Identification of Challenges concerned to the Research and Development (R&D) Mechanism in Public Sector Universities of Pakistan

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Abstract

Research and Development (R&D) mechanism at higher education is facing severe challenges that are plaguing the educational system of Pakistan. This study focuses the challenges of R&D mechanism concerned to the public sector universities. Sample of the study comprised of six hundred and ninety (690) faculty members from selected twenty-three (23) public sector universities. The study was survey and descriptive in nature. The quantitative as well as qualitative (QUAN-qual) methods were adopted and the explanatory sequential technique was used. The questionnaire was used as a research tool based on closed ended items and open-ended questions. The research tool was refined and modified in light of the expert opinion and reliability was calculated 0.771 through Cronbach's Alpha. The researcher personally visited the selected universities for data collection. SPSS-21 was used to evaluate the gathered data using statistical formulas. The study revealed diversified results regarding the challenges of R&D centers. Collectively, it was found that 75.48% respondents responded that R&D mechanism at public sector universities. It was identified that challenges concerned to the R&D mechanism, explored by the present research, need to be alleviated. The study recommended R&D centers should be upgraded on priority basis in public sector universities of Pakistan.

Keywords: Challenges, R&D Mechanism, Public Sector Universities, R&D Centers

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Introduction

Mechanism for Research and Development is considered as a central part of the universities, research institutes and industrial sectors and it gives new information to explore the secrets of the universe (Zafar, J. M., Hussain, I. and Shakir, M., 2017). It is the systematic process of introducing modern systems, instruments, procedures, machines, assignments, equipments and goods. R&D improves research activities and practices in an excellent way (Bako, 2005; Bartlett & Burton, 2009).

R&D center is an important platform to introduce inventions in the universities. These centers offer various graduate studies programs and motivate the scholars (Zafar, J. M., Akhtar, A. and Shakir, M., 2018). These centers are contributing in quality of education and developing research

culture. These provide innovative methods of teaching and learning in the universities. These are very effective to train the young scholars (Gay, 2005; Matos, 1999).

R&D intensive organizations are making efforts to resolve fundamental problems of research from last three decades and making effort to introduce technologies in the universities (Zafar, J. M., Lodhi, I. S., and Shakir, M., 2016). A large number of R&D intensive firms are now struggling to establish collaborative links with universities for the economic reasons (Brostrom, 2010).

All over the globe, the R&D-spending of the top ten countries except China has not been altered in the last few years. In 2011, China beat Japan for the number two position for its R&D-expenditure. Interestingly, more than 50% of the total R&D investment at international level was done by United States, China and Japan. However, the U.S., Canada and Mexico invested near about 40% of world's total R&D in the past five years. The higher level of China's research intensity has been expected to sustain for about 20 years. It has been forecasting that there is no chance of any change in R&D trends of these regions and will continue more likely through 2020. Amongst Asian countries, Pakistan is trying its best to keep pace with developed nations. Ex-Chairman of HEC Prof. Atta-ur-Rahman expressed that Pakistan was passing through a very serious situation in past. It was far behind the East Asian countries as well as the South Asia indicated that it was very critical time to overcome the challenges confronted by Pakistan's education system (HEC-Press Release, 2006). The Government of Pakistan invested seven fold greater funds than 2002-2006 period of amount 0.5% of Pakistan's GDP for higher education (Shah *et al*., 2006; Shaikh & Hatcher, 2007). Moreover, overall expenditure of HEC increased by more than 334 % from the period of 2001-2002 to 2005-2006 (World Bank, 2006). The funding for university research has been increased in Pakistan in the field of Science and Technology by 8000% during this period (Gaardhøje *et al*., 2006).

Higher Education Commission of Pakistan launched Pak-Euro project a U$$15 billion for establishing nine world-class engineering universities staffed with European faculty members, professionals and well known administrators, over the next ten years. Furthermore, European Commission EU launched the distribution of its Asia-Link program with the consultancy of HEC to promote the education sector, especially higher education and research in Pakistan. Whereas, doctoral scholarships were offered to the Pakistani scholars, trainings of post-doc and helped in opening of new higher education institutions in Pakistan (Essays UK, 2013; Education: News & Events 2006; Mughul, 2008). These important steps were taken for universities in Pakistan to increase the professional development and quality of education, at university level. These educational reforms were made to reorganize the system of higher education and to make Pakistan a developed country.

In spite of great struggle, the status of higher education in Pakistan is facing severe challenges. The major 'challenges for Pakistan as a developing country' are the economic growth and poverty alleviation. Whereas, the 'institutional challenges' to Pakistan like reforms for curriculum, brain-drain, proper student's assessment, accreditation process and sharing of expertise at university level in Pakistan (Zafar, J. M., Hussain, I. and Shakir, M., 2015). To solve these puzzles, Pakistan is struggling for the reorientation of the education system in order to keep pace with the

accelerating globalization. Hayes (1987) described that Pakistan facing many educational challenges like over population, resource crisis and lack of proper funding, no contribution from the private institutions, dearth of trained manpower, lack of vision for quality of research, shortage of updated infrastructures, lack of funding for research, and insufficient trainings for research staff, unstable political policies, incompetent educational management system, depletion of resources, and reduced execution of planning etc. (Khan *et al.,* 2014).

Naim (2001), discussed that twenty-five hundred and twenty-eight PhD students out of 14,517 successfully finished their science research projects, it was discussed. Out of the 35 000 patents registered by the Pakistani Patent Office, only 35% were in the field of engineering sciences. In addition, few agreements were signed for science and technology with the Egypt, Iran and Romania (UNESCO, 2012).

Researcher herein, attempted to highlight the obstacles, constraints and challenges in the way of a successful R&D mechanism to be practiced at public sector universities of Pakistan.

Research Objectives

Objectives of the study were;

- To identify the challenges concerned to the R&D centers in public sector universities
- To resolve the issues concerned to the R&D process in public sector universities

Research Objectives

Research questions of the study were;

1. What are the challenges of R&D centers in public sector universities?
2. What are the issues of R&D process in public sector universities?

Hypothesis

Hypothesis of the study was as follows;

- There is a significant role of R&D center in resolving the challenges and issues of research in public sector universities

Research Methodology

Research design

The study was survey and descriptive in nature. The quantitative as well as qualitative (QUAN-qual) research method was adopted. The explanatory sequential technique was used.

Population

Supervisors, HODs, deans, directors of the Board of Advanced Studies and Research, and administrative personnel from quality improvement cells at the university level were the population of the study.

Sample, sampling and sample Size

The probability sampling method was adopted in this research. The sample size was rationalized according to Manion *et al*. (2008) “if the population is almost 100,000 or more, then appropriate sample size should be 384”. Six hundred and ninety (690) faculty and staff staff members from selected twenty-three (23) public sector universities were chosen as the sample, including ten (10) research supervisors, five (05) department heads, five (05) deans of faculties, one (01) director of

R&D, five (05) administrative staff members of R&D, and four (04) members of quality enhancement cells. "The sample would be higher in survey study to reflect the population than experimental investigations," Best and Kahn (2006) illustrated. A larger sample size lowers the likelihood of mistakes.

Tool development

The questionnaire was considered the most appropriate research tool for data collection as the study was survey and descriptive in nature. The challenges concerned to R&D mechanism in public sector universities could be explored through the questionnaire. The questionnaire was comprised of both quantitative as well qualitative parts.

Pilot study

The questionnaire was modified and validated in light of the expert opinions. The reliability of questionnaire was calculated through Cronbach Alpha.

Data Collection

The researcher personally went to the targeted universities and gathered the necessary information from the respondents. The participants responded freely about the challenges concerned to the R&D mechanism of public sector universities. The questionnaire was based on factors like as; (a) lengthy R&D mechanism, (b) lack of R&D expertise, (c) low priority to R&D, (d) financial constraints, (e) biased behavior, (f) inconsistent policies, (g) poor coordination, and (h) in-competent heads.

Data Analysis

The collected data was feed into the data sheet. The collected data was analyzed through SPSS-21 using relevant statistical formulas as frequency, percentage, standard deviation and mean score etc. The data regarding Part-1 about closed ended items/ statements was analyzed through SPSS-21 whereas Part-2 the data about open questions was analyzed through coding the themes and interpreted these results.

Furthermore, it was tabulated and interpreted (see Table).

Table.1: Challenges concerned to the R&D mechanism at the universities of public sector

Factor	Disagree		UD[c]		Agree		Total		SD	Mean
	F[a]	%[b]	F	%	F	%	F	%		
Lengthy mechanism	136	20.0	12	2.0	542	78.0	690	100	1.07	3.75
Lack of expertise	157	23.0	15	2.0	518	75.0	690	100	1.11	3.63
Low value to R&D	186	27.0	07	1.0	497	72.0	690	100	1.19	3.59
Financial constraints	171	24.7	16	2.3	503	73.0	690	100	1.20	3.65
Liking and disliking	153	22.8	14	2.0	523	75.8	690	100	1.16	3.70
Unstable policies	143	20.7	14	2.0	534	77.3	690	100	1.15	3.74
Lack of coordination	146	21.2	12	1.7	532	77.1	690	100	1.09	3.71
Lack of competency	152	22.0	20	2.9	518	75.1	690	100	1.15	3.71
(Overall Result)		22.6		1.97		75.5			1.13	3.68

Note. [f]Frequency; [b]Percentage; [c]Undecided; [d]Standard deviation

Source: Above table-1 is based on analysis of primary data collected the questionnaire

The data in above table highlights the challenges concerned to the R&D mechanism in the public sector universities of Pakistan. Data showed that 78.0%, 20.0% and 2.0% of the respondents were agreed, disagreed and unclear about lengthy process of R&D mechanism respectively. Likewise, 75.0% of the respondent thought that R&D centers are lacking research expertise in universities, 23.0% of the respondents opposed this statement, whereas 2.0% of the respondents were unclear about this. Furthermore, 72% of the respondents indicated that academia did not give value to R&D mechanism, whereas 27% of the respondents were in opposite to the statement, and 1% of the respondents were in a doubt situation. 73% of the respondents viewed that R&D centers were suffering from funds' deficiency, where 24.7% of the respondents mentioned that there is no issue of funds deficiency at R&D centers. But, 2.3% of the respondents were not sure about it.

The opinions of 75.8% of the respondents clarified that biased behaviors influenced the R&D mechanism in public sector universities, while 22.8% of the respondents were of the opposite opinions, but 2% of the respondents were in ambiguity. According to ideas of 77.3% respondents, the unstable policies are one of the challenges concerned to the R&D centers, whereas 20.7% respondents did not consider the unstable policies as a challenge to R&D mechanism, but 2% of the respondents were uncertain about the statement. Concerning the coordination, 77.1%, respondents responded that stakeholders of the R&D did not assist to each other properly, while 21.2% of the respondents did not identify lack of coordination as a problem to R&D process, but 1.7% respondents were unsure about the statement. It was supported by 75.1% of the respondents that incompetent peoples of human resource development may surely affected the R&D mechanism, while 22% and 2.9% of the respondents disagreed and not clear to the statement respectively.

Table 2

Region based comparison of challenges concerned to the productivity of R&D centers

No	Province	D.A		A		Overall	
		F	%	F	%	F	%
1.	Punjab	7270	41.00	10490	59.00	17760	100
2.	Sindh	3260	49.00	3400	51.00	6660	100
3.	Baluchistan	1215	55.00	1005	45.00	2220	100
4.	Khyber P.K.	7800	49.00	7740	51.00	15540	100
5.	Federal area	3930	44.00	4950	56.00	8880	100

Source: Above table-2 is based on analysis of primary data collected the questionnaire

Table 2 represents region based comparison of challenges concerned to the R&D mechanisms at Pakistani universities. based on data analysis, In Sindh province 51.00% of the respondents agreed that the challenges of R&D centers affected the productivity of public sector universities at Sindh Province. In Baluchistan province data displayed that 55.00% of the respondents disagreed the challenges of R&D centers affected the productivity of public sector universities. In Khybar P.K.

data disclosed that 51.00% of the respondents disagreed that the challenges of R&D centers influenced the productivity of research institutions in public sector universities. In Federal area data showed that 56.00% of the respondents agreed that the challenges of R&D centers affected the productivity of research institutes of public sector universities. In Punjab province, 59.00% of the participants agreed that the challenges of R&D centers affected the productivity of public sector universities (see Table 2 and Figure1).

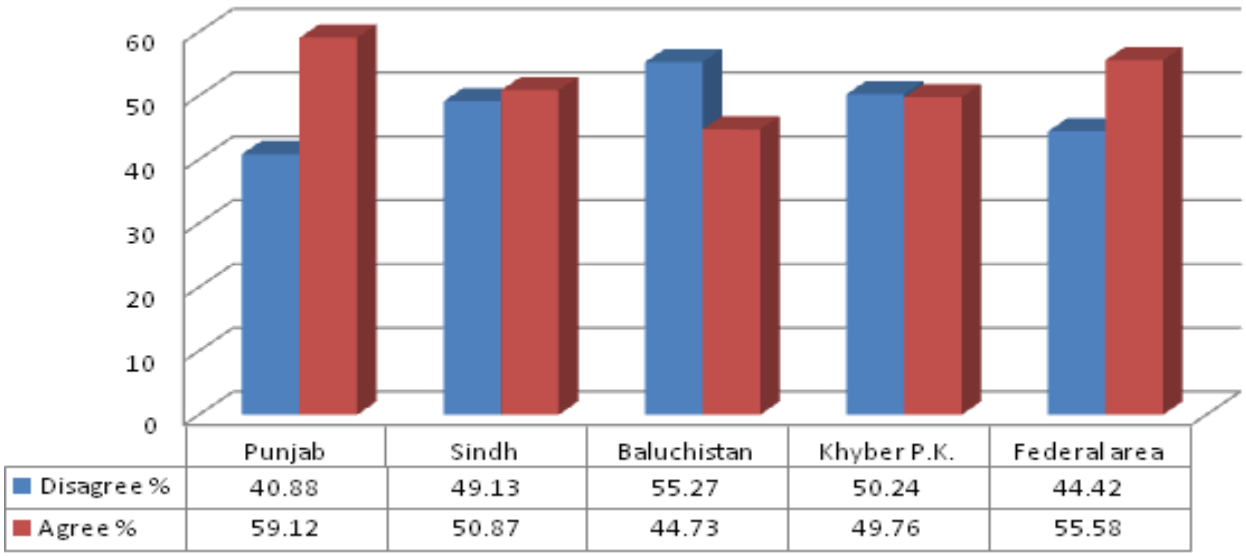
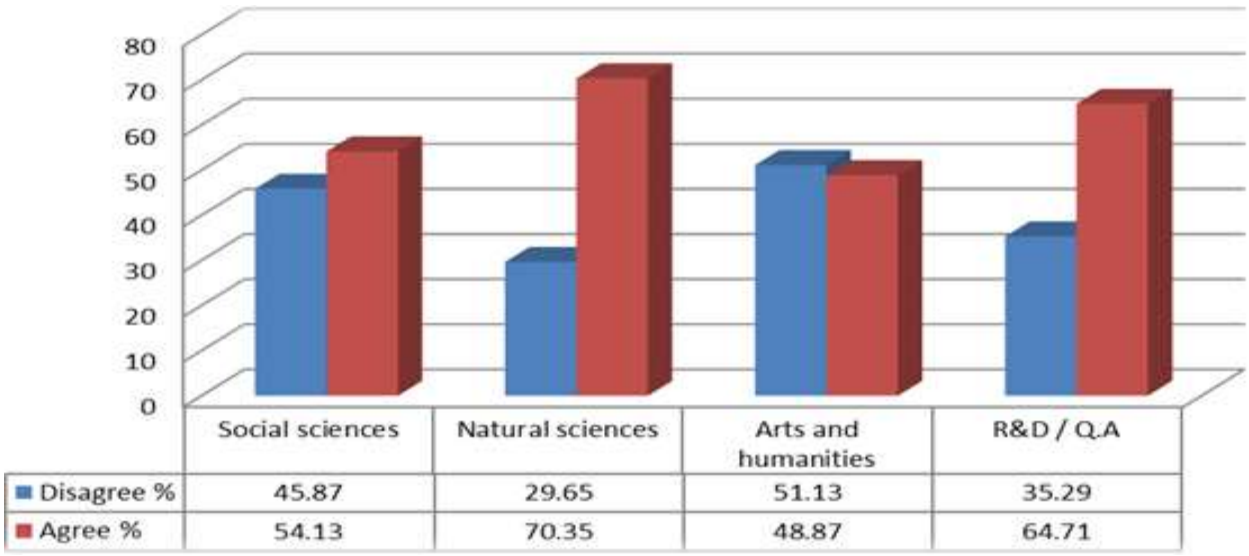


Figure 1: Comparison of the productivity R&D centers' difficulties by region
Source: Above figure-1 is based on data analysis

Table 3
Discipline based comparison of challenges to the productivity R&D centers

No	Discipline	D.A		A		Overall	
		F	%	F	%	F	%
1.	Social Sciences	5450	46.00	6449	54.00	11914	100
2.	Natural Sciences	3520	30.00	8394	70.00	11914	100
3.	Arts & Humanities	6104	51.00	5810	49.00	11914	100
4.	R&D/ORIC/QEC	5395	35.00	9923	65.00	15318	100

Source: Above table-3 is based on analysis of primary data collected through the questionnaire
Table 3 represents that regarding the function of R&D centers based on academics or disciplines. Information of data indicates, in the social sciences 54.00% of the participants agreed that the challenges of R&D centers affected the research process, in the natural sciences 70.00% of the respondents agreed that R&D centers influenced the research process, in the arts & humanities 51% of the participants disagreed that R&D centers affected the research process, in the ORIC/R&D/QEC 65% of participants agreed that R&D centers affected the research process (given in Table 3 and Figure 2).



	Social sciences	Natural sciences	Arts and humanities	R&D / Q.A
Disagree %	45.87	29.65	51.13	35.29
Agree %	54.13	70.35	48.87	64.71

Figure 2: Discipline Based Comparison of Challenges to the Productivity R&D Centers
Source: Above figure-2 is based on analysis of primary data

Discussion

In current research, the ongoing challenges to the R&D mechanism at twenty three (23) universities of Pakistan have been explored. The majority of respondents, it was found, believed that the R&D process was particularly time-consuming, which had a negative impact on the predicted effectiveness of research and development facilities. It was explored that R&D centers were lacking research expertise in universities. As described by Khan *et al.,* (2014) the 'institutional challenges' to Pakistan include quality of education, reforms in curriculum, brain-drain, reliable student's assessment mechanism as well as efficient accreditation process and mutual coordination system among universities. To solve these puzzles, Pakistan is struggling for the reorientation of the education system in order to keep pace with the accelerating globalization. Additionally, the administration and academics are neglecting the requests for innovations from the research and development institutes and giving the university R&D process less attention.

Another challenging factor for the R&D is the financial crises and lack of funding which definitely decrease the performance of R&D centers. Personal preferences have a poisonous effect on the effectiveness of research and development centers at Pakistani institutions. As discussed by Bako, (2005); Bartlett & Burton, (2009) R&D is a methodical procedure used to update traditional methods, systems, tools, techniques, gadgets, services, materials, and goods. It improves current practices of research and innovation with excellence. Additionally, unstable policies are declining the quality of R&D mechanism at university level in Pakistan. Apart from these, low coordination among the concerned people of R&D centers is the severe challenge influencing the collaborative work in promoting purposive and functional research culture. Results of the study are also signaling that shortage of specialists and lack of spirit for coordination among the people of human resource management are also threatening research and development centers.

The role of R&D centers in the Punjab province is relatively better than the other provinces, according to the comparison of the productivity of R&D centers by area or province in universities and other higher education institutions. Whereas, the performance of R&D centers in the universities and concerned institutes of higher education in Baluchistan province is not better as compare to other provinces. Pakistan invested greater funds for higher education (Shah *et al*., 2006; Shaikh & Hatcher, 2007). According to HEC Press Release, (2006) it was very crucial time to overcome the challenges confronted by Pakistan's education system. Similarly, the R&D centers showed better outcomes in natural sciences was much better than other disciplines. Whereas, R&D centers showed poor performance in arts and humanities comparatively other disciplines.

Conclusions

The study concluded that research process is a lengthy and time consuming activity, lack of research expertise, low priority and ignorance of research activities, lack of funds, unfair attitude of R&D personnel, lack of balanced and constant policies of stakeholders and be deficient in of coordination between research institutions, universities and industry are the major flaws challenging the whole R&D mechanism and are serious threat to the R&D centers which are the cornerstones of higher education institutions, particularly universities. Whereas, these universities are the research juggernaut of nations that can put Pakistan into the list of developed nations. Therefore, it is the dire need to revolutionize the process/ mechanism of R&D, ORIC and QEC by the research and development (R&D) facilities found at colleges and institutions in Pakistan through appropriate planning of the think tanks, intellectuals and decision makers.

Recommendations

R&D mechanism is the pillar of universities and higher education institutes for promoting research and innovation. Now a day, it is facing the most critical challenges in Pakistan. In light of findings and conclusions the study recommended that; funds required for research and development centers from higher education commission should be provided for its smooth functioning because it is very costly process. R&D mechanism should be made very easy and special worth should be given in the universities. The research scholars, supervisors and research experts should be encouraged to create authentic knowledge, modern products; technology-based processes, modern procedures, updated systems in the execution and management of programs and projects. A more advanced research management system is required, with interdisciplinary access to laboratories and help with contract administration, legal concerns, and financial considerations. Mutual linkages of R&D centers with industry, corporations and domestic business firms should be established. The research collaboration should be promoted with the international corporations and industry of the developed nations because many foreign corporations have established R&D centers in educational institutions.

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