Therefore, the workers unconsciously equate their learning and knowledge with standard operating procedures of the organization. This process adds to the individual, team and organizational capacities, performance and productivity (Saadat and Saadat, 2016). Strategies for learning in every kind of organization need the moderating and mediating support of leadership, culture, technologies and structure (Goodyear et al., 2014). However, some of the case-studies negate the direct and consistent relation between organizational learning and strategy (Hotho et al., 2015). Since, most of the activities carried out in organizations are directly or indirectly linked to the strategic goals of the organizations, it is important to have a learning aspect in the strategy. This will make it easier for the workers and system as whole to implement the learning related tasks. Moreover, learning of strategy in itself is important aspect where organizations learn from their past or existing strategies by evaluating the outcomes and adjust their goals or activities to achieve the goals depending upon changes in the external environment. Therefore, strategy may have a very strong link with organizational learning and development and is a topic for further exploration.

After carefully analysing various research studies on the core cognitive element for the Organizational development, we summed up the following conceptual model and research hypotheses as mentioned in Fig. 1.

2.6.1. Research hypotheses

H1. There is a positive relation the role of knowledge worker on Organizational development.

H2. There is a positive relation the empowerment on Organizational development.

H3. There is a positive relation the Leadership on Organizational development.

H4. There is a positive relation the organizational Structure on Organizational development.

H5. There is a positive relation the organizational Strategy on Organizational development.

H6. There is a positive relation the Culture on Organizational development.

3. Methodology

This study is based on the primary data collected through self-administered questionnaire from the teaching faculty and general management from 22 Higher Education Commission (HEC) recognized institutions/universities operating in Rawalpindi and Islamabad region of Pakistan. Questionnaire was adopted from the previous studies (see Appendix). The aim of the study was to explore the impact of cognitive elements on the Organizational development. Convenient sampling (non-probability) technique was adopted for the present study which is common practice in the survey research and social sciences and also recommended by (Angelis, 2016; Moon et al., 2017). As all the faculty members and employees of the universities were qualifying the criteria to be included and assessed, therefore, convenient sampling technique was adopted. Total of 137 questionnaires were collected from faculty members and administrators. A standardized questionnaire has been used to get desire data about all the main variables of the study/research. For each variable at least 4 items were included and their reliability was checked before proceedings for the final data collection. The questionnaire is based on a five-point Likert scale starting from 1 representing "Strongly disagree" to 5 with "Strongly agree" option.

1-Strongly disagree ⟶ 5-Strongly agree

The questionnaire is composed of two parts. Section first covers the

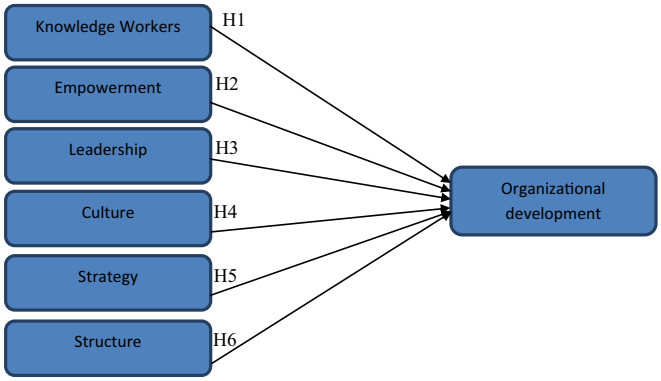

Fig. 1. Conceptual model for the study.

demographic and personal characteristics of the population containing 6 questions and the second part contained questions about independent and dependent variables (see Appendix).

The study was approved by the faculty of Industrial Management, University Malaysia Pahang, Malaysia.

4. Results & discussion

4.1. Reliability analysis

In current study, analysing reliability means calculating a construct ability to produce consistent results. Internal consistency analysis was done separately for the variables corresponding to each of the seven constructs. Overall and item-wise reliability was calculated for the questionnaire before proceeding for the final data collection. Overall reliability has been given in Table 1 and item-wise reliability has been given in Table 2.

Table 2 shows the values of Cronbach's coefficient, mean and variance, if we delete one item, then the overall value of Cronbach's alpha becomes .924 compared to .933 and it means that variables and questions selected in this research is a reliable measure and it should be considered in future research work. Item was reliability for the organizational learning development (OLD) was 0.893, Empowerment was 0.924, organizational structure was 0.845, organizational structure was 0.869, and organizational culture 0.847 and knowledge worker 0.912 was attained. All the above variables have Cronbach's values in significant range, therefore, the questionnaire and their items were found reliable enough to proceed for data collection. In addition, the findings of the previous studies conducted have different results and had shown lower reliability for the items (Alsabbagh and Khalil, 2016; Crossan and Berdrow, 2011).

4.2. Descriptive statistics

Descriptive statistics deals with the concepts and methods concerned with summarization and explanation of the important aspects of the statistical data. This area of the study consists of the summarizing of data, their graphical displays and the calculation of a few statistical quantities that provide information about the centre of the data i.e. mean and indicate the spread of the observed data i.e. dispersion.

The mean values of the Table 3 are near to maximum values, i.e. mean and median of the constructs, which indicates that the items were having greater impacts on organizational learning and development. The responses showed that organizational cognitive factors were accepted and accommodated by the respondents and perceived that empowerment (3.4564), leadership (3.4834), organizational culture (3.1125), organizational structure (3.1125) organizational strategy (3.2318) and knowledge workers (3.3219) have Vitol role in organizational learning and development. And the values of the standard deviation are very low, which means that cognitive factors have greater impacts on the Organizational development and play their role in Organizational development.

Table 4 shows the relationship between dependent and independent variables. There are 137 respondents that shows, independent variables organizational strategy (r = .561) and culture (r = 0.486) and knowledge workers (r = 0.317) have moderately significant relationship with Organizational development. Moreover, leadership (r = 0.753), organizational structure (r = 0. 763) and organizational structure (r = 0.773) are strongly correlated to the organizational development. The correlation table show the significance relationship among the elements of the intelligence and exhibit that each independent variable has significant relationship with the dependent variable i.e. Organizational development.

Table 1
Reliability statistics all constructs.

Cronbach's Alpha	N of Items
.933	58

Table 2
Item-total statistics.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
OLD	11.347	2.834	.771	.893
Empowerment	10.2246	3.225	.675	.924
Org: structure	10.3967	2.739	.874	.845
Org: Strategy	10.3498	2.819	.807	.869
Org: Culture	11.0183	2.211	.811	.847
Knowledge Worker	9.0118	2.3251	.718	.912
Leadership	10.4239	2.3551	.791	.872

Table 3
Descriptive statistics of the questionnaire.

	Number of respondents	Minimum	Maximum	Mean	Std. deviation
Organizational Development	137	1.83	4.75	3.6246	.57089
Empowerment	137	1.33	4.50	3.4564	.62495
Leadership	137	1.77	4.71	3.4834	.63340
Org: Culture	137	1.42	4.44	3.1125	.34891
Organizational Structure	137	1.47	4.38	3.1902	.3482
Org: Strategy	137	1.55	4.17	3.2318	.7109
Knowledge worker	137	1.73	4.15	3.3219	.6739
Total	137				

4.3. Regression analysis

The values of R, R Square, and adjusted R indicate that the model is best fit for the study and can be used to measure organizational development with the predictors of cognitive organizational learning factors (see Table 5).

Table 6 shows the fitness of the model. Residual sum of square is 14.749 which show the unexplained deviation of dependent variable i.e. organizational development from its estimate. The F-statistics is 74.355 at .000 sig level which is less than the cut-off of 0.05 (Rahimian et al., 2014; Dicle and Okan, 2015). This shows significant relationship between the independent variables and dependent variable. The significance value shows that the model is fit for this study.

From the Table 7, it is observed that all the independent variables have higher significant values and all of them are less than the value (.05), which means that the relation is direct and significant (Adcock, 2012; Cartwright, 2002). All the independent variables have significant impact on the dependent variable i.e. organizational development. Summary of hypothesis testing is given in Table 8 below.

5. Discussion

The purpose of the study was to check the impact of the cognitive factors on Organizational development. Different theories were cited to support the stances made in literature. Results show considerable significant impact of the cognitive element on the Organizational development. Knowledge workers and organizational structure were the main contributors, based on the data and results to the Organizational development. Moreover, all the factors are found to be real contributors towards the organizational development. A positive impact of knowledge worker is noticed on Organizational development which is quite obvious as the knowledge worker works as a main carrier of knowledge and not only grows it by learning from experiences but also effectively and efficiently transfers it to other knowledge workers. Hence, improving others'

Table 4
Pearson correlation between variables.

	OD	E	L	S	OS	C	KW
Organizational Development **(OD)**	1						
Empowerment **(E)**	.753**	1					
Leadership **(L)**	.317**	.773**	1				
Structure **(S)**	.415**	.600**	.763**	1			
Organization Strategy **(OS)**	.761**	.567**	.317**	.561**	1		
Culture **(C)**	.753**	.561**	.416**	.731**	.486**	1	
Knowledge Worker **(KW)**	.347**	.317**	.761**	.317**	.561**	.317**	1

N = 137.
** P < 0.001.

Table 5
Regression model summary.[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.821[b]	.673	.665	.37785

[a] Organizational development.
[b] Predictors: (Constant), Empowerment, leadership, Org: Structure, Org: Strategy, Org: culture, Knowledge Workers.

Table 6
Regression ANOVA.[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	30.184	3	10.061	74.355	.000[b]
	Residual	14.749	109	.135		
	Total	44.934	112			

[a] Dependent Variable: Organizational development.
[b] Predictors: (Constant), Empowerment, leadership, Org: Structure, Org: Strategy, Org: culture, Knowledge Workers.

Table 7
Coefficients of regression.[a]

Model		Un-standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.503	.230	.013	2.185	.031
	Empowerment	.093	.086	.084	1.080	.003
	Leadership	.345	.085	.371	4.077	.000
	Org: Structure	.441	.012	.324	2.341	.000
	Org: Culture	.412	.118	.314	3.416	.002
	Knowledge Workers	.091	.132	.361	4.015	.000
	Org: Strategy	.117	.178	.331	3.412	.001

[a] Dependent Variable: Organizational development.

knowledge and learning as well. Same has been reported by the previous studies as well (Alhabeeb and Rowley, 2017). Similarly, empowering the workers can also have a significant positive impact on Organizational development. Same has been reported previously by (Mumford et al., 2017). This is due to the fact that when employees or workers are empowered by giving them more authority over their work processes it encourages creativity which is the core aspect of learning and development. Moreover, empowerment is also done through engaging workers in the decision making process which increases the sense of ownership and improves work dedication. Hence, employees are motivated to creatively improve their learning and introduce innovative methods in their work, which also results in organizational development.

Good leadership is another factors that proved to have a positive impact on Organizational development and this has been reported by many studies previously (Danish et al., 2015). Leaders set example for the whole organization and lead the team towards learning and organizational development. They introduce the activities through their learning and experience and use their leadership abilities to influence the workers towards learning and improvement in work processes which results in effectives and efficiency and ultimately in organizational development. Though some previous studies (Jahmurataj, 2015) found that there is no or very low impact of organizational structure on organizational development our results show that there is a significant impact of organizational structure on organizational development which is also supported by (Gumora and Arsenio, 2002). Our results proved that organizational strategy have a significant impact on Organizational development, this has been previously noticed by (Gino and Staats, 2015). Having an aspect of learning in strategy can have significant impact on the organizational development as in current era due to the rapid changes in the external environment e.g. due to technology requires organizations to continuously learn and update their knowledge to compete successfully. Therefore, strategy can play a major role in the organizational learning and development by enabling and guiding the overall activities of the organization towards development. Organization culture proved to be another important factor in organizational development. Culture of creativity, openness towards sharing knowledge, openness towards outside world and external factors etc. all play a very important role in organizational development. These factors enable workers to acquire new knowledge and openly share it with their co-workers and plays a vital role in organizational learning and development. This result is supported by different previous studies like (Jahmurataj, 2015).

Table 8
Comparison with the previous studies.

S. No	Hypothesis	Accepted/ Rejected	Literature Support
H1	There is a positive relation the role of knowledge worker on Organizational development.	Accepted	(Alhabeeb and Rowley, 2017)
H2	There is a positive relation the empowerment on Organizational development.	Accepted	(Mumford et al., 2017)
H3	There is a positive relation the Leadership on Organizational development.	Accepted	(Danish et al., 2015)
H4	There is a positive relation the organizational Structure on Organizational development.	Accepted	(Gumora and Arsenio, 2002)
H5	There is a positive relation the organizational Strategy on Organizational development.	Accepted	(Gino and Staats, 2015)
H6	There is a positive relation the Culture on Organizational development.	Accepted	(Jahmurataj, 2015)

6. Conclusion

Organizational cognitive learning elements have greater impact on the Organizational development. Therefore, the leadership of the learning organizations like universities should develop an organizational

culture, structure and strategy which should support learning and boost the confidence level of knowledge workers by empowering them for the new achievements and innovation (Alsabbagh and Khalil, 2016; Angelis, 2016). All leadership styles, even dictatorship leadership style also believe in the development of organizational culture and structure and do their best to foster knowledge and expertise and skills in knowledge workers (Alsabbagh and Khalil, 2016). Similarly, organizational culture produce citizenship behaviours among workers and ameliorate workers to burn their mind and blood for the organizational development (Angelis, 2016). Moreover, organizational strategies main focus always remains on the organizational development, and the organizational leaders plan to adopt futuristic policy for fostering learning and experiences for organizational development (Goodyear et al., 2014). Furthermore, humanistic and flexible organizational structure empowers their workers to learn which have direct impact on organizational learning and development (Ahadi, 2011; Martínez-León and Martínez-García, 2011). The study under considerations explore that organizational cognitive factors, which are different in degree and mechanism to the human cognitive factors, needs more attentions for the organizational learning and development. For future recommendations, more contextual elements, behavioural and social elements and aspects of organizational learning should be explored. Moreover, leadership styles best fit in various situation needs to be explored for the organizational learning and development. Furthermore, the role of virtual organizational structure needs the focus of the researchers, that how they can be best used for organizational learning and development. The learning organizations are also supposed to develop a mechanism which can help their worker to preserve tacit and explicit knowledge and utilise it in the organizational context when needed.

Declarations

Author contribution statement

Jamshid Ali Turi: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Shahryar Sorooshian: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Yasir Javed: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

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