Original Article

Impact of organizational structure on management innovation in public sector universities of Pakistan

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Abstract

The paper analyses the effect of two components of organizational structure (formalization and centralization) on management innovation. The research uses the theoretical framework of dual-core theory of innovation. For this purpose, the data is collected with the help of questionnaire from 190 academics of public sector universities in Peshawar, Pakistan by using convenient sampling technique. The analysis is done with the help of structural equation modeling and hierarchical regression analysis. The findings show that the centralization in organizational structure enhances management innovation. They also indicate that formalization has a significantly positive impact on management innovation. The implication of the results refer that a tighter and well-directed control from 'above' can lead to efficient utilization of resources which results in innovation.

Keyword: Organizatioanl structure; centralization; formalization; management innovation, public sector universities, paksitan

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Introduction

Lately, organizations have become more competitive due to globalization and technological development. To cope with the changing market needs of the competitive environment, firms must bring innovation in management style besides technological innovation. This type of innovation relies on bring newness in technologies to have market share (Hamel, 2006). The literature provides insights about the role of organizational structure in innovation with inconsistent results (e.g. Vaccaro et al., 2012). Nevertheless, the potential of the topic still has not been sufficiently exhausted and it remains under researched till date. For instance, Crossan and Apaydin (2010) documented that a total of 524 articles published on organizational innovation in top management journals over the period 1981–2008, only three of them were about management innovation while majority of the

manuscripts addressed technological innovation (Cardinal, 2001; Prajogo and McDermott, 2014).

The current study investigates the impact of organizational structure on management innovation in public sector universities of Pakistan. Most of the existing literature on this topic was carried out in other markets such as the USA, the UK etc. (Birkinshaw et al., 2008) and it leave a wide space to carry out further research emerging country like Pakistan (Palyvoda, Karpenko, Bondarenko, Bonyar, & Bikfalvi, 2019; Duong, & Swierczek, 2019). The findings of a recent study (Iranmanesh, Kumar, Foroughi, Mavi, & Min, 2020) shows that organizational performance is based on the structure of the organization. The study recommended further research to investigate that innovation can be used to enhance organizational performance. A similar study conducted on teachers showed that there is a transformational leadership which builds an organizational structure creating innovation (Waruwu, Asbari, Purwanto, Nugroho, Fikri, Fauji, & Dewi, 2020). In an educational institute both teachers and students do not only learn but they also tend to innovate. In the educational institute students get knowledge of new things which lead to innovation and generation of ideas. On the basis of this rationale this study hypothesizes that organizational structure would have different relationship with management innovation in public sector universities of Pakistan.

The next section is throws light on the existing literature followed by section three on methodology. Section four deals with the results and section five concludes the paper.

Literature Review

The literature has three sub-sections where the first part is about innovation and its types. The second section of the literature discusses the organizational structure and its models whereas, the third section establishes a link between the literature on the organizational structure and the innovation.

Innovation

Innovation is usually categorized into two broad types: management and technological innovations (Damanpour & Aravind, 2012). Management Innovation refers to new plans, programs, policies, structures, products and services (Vaccaro, 2012). Different scholars consider management innovation as a complicated sequence of events which comprises decisions, social structures and specific behaviors (Chen, Yin, & Mei, 2018; Gopalakrishnan and Damanpour, 1994). According to Ford (1996, p. 286), creative thinking (innovation) is "a domain-specific, subjective judgment of the novelty and the worth of an outcome of a particular action."

There are two ways within which innovation processes can be conceptualized. Klein et al. (1996) differentiated between two processes of innovation, that is, 'user-based' and 'source-based'. In source-based innovation method the main focus is upon technologies, services, and new products that the organization generates for

the market. In the user-based innovation process, the main target is on technology, service, or product that is used for the first time within the organization. The same distinction is created between the generation and adoption of innovations (Tornatzky et al., 1990; Tidd, & Bessant, 2018) on the notion, that innovations are generated by one organization which is utilized by another (Damanpour and Wischnevsky, 2006; Dziallas, & Blind, 2019).

Various typologies exist in innovation research. For example, Meeus and Edquist (2006) found that these typologies consist of two kinds in product innovations (services and goods) and two types in process innovations (organizational and technological).

Technological Innovation

These innovations are technology-based that are important in corporations with merchandise businesses (Meeus and Edquist, 2006; Markard, 2020). Process and product are two sub-technological innovations that influence organization's merchandise and manufacture systems. Product innovations are market-driven which direct towards the external audience, and they look ends up in the quality of the business production for its regular customers (Kozma, & Voogt, 2003; Fagerberg, Mowery, & Nelson, 2005; Azar, & Ciabuschi, 2017). In distinction, process innovations are new features added into firm or organization's operating structures for manufacturing its product (Boer & During, 2004; Damanpour and Aravind, 2006; Coccia, 2017).

Service Innovation

Service innovations are the launch of unique facilities to raise the quality of the organization's output in the form of service or product (Damanpour, et al., 2009; Witell, Snyder, Gustafsson, Fombelle, & Kristensson, 2016). The previous studies on innovation do not differentiate between service and products innovations and they used the two terms interchangeably (Moore, & Benbasat, 1991; Berry, 2019).

Management Innovation

Management innovation is a sort of non-technological innovation which is also known as organizational innovation (Sanidas, 2005; Khosravi, Newton, & Rezvani, 2019) and managerial innovation (Damanpour, 2014; Rajiani, & Ismail, 2019). Organizations directly link with technical (process) innovation and largely produce modifications in their atmosphere in order to connect the organization's central work with the organization (Angle, 2000; Damanpour et al., 2009). All these terms significantly overlap both in the definition and their usage. Irrespective of the word that is used to define this kind of innovation, the management innovation is the most frequently discussed as compared to technological or technical innovation (Birkinshaw, Hamel, & Mol, 2008; David, 2019). Moreover, management innovation means the formation and utilization of practices which are new in structures, management, techniques and processes (Vaccaro et al., 2012).

Organizational Structure

An organizational structure describes exactly how job tasks are formally divided, grouped, and coordinated (Daft, 2010). Organization's structure comprises centralization, personnel ratios, professionalism, formalization, a hierarchy of authority and specialization (Daft, 2010; Sandhu, & Kulik, 2019).

Centralization concerns the hierarchical power to make a decision in the organization at the top level. When the decision-making process occurs at the topmost level in organization it is called as centralized and when decision-making process is located at the bottom level in a firm it is referred as decentralized (Daft, 2010; Alexiou, Khanagha, & Schippers, 2019). It is mainly concerned with the organization handling of the decision-making process (Jansen et al., 2006). The essence of centralization is a top-down distribution of power in an organization (Hage & Aiken, 1967; Rogers, 1995; Elbich, Molenaar, & Scherf, 2019).

Formalization concerns the extent of paper documentation. Documentation exists in the form of procedures, work descriptions, guidelines and instruction manuals (Daft, 2010). It is mainly concerned with the quality of being specific about duty, job classification and the documentation of guidelines for personnel to observe. In short, it emphasizes on clarification of the number of procedures and amount of communications (Gosselin, 1997).

Organization Structure and Management Innovation

The research findings regarding centralization and innovation suggest positive, negative and insignificant relationships. Some researchers found that centralization has a positive assocation with innovation (Gosselin, 1997; Gatignon et al., 2002; Bingham, & Nabatchi, 2019). In contrast, some researchers documented a negative association between centralization and innovation (Damanpour, 1991; Wang, Lu, & Li, 2019).

In other cases, some researchers found insignificant association between centralization and innovation (Lai and Guynes, 1997). The negative relation is due to vertical communication where information flow is going up and down in the organization (Cardinal, 2001; Jansen et al., 2006; Kasap, & Pozantı, 2019). This vertical communication delays the quality and frequency of creativity (Jansen et al., 2006). Hence, employees of centralized structure might be less creative (Jansen et al., 2006). Owing to this controlled communication within an organization, many researches support the hypothesis that the centralization has a negative relation with innovation (Damanpour, 1991). For the positive relationship, the explanation is that the administrators have more control and they have more freedom when making decisions (Miller, 1987). It argues that in a case of centralized organizations, managers can organize knowledge and resources more effectively to nurture competence and innovation (Cardinal, 2001). Thus, the literature shows both positive and negative relationship. Here, the first formulated hypothesis is:

H1: The centralization has negative relationship with management innovation.

The previous literature also shows a negative relationship between formalization and innovation (West, 2000). It argues that a growing formalization

reduces the freedom of employees to work out-of-the-box which leaves little chances for innovation (Raub, 2007). It further reveals that formalization results in a lack of creativity due to its inflexible nature (Lewis et al., 2002). Resultantly, the past literature supports that low level of formal structure leads to more innovation (West, 2000; Raub, 2007). On the other hand, research suggests that the association between formalization and innovation is positive where an increase in innovation is due to coordination among different sections of organization (Schultz et al., 2013). Thus, the literature shows both positive and negative relationship. Hence, the second formulated hypothesis is:

H2: The formalization has a negative relationship with management innovation.

Although ample literature exists on organizational structure and its impact on management innovation (Van & Denhardt, 2019), yet a few empirical studies have been done in public sector organizations on this topic. The purpose of this study is to address the gap in the human resource development literature by offering some importance to practitioners and researchers about organizational structure that may be a driving force to manage innovation in public sector universities of Pakistan.

Methodology

The faculty of four reputable universities in Peshawar city (University of Peshawar, University of Engineering Technology, University of Agricultural Peshawar, and Islamia Collage University) acts as sample for this study. University teachers are considered as the unit of analysis which includes lecturers, assistant professors, associate professors and full professors. The total workforce of the four academies consist of approximately 1400 university teachers. Non-probability convenience sampling method is used to collect data for existing study as the faculty members were easily available to provide the required information. While it is less accurate sampling technique in term of generalizability, it is rapid, appropriate and less expensive method of data collection. Thus, these features make the sampling technique quite suitable for this study as it has to be completed in one semester.

As sample size influences power and standard errors, according to $N > 100$ rule of thumb (Kline, 2005) a sample size of 100 must be considered small, a sample between 100 and 200 should be considered medium and more than 200 sample size should be considered large (Schumacker and Lomax, 2010). Keeping with the $N > 100$ rule of thumb and the recommendations of Kline (2005) and Schumacker and Lomax (2010) the minimum sample size for this paper is expected to be around 200. A total of 245 questionnaires were distributed among teachers. The 190 responded to those questionnaires which made the active sample size for this is 76% of the total. The following table shows numbers of teaching in different universities.

Demographic Variables

For this study, the demographic variables included are: gender, age, income, qualification and designation. Gender is considered as a dichotomous variable coded as Male = 1 and Female = 2. Age is coded as, 30-40 Years = 1, 40-50 Years =

2 and 51 Years and above = 3. Income is coded as: below 50000 = 1, from 51000 to 80000 = 2, and from 81000 and above = 3. Education is coded with Graduation = 1, Master = 2 and M.Phil/Ph.D. = 3). Similarly, the designation is coded with Lecturer = 1, Assistant Professor = 2, Associate Professor = 3 and Professor = 4. Experience is coded with less than 5 Years = 1, 6-10 Years = 2, 11-15 Years = 3, 16-20 Years = 4 and 21 Years and above = 5.

Measurement Instruments[i]

Organizational structure

The constructs for centralization and formalization are adopted from earlier studies of Caruana et al. (1998). The formalization construct is measured with four items and the Centralization construct is measured with six items. The previous alpha reliability value of formalization was (α=.87) and of centralization (α=.91). Formalization measures with the amount of the presence of structured control and verbal exchange bolstered through authentic written direction in organizations (Gibson, Dunlop, & Cordery, 2019). The responses of the respondents are gathered with their agreement or disagreement with each item on a 5-point Likert scale, in which the preferences lie on the continuum ranging from Strongly Disagree (1) to Strongly Agree (5).

Management innovation

The six items construct of management innovation is adopted from Vaccaro et al. (2012) and Nieves and Segarra-Cipres (2015). These scales are perception measured on five point Likert scale. The past value of alpha reliability was (α=.92).

Data analysis techniques

For hypothesis testing we run regression analysis and also used SEM to find the relationship of the variables. Cronbach's alpha is used to measure the reliability of the composite scores. The minimum acceptable value for alpha is 0.70.ii Reliability scores for centralization is (α =0.77), for formalization (α =0.79), and for management innovation (α =0.81). All of them are acceptable as they are more than 0.70.[iii] The results of Cronbach's alpha for the composite scores are presented in Table 1.

Table 1: Cronbach's Alpha (α) of the all three instruments (N = 190)

Variable	**N**	**α**
Centralization	4	0.77
Formalization	4	0.79
Management Innovation	6	0.81

3.4 Correlational analysis

Table 2: Correlations among Scores on Centralization, Formalization and Management Innovation (N = 190)

Variable	1	2	3
1. Centralization	-		
2. Formalization	-.04	-	
3. Management Innovation	.22**	.29**	-

** p <.01

The table displays the correlation coefficients among centralization, formalization and management innovation. Centralization was significantly positively associated to management innovation (r =.22, p =.002) that explained 4.84 percent variance in management innovation (R^2 =.0484). Formalization was significantly positively assocaited to management innovation (r =.29, p =.001) which explained 8.41 percent variance in management innovation (R^2 =.0841). Finally, both centralization and formalization were not significantly related to each other (r = -. 44, p =.612).

The next section shows the results.

Results

The results are broadly divided into two sections. The section 4.1 shows the findings of regression analysis followed by section 4.2 of Structural Equation Modeling.

Regression analysis

Table 2 shows the findings of the three models.

Table 2: Regression analysis

Predictors of Management Innovation (N = 190)

		Management Innovation		
	Model 1	Model 2	Model 3	
Variable	*B*	*B*		95% CI
Constant	3.39**	1.86**		[0.74, 2.98]
Gender	0.25	0.25*		[0.01, 0.50]
Age				
41-50 vs 30-40	-0.04	0.01		[-0.35,
51 and Above vs 30-40	0.15	0.36		[-0.22,
Income				
51000-80000 vs Below 50000	-0.34	-0.39		[-0.88,
81000 and Above vs Below 50000	-0.60*	-0.69*		[-1.26, -
Education				
Master vs Graduation	-0.40	-0.46		[-1.22,
MPhil/PhD vs Graduation	-0.31	-0.32		[-1.04,
Designation				
Assistant Professor vs Lecturer	0.26	0.20		[-0.07,
Associate Professor vs Lecturer	0.10	0.03		[-0.43,
Professor vs Lecturer	0.60	0.42		[-0.38,
Experience				
6-10 vs Less than 5	-0.28	-0.19		[-0.62,
11-15 vs Less than 5	-0.16	-0.09		[-0.64,
16-20 vs Less than 5	-0.08	-0.10		[-0.76,
21 and above vs Less than 5	-0.63	-0.56		[-1.48,
Centralization		0.15*	0.15*	[0.04, 0.26]
Formalization		0.30*	0.30*	[0.18, 0.42]
R^2	0.11	0.25	0.138	
F	1.59	3.68**	14.925**	
ΔR^2		0.14	0.128**	
ΔF		16.35**	16.35**	

*p <.05. **p <.001.

Note* N= Total numbers of respondents

In the first step of hierarchical multiple regression (Model 1), fourteen predictors are entered i.e., gender (male and female), age (41-50yrs vs 30-40yrs, 51yrs and above vs 30-40yrs), income (51000-80000 vs below 50000, 81000 and above vs below 50000), education (master vs graduation, MPhil/PhD vs graduation), designation (assistant professor vs lecturer, associate professor vs lecturer, professor vs lecturer), and experience (6-10yrs vs less than 5yrs, 11-15yrs vs less than 5yrs,

16-20yrs vs less than 5yrs, 21yrs and above vs less than 5yrs). This model is not statistically significant F (14, 175) = 1.59; p = 0.087 at 5% confidence level[iv] and explained 11% of variance (R^2 = 0.11) in management innovation. After the entry of constructs of centralization and formalization at Step 2, the total variance (R^2) increased to 0.25 which refers that 25% variation in management is explained by the model with statistical significance i.e., F (16, 173) = 3.68; p < .001. The introduction of centralization and formalization explained additional 14% variance in management innovation (ΔR^2 = 0.14; F (2, 173) = 16.35; p < .001), after controlling fourteen predictors of gender, age, income, education, designation and experience.

The model 3 above shows the multiple liner regression. The model is statistically significant F (2, 187) = 14.9; p < .001). Entry of centralization, formalization and the total variance (R^2 = .13) is explained by the model as a whole which is 13%. The introduction of centralization and formalization alone explained 15% and 30% variance in management innovation respectively.

Structural Equation Modelling

Measurement model

The composite reliability and Cronbach's alpha for centralization, formalization and management innovation are computed by SmartPLS. The values range from 0.835 to 0.845 for composite reliability and 0.762 to 0.780 for Cronbach' alpha respectively for the three constructs as shown in the Table 3. It refers that all the constructs are reliable as the values of the Cronbach's alpha and composite reliability are above the threshold of 0.7. The results are also supported by the discriminant validity value Average Variance Extract (AVE) of the questionnaires used in this study which are also above the standard of 0.50 (Hair et al., 2010).

Table 3: Summary of PLS Quality (AVE, Composite Reliability and Cronbach's Alpha)

Variable	Number of Items	AVE	Composite Reliability	Cronbach's Alpha
Centralization	4	0.512	0.835	0.762
Formalization	4	0.651	0.853	0.768
Management Innovation	6	0.616	0.845	0.780

Structural model

The Table 4 shows that the coefficient of centralization is significantly positive (β = 0.351, p < 0.05). Thus, hypothesis H1 is not supported. Similarly, the coefficient of formalization is significant and positive (β =0. 375, p < 0.01). Thus, hypothesis H2 is not supported either.

While earlier researches found a negative relationship between formalization and management innovation (Damanpour, 1991), the current study shows a negative relationship between formal structure and management innovation. Though, our main argument is that formal structure and centralized structure stifle innovative tactics nevertheless, the hypothesized relationship shows positive effect. Previous studies also revealed that that when organization is centralized, administrators can organize knowledge and resources more effectively to nurture competence and innovation (Cardinal 2001).

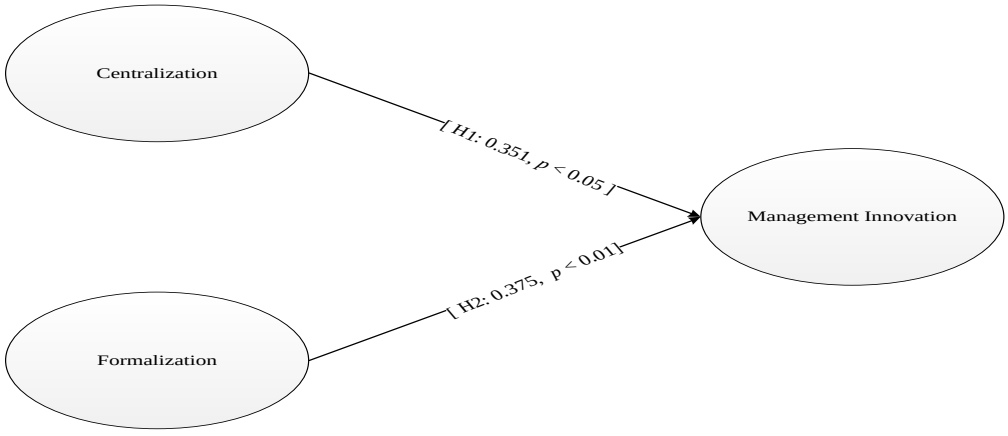
This hypothesized relationship shows positive effect with justification from prior studies. For example Cardinal (2001) argues that when an organization is centralized, administrators can organize knowledge and resources more effectively to nurture competence and innovation. In summary, we conclude that organizational structure matters for innovation and success and that the centralized and formal structure work best to bring innovation in the education sector of Pakistan. The results are varying because Pakistan is one of the collectivist cultures as well strong power distance society (Hofstede, 1996).

Table 4

Summary of the Structural Model

Hypotheses	Beta	Significant	Supported?
H1: centralization ► management innovation	0.351	p <.05	Not Supported: Positive Relationship
H2: formalization ► management innovation	0.375	P < 0.01	Not Supported: Positive Relationship

Figure 1. Overall Structural Model



Discussion and Conclusion

Management innovation is a trendy research topic in management research area and yet a lot of exploration of the field is required to understand the background and the potential outcomes of its impact. Previous researchers have found mixed results for the association between organizational structure (centralization and formalization) and management innovation. The paper analysed this relationship in public sector universities of Pakistan with the help of 190 questionnaires from faculty members.

Regarding management innovation in the educational institutions, the findings of the current research do not offer support to the negative effect of formalization and centralization on management innovation which are hypothesized. The concept of centralization has been extensively studied in innovation literature and hypothesized as negatively in relation with innovation (e.g. Damanpour 1991). However, this research shows a positive association between management innovation and centralization. The finding reveals that centralized structure can effectively manage resources and it can have a good chain of common for innovative ideas. Similarly, a positive coefficient of formalization refers that clear procedures and rules are essential for management innovation. This observation emphasizes on the notion that establishment of procedures and rules are directed to improve the outputs and processes (Daft and Lengel 1986; Benner and Tushman, 2003). The rules and procedures that are well-designed help employees in better mastering their functions and tasks (Adler and Borys, 1996). Furthermore, categorization of knowledge that is newly developed in written procedures and rules may assist units in facilitating the diffusion and replication of innovation (Zollo and winter, 2002).

The results of this paper support a dual-core theory of innovation which says that most of the organizations have primary structures of innovations, such as an administrative core and a technical core. Each core performs different innovative task through their employees. However, the findings partially contradict the meta-analysis by Damanpour (1991) which showed an insignificant association between formalization and innovation while a negative association between centralization and innovation. Other recent studies (Iranmanesh et al., 2020; Waruwu et al., 2020) finding show that there is a positive and significant relationship between organizational structure and innovation.

The future analysis can be done on constructs like examining organization's size, organization's age and organization's culture in order to decipher the underlying mechanism that relates organizational structure to management innovation and performance.

Limitations and Future Research

Studies related to management innovation aim to discover those factors of organizational structure which influence management innovation, therefore, the downsides of the current study needs to be highlighted in order to pave way for

higher rationalization of the outcomes in future. Primarily, the understanding of organizational structure may be an awfully vast and complex concept and the two factors that are examined within the present study cannot entirely cover this topic.

As a ground breaking work, the primary focus of this study was on a few constructs linking organization structure to management innovation,. Attention needs to be directed to all the constructs holistically as different ideas can generate additional substantive results. For instance, the future analysis can be done on constructs like examining organization's size, organization's age, and organization's culture in order to better understand the underlying mechanism that relates organizational structure to management innovation and performance. In other words, it is valuable to analyse how organizations and their employees would act after opting different variables such as organization's size and age as moderating variables.

The other potential limitation of this study is in the context of population. Although it is believed that a university would have appropriate population, nonetheless, specialized teaching staff was chosen from four different universities across Peshawar: the University of Peshawar, University of Engineering & Technology, Islamia College University and Agricultural University. In order to facilitate improved analysis & validity, it is vital to include private universities to generalize the results of this study. The process of these tested relationships in other cities will facilitate to validate or reject the results generated through this study.

For future research, the consideration of a longitudinal research design would be useful to assess how organizational antecedents influence management innovation with time.

Practical Implications

This paper contributes to the management innovation literature because it is among the extant studies in examining organization's structural factors such as centralization and formalization as determinants of management innovation in the educational institutions.

Although findings regarding formalization, centralization and management innovation in different organizational and cultural context suggest positive, negative and no relationship at all. The results of this paper reveal that centralization is the best fit for educational intuitions. It is because when an organization is formal and centralized, administrators can organize knowledge and resources more effectively to nurture competence and innovation (Cardinal, 2001). Administrative procedures put emphasis on command and control, with power located on the first pyramid of the organization and information going downward through the ladder. Similarly, information is very much centralized, restricted in access and do not permeate

extensively in the organization. Thus, these processes coerce organizational behaviour toward efficiency and cost minimization.

End Notes:

[i] See Appendix 1.

[ii] The guidelines of George and Mallery (2010) is used in the interpretation of alpha values, where α >0.9 is excellent, >0.8 is good, >0.7 is acceptable, >0.6 is questionable, >0.5 is poor, and <0.5 is unacceptable.

[iii] However, the two items of centralization having negative values in inter-item correlation matrix which are deleted. The presence of negative values indicates that these items are not measuring the relevant construct but something else (Pallant, 2011).

[iv] However, the value is significant at 10 percent confidence level,

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