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ANALYSIS OF CURRENT RESEARCH AND DEVELOPMENT (R&D) MECHANISM AND PREPARATION OF A MODEL FOR RESEARCH AND DEVELOPMENT AT UNIVERSITY LEVEL IN PAKISTAN

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DEPARTMENT OF EDUCATION

FACULTY OF EDUCATION

The Islamia University of Bahawalpur

PAKISTAN

2013

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By

JAM MUHAMMAD ZAFAR

A dissertation submitted in partial fulfillment of the requirement for the award of the degree of

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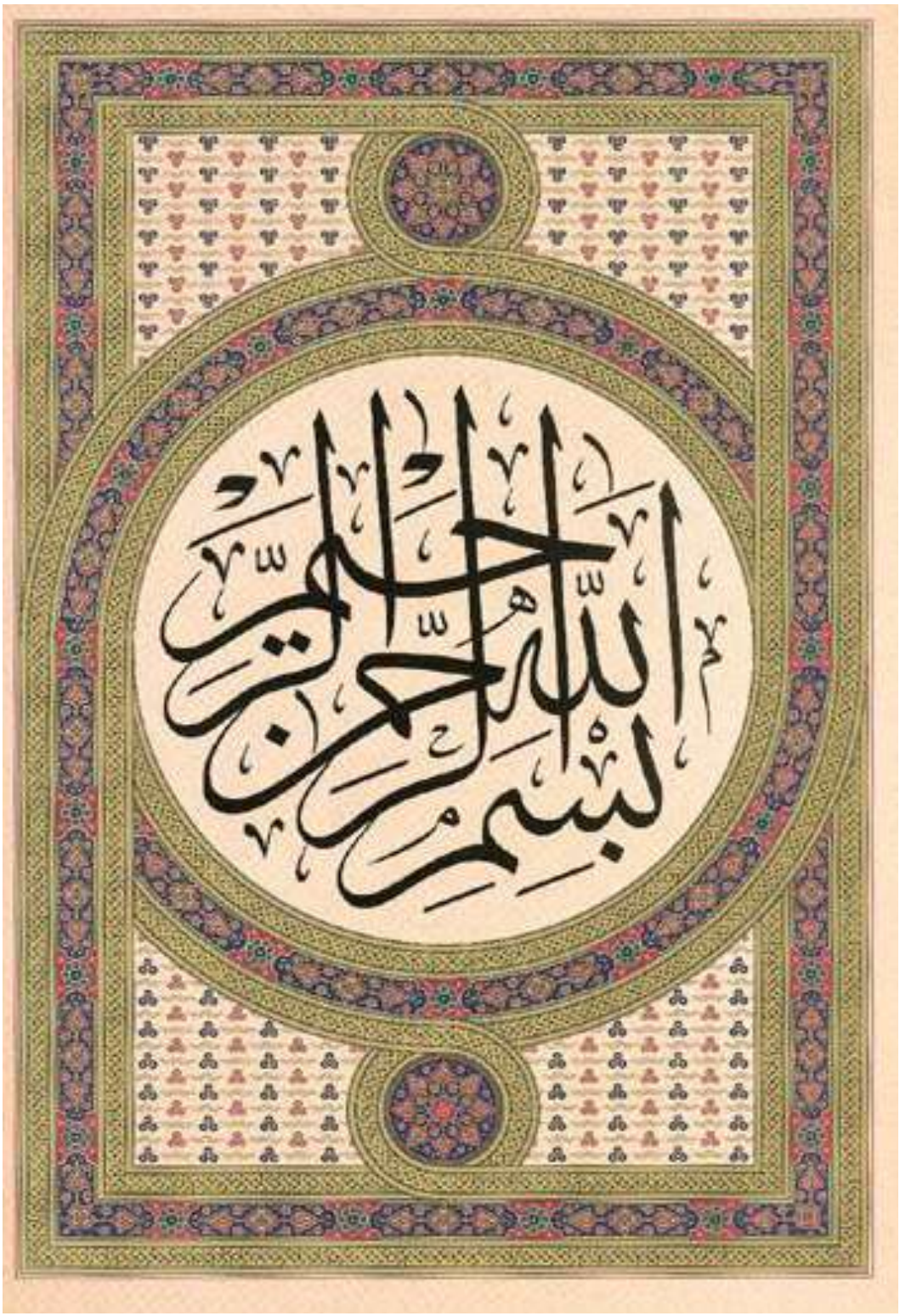
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AUTHOR'S DECLARATION

I, Jam Muhammad Zafar, PhD scholar in the Department of Education at The Islamia University of Bahawalpur do solemnly declare that the thesis entitled, "Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan" submitted by me in partial fulfillment of the requirement of PhD in the subject of Education is my original work. I solemnly declare that this is my original work and has not been submitted for this or any other degree or published earlier and also shall not be submitted in future by me. It shall also not be submitted to obtain any degree to any other university or institution.

Jam Muhammad Zafar

FORWARDING CERTIFICATE

The research theis entitled, “Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan” has been conducted by Jam Muhammad Zafar under my supervision and the thesis is submitted to Deartment of Education, The Islamia University of Bahawalpur in the partial fulfillment of the requirement for award of degree of Doctorate of Philosophy in Education with my permission.

Dr. Irshad Hussain

DEDICATION

DEDICATED TO

My Loving Father (Late)
&
My Sweet Mother
Whose heartfelt prayers and altruistic love as deep as sea, as philanthropic and pure as unsullied lily, as constant as Northern star and whose advises and Suggestions as valuable as the most precious diamonds, have always transformed my dreams into reality and made me what I am today and I dedicated output of this study to my elders and the R&D model proposed was named as Saeed & Nizam model of research & deelopment

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Jam Muhammad Zafar

ABSTRACT

This study titled, "Analysis of current research and development mechanism and preparation of a model for research and development at university level in Pakistan" was conducted with the objectives to (1) analyze the status of research and development at universities in Pakistan, (2), explore the existing research and development practices at universities in Pakistan (3) identify the problems faced by research & development center for its smooth functioning (4) find out the trends of research & development in Pakistani Universities, and (5) propose a model of research & development for Pakistani universities. The study was descriptive in nature; therefore survey approach was considered appropriate and adopted for its completion. The population of the study consisted of research supervisors, chairpersons and/ or heads of teaching departments, deans of faculties, concerned authorities of research & development centers and quality assurance cells from twenty three (23) public sector general universities in Pakistan. The multistage sampling based on three stages was adopted for study. The sample of the study consisted of thirty (30) respondents from each university including ten (10) research supervisors, five (05) chairpersons and/ or heads of teaching departments, five (05) deans of faculties, one (01) head and five (05) officials of the research & development center, and four (04) official working in quality assurance cells taken randomly from the population. Five (05) separate questionnaires were prepared on five point rating (likert) scale according to the objectives of the study were used as research tool. It was finalized after its pilot testing. After finalization of research tool the researcher personally administered research tool and collected data from the respondents. After data collection, it was coded in SPSS version 17 and statistically analyzed. The data analysis revealed diversified and interesting results. In overall 56.7% of the respondents appeared to be satisfied with current status of research & development council, whereas 51% of the respondents reported their dissatisfaction with its role in managing research activities to enhance the productivity. About half (50%) of the respondents affirmed appropriateness of planning process but 52% showed their otherwise opinion about implementation of the planning. Furthermore, the results indicated that 50.6% of the respondents were dissatisfied with the monitoring networks, 49.6 % of the respondents wished technical assistance and 54% disagreed with financial assistance provided by reseach and development council. Likewise, 52.9% desired feedback and 51% of them affirmed lack of coordination

among activities. Half (50%) of the respondents reported their dissatisfaction with outcomes of the research & development process. However, significant majority (75.5%) of respondents were of the view that research & development mechanism faced some problems in universities and institutes of higher education in Pakistan –lengthy process, lack of expertise of different personnel involved in research and development activities, less priority given to R&D, lack of funds, personal liking and disliking, unstable policies, lack of coordination and lack of professional competencies among research and development personnel. Based findings a model of research & development (R & D) was proposed by the researcher for the public sector universities in Pakistan. This study also recommended that research & development mechanism in the public sector universities should be made simple by strengthening research and development councils in Pakistani universities. Research & development process should be given top priority in universities and proper budget should be allocated for research & development activities.

LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BASR	Board of Advanced Studies and Research
CEO	Chief Executive Officer
CRD	Center for Research and Development
CS	Consultancy Service
DOE	Department of Energy
DTI	Department of Trade and Industry
EIA	Energy Information Administration
GB	Government Board
GDP	Grade Point Average
HEC	Higher Education Commission
HOD	Head of Department
HRM	Human Resource Management
IEA	International Energy Agency
KPK	Khyber Pakhtoon Khwah
NEP	National Educational Policy
NPD	New Product Development
NSB	National Science Board
OECD	Organization for Economic Co-operation and Development
ORIC	Office of Research, Innovation and commercialization
PCST	Pakistan Council for Science and Technology
QA	Quality Assurance

R&D	Research and Development
S&T	Science and Technology
SEAB	Secretary of Energy Advisory Board
SPSS	Statistical Package for Social Sciences
STEDEC	Science and Technology Development Center
TIC	Technology Incubation Center
UNDP	United Nations Development Program
UoG	University of Gujarat
URIs	Universities Research Institutes
VC	Vice Chancellor

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CHAPTER 1
INTRODUCTION

The 21st century is known as the century of knowledge, innovations and inventions. Knowledge spurs out of research and higher education institutions particularly universities play a crucial role in genetraing research-base knowledge. Therefore, universitities are regarded as hub of research and knowledge. However, Hussain and Reza (2010) considered a university as an institution of higher education which imparts instruction, conducts research and holds examinations. According to them research appears to be one of the prime objectives of a university for knowledge generation and its dissemination. Hence, conducting research is one of the basic functions of university academia and/ or faculty. University academia and research scholars conduct research to fulfill their academic duties and contribute to treasure of knowledge.

In Pakistan, the Higher education commission (HEC) is regulatory authority of universities and institutions of higher education. Since its establishment in 2002 HEC is playing a vital role to promote research activities in universities and other institutions of higher education (HEC, 2005) throughout the country. Research & development (R&D) is an important element which aims at promoting research culture in universities and institutions of higher education. It facilitates academia in undertaking research to addressing an issue of significance in the given time frame. It boosts up available practices in an effective, technically reliable, feasible and excellent style. In research & development, careful thinking and judgment generate new ideas that are checked hypothetically and proved experimentally. Wilson (2009) predicted that research offers a theoretical mechanism which involves identification of possibilities, whereas development stands for the utilization of discoveries. Research & development charts out a framework through which practicing professionals can establish useful linkage with information and research resources at public sector universities to put knowledge into practice. Research & development play important role to promote quality and productivity of research in the universities. That is why, it demands establishment of research & development centers in the universities; to speed up research activities, to set up consultancy service, to create linkage with national and international academic institutions and industrial organizations. David (2007)

described that research & development personnel actively participate to introduce new research techniques in the universities. They have capability to bring innovations as well as improvements. For example research & development employees and managers know how to transfer a complex teacher adjusting process in a simpler way. They can outperform to promote quality of education through various strategies in accordance with the availability of resources. (UoG, 2012).

According to Gay (2005) the basic purpose of R&D is to sort out new methods of teaching, learning and research by facilitating the universities with teacher training materials, learning materials, media materials, behavioral objectives, modern equipments, latest technologies and management systems to meet detailed specifications. To achieve predetermined levels of excellence, R&D is performed again and again in a cyclic manner. Although, R&D cycle is expensive but the research and development process become valuable and beneficial for the research institutions and industry in coming days.

Issani and Virk (2005) felt that every university is trying its best to establish R&D departments. Every section of R&D is going to thrive for educational development. According to different surveys, the most successful organizations emphasize R&D strategy to provide opportunities to gain long term objectives and goals. A well formulated policy can establish a direct relationship between external resources and internal capabilities and skills. Such types of policies can back up strategy implementation activities which are helpful in basic and applied research to elevate the improvement process and assist robotic and manual type processes. An excellent policy informs about the possible major investment and also tells how to invest on the researcher of private and public sectors.

R&D department also ratifies a link with some other functional departments. A well formulated policy having clear cut objectives can alleviate competition among marketing, accounting and finance, R&D and information system departments at university level. There is usually a fight among decision makers whether to obtain R&D expertise from external institutions (industry, firm and department) or to gain it internally (in house R&D). However, following guidelines can be taken into account while making such decisions.

i. With slow research progress and moderate development rate in house R&D is temporarily preferred to solve the above mentioned problems.

ii. Fast research progress of technology and slow rate of market development may lead to gentry and grown out of use technology. So, in house or external R&D is not a good choice.

iii. If the technology is rapidly changing and market is expected to be growing, it is better to get R&D expertise from specialized external institutions.

iv. If both research progress and development rate are fast and quick, then expertise should be gained from well-established in house department in institutions.

Mission of R&D is commendable, it relates research activities with the needs of countries, universities, institutes and departments. Tijssen (2009) further added that it forms a link between research centers of universities and national industry. It upgrades research centers of universities at national level. It assists fund generation and grants approval from the government for the promotion of projects and general facilities of the universities. R&D coordinates with functional institutes for training and employment of research scholars. It encourages research environment and is also a source of dissemination of research findings.

Over the last three decades R&D-intensive firms are looking more to the universities for solving fundamental problems and producing science-based technologies to fill their corporate innovation pipelines. Many large R&D-intensive enterprises are now for economic reasons increasingly inclined to outsource their basic science to establish close collaborative links with universities and government research institutes wherever they can find the best suitable provider (Brostrom, 2010). This is especially true in the advanced nations with well-developed research and innovation systems.

Most of the academic studies on research collaboration focus on formal relationships at the organizational level, such as the occurrence of joint labs, contract research, university spin-off companies (Audretsch et al., 2010). These relationships are visible and relatively easy to identify, classify and measure. However, a large slice of industry science interactions and relationships take place through informal and indirect channels or through formal and direct channels. These hidden linkages often relate to intangible processes and relationships between individuals that tend to attract much less attention. Geographical and economic factors exert a significant impact on these processes. The conventional economic frameworks that are applied

by R&D experts; include several proxies of science related flows between the universities and industrial sector (OECD, 2010):

- Capital (research income, contract research funds, equipment and facilities, commercialization of research-generated intellectual property);
- Human resources and tacit knowledge (business sector employment of PhD graduates, R&D staff, engineers and technicians);
- Codified knowledge (access to research based documents).

Current scenario of Pakistan is demanding an alignment of R&D activities to meet the desired objectives in the universities. Universities are utilizing their full resources to improve communication climate between R&D personnel and policy makers. Different tasks are being performed by the managers, special assignments are being done and new methods are being introduced to reduce the time period in R&D process. In this connection, universities are creating a sense of cooperation leading to the associative research work and consortia for R&D needs. Lifting the veil of secrecy through communication, collaboration and cooperation has paved the way to flourish marketing of new technologies and given a big boost to the field of educational research (National Education Policy, 2009).

1.1 Rationale

To meet the challenges of the 21st century, there is an urgent need to increase the efficiency and effectiveness of the institutions of research and development for improving the quality of research at universities. This research focuses on different perspectives and practices of research and development. It provides a clear framework which will enable the researcher to analyze the current practices of R&D and suggest new initiatives for improving the research and development mechanism at university level. Researcher's interest with R&D started during research process. During research work for M.Phil degree researcher found that R&D had a significant role in creating research environment at university level in Pakistan. The main function of a university is to create, and disseminate new knowledge. Therefore research is the only activity through which this important function of a university can be undertaken in a purposeful way. In this study the researcher will analyze the perceptions of managers and personnel of R&D, research supervisors, heads of departments, chairmen and deans of faculties

towards the purposes of research and development, the processes of R&D and the challenges faced by R&D department at university level in Pakistan.

1.2 Statement of the Problems

This study was conducted to analyze the existing mechanism of research & development in the universities to see the purposes and processes of implementation, level of success, initiatives and challenges of R&D. This was to be analyzed with research & development domains as; current structure, functions, initiatives, plans and products of research & development in the public sector universities. The statement of the problem was "Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan".

1.3 Objectives of the Study

Objectives of the study were;

- To analyze the status of research and development at universities in Pakistan;
- To explore the existing research and development practices at universities in Pakistan.
- To identify the problems faced by research & development for its smooth functioning;
- To find out the trends of research & development in Pakistani Universities,
- To propose a new model of research & development for Pakistani universities.

1.4 Research Questions

1.4.1 Major Research Question

The major focus of the study was how to analyze the current situation of research & development mechanism and propose a model for research & development at universal level in Pakistan? Further some subsidiary questions were developed to analyze the current situation of research & development in Pakistani universities.

1. How to analyze the status of research & development at universities in Pakistan?
2. What are the existing research & development practices at universities in Pakistan?

3. What are the problems faced by research & development for its smooth functioning?
4. What are the trends of research & development in Pakistani universities?
5. What are the appropriate strategies to improve the existing mechanism of research & development?

1.5 Significance of the Study

This study aimed to analyze the current situation of research & development (R&D) mechanisms in public sector universities of Pakistan. This is also an effort to suggest some practical measures to improve the existing status and to propose a model for research & development at university level. Each university and/ or higher education institution may have a different type of research & development mechanism and their research productivity also depends on that distinctive type of research & development process as R&D centres, Office of Research, Innovations and Commericalization (ORIC), Quality Assurance Cells (QACs), Board of Advance Studies and Research (BASR) and other research related departments at higher education institutions. This study has an insight into the research & development particularly provided in the public sector universities and institutes of higher education in Pakistan. Thus, the study will be helpful to:

- The researcher to gain new insights about the current emerging trends about research & development around the world.
- The researcher to look at the gaps and current issues about research & development in the universities where the research is conducted.
- The universities in general and research sample universities and/ or institutes of higher education in particular to revisit their process of research & development.
- The researcher to analyze the role of the universities in promoting professionals and skillful personnel for the socio-economic development of the country.
- The research supervisors to create research environment of the universities relevance according to national and international needs.
- The managers of R&D to upgrade quality of research in the universities and research institutes according to the national goals.

- Develop a bridge between teaching departments and/ or research centers of the universities and national industry.
- Facilitate the public and private sector with the benefits of research achievements and/or research products in the universities.
- Obtain research grants from the public-private sectors and foreign agencies to promote research projects in universities.
- Generate funds through sponsored projects, companies and consultancy services for further up-gradation of libraries, computer labs and research facilities in the public universities.
- Co-ordinate with functional institutions and research institutes for practical and subsequent employment of research scholars.
- Encourage and activates research activities, mechanism and environment in order to improve the overall quality of teaching and learning in public universities.
- Keep the faculties, departments, research institutes and centers of the universities abreast of latest developments in the respective areas of specialization.
- Disseminate research findings through the conferences, seminars, and workshops.

1.6 Delimitations and Limitations of the Study

The research & development (R&D) centers were established in many public and private sector universities and institutes of higher education in Pakistan. Practically it was not possible for the researcher to study current situation of research & development in all the universities. So this study was confined to only public sector general universities. For that purpose all the departments of public sector universities were selected. It was further delimited to research supervisors, chairmen and/or heads of departments, deans of faculties, directors of research & development centers, chairmen of BASR, and officials of quality assurance cells. Further, this study was comprised of all the public sector universities in Pakistan. As this study analyzed the current situation of research & development mechanism and proposed a model for research & development at university level in Pakistan, therefore main functions of research & development were focused i.e. role of research & development council, the product management, the planning process, the implementation phase, monitoring networks, technical assistance, financial assistance, feedback, coordination, outcomes and challenges of research &

development. Findings of this study can only be generalized to the sample from which the data were collected.

1.7 Research Methodology

The study was descriptive in nature; therefore survey approach was considered appropriate and adopted for its completion. Further, following procedure was adopted for the proposed study.

1.7.1 Population

The population of this study consisted on:

1. Research supervisors, chairmen and/or heads of departments, deans of faculties, and Directors of BASR working in public sector general universities in Pakistan.
2. Directors of research & development centers, directors of ORIC and directors and officials of quality assurance cells in public sector Pakistani universities.

1.7.2 Sampling and Sample

The multistage sampling based on three stages was adopted for study which according to Connolly (2007) serve as the foundation of all statistical tests.

Stage I: Sampled Universities

At stage one sample was taken from all the provinces including Gilgit-baltistan, and federal area of Pakistan. All of the 23 (100%) general universities working in public sector were selected. Medical, Engineering, Agriculture, and Women universities were exclused. Eight (08) public sector universities were selected from the Punjab. Three (03) general universities were selected from Sindh. Seven (07) public sector general universities were selected from Khyber P.K. One (01) general university was selected form Azad Jammu and Kashmir (AJK). One (01) general university was selected from Baluchistan Province. One (01) general university was selected as sample from Gilgit-baltistan and two (02) public sector universities were selected as sample from Islamabad, the Capital of Pakistan. Higher Education Commission (HEC) from Islamabad was also included in the sample. Gay (2005) described that “for smaller population, say N = 100 or fewer, there is little point in sampling, survey the entire population. So hundred

percent is considered appropriate sample size for survey studies having the population size of only ten or twenty".

Stage II: Sampled Faculties/ Departments

At stage two the sections or departments of research and development (R&D), QEC, ORIC and/or alternate system as; natural sciences, social sciences, arts and humanities in all the public sector general universities of Pakistan was taken as a sample. Sample was spread and ideally representative of the population. According to Best and Khan (2003) in survey research the sample should be large enough than experimental researches to represent the population.

Stage III: Sampled Personnel

At stage three, the stakeholders of R&D council such as, vice chancellors, deans, chairmen/ heads of departments, research supervisors, chairmen of BASR, and all officials or personnels working in the research and development (R&D) centers were included in the sample. The size of sample was rationalized as Cohen, Manion and Morrison (2008) and Jyothi (2007) suggested to select form the size of population i.e. "if the population of a research study is 100,000 and above, the size of sample should be 384 as appropriate". The researcher included (690) participants as a sample for this research, which was slightly above to the actual suggested, just to maintain if any error of counting representation accuracy. The sample of the study consisted of thirty (30) respondents from each university including ten (10) research supervisors, five (05) chairpersons and/ or heads of teaching departments, five (05) deans of faculties, one (01) head and five (05) officials of the research & development center, and four (04) officials working in quality assurance cells taken randomly from the population.

Table 1.1

Sample of the study

No.	Title	Punjab	Sindh	Balochistan	Khyber PK	Federal Area	Total
1 2	Population	08	03	01	07	04	23
	Sample	30 x 8 =240	30 x 3 = 90	30 x 1 = 30	30 x 7 =210	30 x 4 = 120	690

1.7.3 Research Instruments

The problem was explored in a quantitative way because the current practices of research and development (R&D) at university level could be analyzed better through the questionnaire than other research tools. The respondents were free to respond about the existing set up of research & development, current practices and functions of research & development, issues and challenges faced by research & development centers of the public sector universities in Pakistan. Therefore, five (05) separate questionnaires were designed for the deans of faculties, chairmen and/ or heads of departments, research supervisors, directors and officials of research & development centers, considering the following;

- Role of research & development (R&D) council to ensure the quality of research.
- Product management of research & development for industry and private sector.
- Planning process of research & development to formulate research policies.
- Implementation phase of research & development on research policies.
- Monitoring networks of research & development for research activities.
- Technical assistance of research & development for research projects.
- Financial assistance of research & development for research process.
- Feedback of research & development process for social sector.
- Coordination between local and international institutions.
- Outcomes of research and development (R&D) mechanism.
- Challenges of R&D mechanism in the general universities of public sector.

1.7.4 Pilot Testing

The research instruments were pilot tested to make the instruments valid and reliable. First of all, the proposal of the study was presented to all the faculty members and researchers in the department of education in the university together with its research instruments for their validation. After the presentation, the question-answer session was held to refine the proposal and the instruments in the light of faculty members' and researchers' comments. The instrument was again distributed to the teachers and researchers in the department after making it initially refined to take it into final shape. Now the research instrument was ready to be launched in the field to test the reliability. There was a pilot study at The Islamia University of Bahawalpur so that the reliability of the instruments may be assured. In the light of comments and feedback

from research supervisors, chairmen of the departments and directors of R&D department for the instruments, there was again some necessary refinement. Thus, the pilot testing was completed to make sure reliability and validity of the research instruments.

1.7.5 Data Collection

The researcher collected data personally from the selected general universities at public sector in Pakistan. The permission to collect the data was obtained from vice chancellors (V.Cs) who were the administrative heads of the universities in Pakistan. The authorization was also sought from the registrars and head of R&D department from where the data was to be collected.

1.8 Data Analysis

The collected data was analyzed with the help of Software Statistical Package for Social Sciences (SPSS) version 17 by using statistical formulas of t-test, correlation, regression, analysis of variance, simple mean, and percentage. The effect of different factors on research and development (R&D) was analyzed item wise and as a whole also. The problems faced by R&D managers and researchers were also analyzed. After obtaining results from the analysis, the findings were reported and on the basis of these findings appropriate measures were suggested and the researcher proposed a model for R&D at university level in Pakistan.

1.9 Research Ethics

Researcher kept in mind the following research ethics while conducting research.

- To take permission for participant in written form, by the research supervisor.
- The participants' willingness to take part in the study before data collection.
- Keeping all the information confidential and disguise participant's identity in records and reports.
- Verifying the accuracy of results through peer reviews.
- Acknowledging those who have aided in investigation, participated in data analysis, or contributed to the preparation of research report.
- No unauthorized copying or manipulation of data.

1.10 Overall Timeline

1. Discussing technical matters with experts. (One Month)
2. Review of related literature. (Two Months)
3. Development of research instruments. (One Month)
4. Gathering initial information about field visits. (One Month)
5. General arrangements. (One Month)
6. Data collection/Field visits. (Four Months)
7. Data feeding and analysis. (Two months)
8. Report writing. (Two Months)
9. Electronic composing and proof reading. (One Month)

1.11 Definition of Terms

- **Fact:** A fact is an observation that represents a universal truth.
- **Concept:** A concept is an idea expressed in symbol or in words. Concepts are used to communicate the real meaning of an observation.
- **Variable:** A variable can be operationalized to observe and measure concepts. A variable can have minimum two values at its most limited form of operationalization.
- **Constructs:** A construct is an abstract representation of a phenomenon and is invented for special theoretical purpose. A construct is an image or idea specifically invented for a given research and / or theory building purpose.
- **Conceptualization:** Conceptualization is the process of taking a construct and refining it by giving it a conceptual or theoretical definition.
- **Conceptual definition:** A conceptual definition is a definition in abstract theoretical terms and it refers to other ideas or constructs.
- **Operationalization:** Operationalization is the process of linking a conceptual definition to a specific set of measurement techniques or procedures.
- **Research and development:** Research and development stands for R&D centers and its alternative system in universities.
- **Descriptive research:** Descriptive research involves collecting the data in order to test hypothesis or to answer questions concerning the current status of the subject of the study.

- **Experimental research:** In an experimental study, the researcher manipulates at least one independent variable, controls other relevant variables and observes the effect on one or more dependent variables.
- **Validity:** Validity is the degree to which a test measures what it is supposed to measure and consequently, permits appropriate interpretation of scores.
- **Reliability:** Reliability is the degree to which a test consistently measures whatever it measures.
- **Hypothesis:** A hypothesis is a tentative explanation for certain behaviors, phenomena or events that have occurred or will occur.
- **Qualitative approach:** Qualitative approaches involve the collection of extensive narrative data in order to gain insights into phenomena of interest.
- **Quantitative approach:** Quantitative approach involves the collection of numerical data in order to explain, predict, and / or control phenomena of interest.
- **Public Sector Universiities:** The universities of government sector are considerd as public sector universities.

1.12 Summary

This chapter introduced the study, objectives of the study, research questions formulated to achieve the specific objectives, delimitations of the study, significance of this study in field and brief procedure, data analysis technique, definition of terms used and a complete structure of the thesis. Keeping in view the significance of the study, relevant research studies conducted in this field and other related literature will be cited in the next chapter.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

A review of the related literature is presented in this chapter in order to discuss the phenonmenon under study in detail.

2.1 Background of Research and Development

The literal meaning of the research and development is to investigate thoroughly. Research and development is a dynamic, careful and organized procedure of investigation designed to explore, interpret and revise the facts. The term research and development is also used to illustrate a complete set of data about a particular matter and is generally connected with the production of science and the scientific method. Research and development is a series of steps, techniques, exercises and events that can be applied to every sphere of life. Every researcher should have some knowledge of the history of original investigation. Leading philosophers, thinkers, scientists and economists had their own styles of conducting research (Bartlett & Burton, 2009).

Research and development provide us knowledge and skills that are needed to solve the real world problems. The term methods of research and development refer to tools and techniques that used to collect analyze and interpret numeric information. On the other hand, the term methodology refers to the theory of how research should be commenced or undertaken. According to Bako (2005) process of research and development is a systematic inquiry whose objective is to provide information to solve problems. It is a systematic and objective process of obtaining, recording and analyzing data for decision making. Research and development is a careful study or investigation of existing facts in order to discover new realities. It is a sound and purposeful hunt for facts and principles that increase the knowledge of a discipline and is a way of answering a-hypothetical questions. The term systematic process suggests that research and development is based on logical relationships, i.e. research involves in explaining the data collection methods, obtaining the meaningful results, explaining any limitation associated with data collection and obtaining and interpreting results.

Research and development (R&D) covers three activities: basic research, applied research and experimental development. Research and experimental development encompasses original work undertaken on an organized basis in order to enhance the accumulation of knowledge, together with knowledge of an individual and society. According to Lauer (2006) this stock of knowledge is used to develop new applications.

In education, R&D plays a key role in developing useful products for use in educational institutions, for instance the school, e.g. teacher training resources, student learning materials, sets of behavioral objectives and an institutional administration means.

In economics, there has been a very noticeable increase in the interest economists has revealed in the course of invention and in industrial research and development. The emergent bulk of research results on productivity turned the attention of economists concerned with economic growth in direction of the process of technological change. A second cause of concern in creation is the varying means that economists are coming to seem at the competitive process i.e. the competition through new products, rather than on direct price competition.

In various industries commercial research and development investment in order to build up new products or new processes. Markets forces give private firms with the incentives are overgenerous for R&D to engage in research and development activities.

Experimental development is organized effort, representation of active facts gained from research and practical understanding, which is engaged to produce fresh resources, goods and plans, to install latest processes, systems and services or to get better considerably those previously formed or installed (Opie, 2004).

The higher education sector generates new knowledge through the performance of research and development and it produces the high qualified people needed to renew itself and to work in other sectors of the economy as they compete in a global market. Higher education is supported by programs from all levels of government, private sector, non-profit organizations and foreign institutions to measure activities of the sector, costs of their performance, sources of their funding, means of monitoring the activities and inform policy decisions and public discourse. One of the most important activities of the higher education sector is performance of research and development (R&D).

Research productivity which is the recognizable output of research is an important concern to the University. The responsibility for assessing the institutional research productivity is hinged on the government and the government agency for regulating higher education and factors that are considered include:

i. Relevance of research to local needs and developments
ii. Local impacts as testified by local end-users
iii. Students applications, quality and innovations
iv. Contributions to local and international journals, books and other publications (Matos, 1999).

Research is strategically important for higher education and national development. The International Commission on Education (1996) for the 21st Century had earlier declared that without higher education institutions and adequate research, no country can achieve real indigenous and durable development. Increasing knowledge through research has become an essential function of higher education for them to be relevant to the development (UNESCO, 1996). Research is strategically important in the universities, as it is necessary to facilitate good quality undergraduate and graduate training, help universities to motivate and empower its researchers and promote the training of future researchers. Today many universities have lost the capacity for doing sustainable research. Shabani (1996) noted that while many countries recognize the importance of the role of research in the socio-economic development process, they failed to give required priority to the development of the various resources needed for research activities. Matos (1999) emphasized that without research universities will lose the capacity to offer first class graduate studies, the capacity to motivate and retain their best brains, the capacity to train the new generation of research fellows and scientists. There are many constraints and challenges facing the development of research in the universities. Trahore (2002) identified the constraints to include, lack of strategic vision in research, lack of infrastructures, lack of political awareness, poor research funding, poor remunerations for research staff among others.

2.2 Nature of Research and Development

Research and development is the systematic investigation towards increasing the sum of knowledge. Knowledge is a product of social processes and this production of knowledge

usually begins when individuals or experts consider that the state of knowledge is insufficient in a particular area. The inadequate knowledge does not satisfy the researcher. The research is never complete till the reality is not found.

Potter (2006) averred that research and development is a systematized effort to gain new knowledge and is an original contribution to existing stock of the knowledge for advancement. The systematic approach concerning generalization and formulation of a theory is also research and development. Often the term research is not the true meaning of the order in our every day use, i.e. the term is used wrongly. What is not research?

i. Collection of facts without clear purpose is not research. The collection of data may be a part of the research process if it is under taken in a systematic way and in particular with a clear purpose.
ii. Reassembling and recording information without interpretation is not considered as research and development. Data is collected from different sources and then assembled in a single document. The sources are listed with the data but there is interpretation of the collected data. The assembly of the data from a variety of sources may be a part of process of the research and development.

Research and development is a cumulative process. It is need to review or modify the earlier beliefs and postulates when new insights are obtained into the problem investigated. It is also an effective process, since the advancement of knowledge; new ideas or products replace the traditional ones.

2.3 Characteristics of Research and Development

Research and development is a process for collecting, analyzing and interpreting information to answer questions. This process must have certain characteristics: it must be controlled, rigorous, systematic, valid, verifiable, empirical and critical (Manion, Cohen and Morrison, 2011).

Controlled – in real life there are many factors that affect an outcome of a particular event which is seldom result of a one to one relationship. Some relationships are more complex than others. Most outcomes are sequel to the interplay of a multiplicity of relationships and interacting factors. In a study of cause and effect relationships it is important to be able to link

the effects with the causes and vice versa. In the study of causation, the establishment of this linkage is essential however, in practice particularly in the social sciences, it is extremely difficult and often impossible to make the link. The concept of control implies that, in exploring causality in relation to two variables, researcher set up the study in a way that minimizes the effects of other factors affecting the relationship. This can be achieved to a large extent in the physical sciences, as most of the research is done in a laboratory. However, in the social sciences it is extremely difficult as research is carried out on issues relating to human beings living in society, where such controls are impossible. Therefore, in social sciences, as researcher cannot control external factors, he attempts to quantify their impact.

Rigorous - the procedures followed to find answers to questions are relevant, appropriate and justified. The degree of rigorous varies markedly between the physical and the social sciences and within the social sciences.

Systematic – this implies that the procedures adopted to undertake an investigation follow a certain logical sequence. The different steps cannot be taken in a random way but some procedures must follow others.

Valid and verifiable - this concept implies that whatever concludes on the basis of research findings is correct and can be verified.

Empirical – this means that any conclusions drawn are based upon hard evidence gathered from information collected form real life experiences or observations.

Critical – critical scrutiny of procedures used and the methods employed are crucial to a research inquiry. The process of investigation must be foolproof and free from any drawbacks. The process adopted and the procedures used must be able to survive critical scrutiny. Research and development has a number of steps.

i. Systematic collection of data
ii. Systemic interpretation of data
iii. To find out things there should be a clear purpose.

There is a multiplicity of possibly purposes for research and development suggested by discovered things. There purposes may be describing, explaining, understanding, criticizing and analyzing. Thus search for knowledge through objective and systematic method of finding

solution to a problem is research and development. The term 'research' refers to the systematic method consisting of explaining the problem, formulating a hypothesis, collecting the data and analyzing it and reaching certain conclusions. These conclusions may be the solutions to a particular problem, answer to a question or number of questions and certain generalizing for some theoretical formulation (Fox, Martin & Green, 2007).

Research is not a remedy but no remedy can be discovered without research i.e. research and development will not solve a problem rather it would help in studying the problem to draw conclusions which would help in decision making.

2.4 Purposes of Research and Development

The main purpose of research and development is to extend knowledge and the ultimate goal is to discover causal relationships between variables. The objectives of research differ with the nature of studies and goals to be achieved. Each research study has its own specific purpose. The research objectives fall into following four broad categories:

i. Exploratory or formative research introduces an increased informality with a fact or to attain new happening into it.
ii. Descriptive research is associated to expose precisely the uniqueness of a specific entity, situation or a collection.
iii. Diagnostic research is designated to find out the frequency with which something happens.
iv. Hypothesis testing research refers to test a hypothesis of cause and effect relationship between variables.

Adams (2007) explains that an economist may deal with the increasing prices of a group of commodities or to solve any current micro and macroeconomic problem. There may be some research if an increase in the knowledge is required. There are five types of research objectives which are reasonable in terms of definitions of research and development.

i. **Reporting:** Reporting may be quite simple and data may promptly be available at the most elementary level, an investigation may be made only to provide collection of some data in this illustration statistics.

ii. **Description:** Description is a higher order of an inquiry objective. It tries to explore the answers to the questions of who, what, when, where and how. In business research, descriptive studies are popular due to their usefulness.

iii. **Explanation:** Explanation goes further than descriptive and details the causes for the facts that the descriptive study only observed. At this stage, the researchers utilize assumptions or at least hypothesis to explain the factors that influence a certain fact to happen.

iv. **Prediction:** Prediction is the fourth level of inquiry. Prediction is established in studies managed to assess specific courses of action. Prediction has proved to be of immense value in improving various aspects of civilization.

v. **Control:** Control is the final level of inquiry which is a rational result of prediction. Researcher would like to control the facts once he explain and predict them. There are many cases when developing a research objective is a more desirable way to focus on a research project. When the goal of the research is descriptive rather than explanatory, a statement of an objective can lead to the research.

2.5 Importance of Research and Development

Research and development (R&D) is a systemic process which is being done for discovery of preferred data or information and the improvement/growth of a structured body of knowledge. Research is a unique involvement to existing collection of knowledge making for its development. According to Moed (2005) research and development means knowing the unknown and it has a great importance for solving different types of problems which can relate to any area like social, business, economic, industry and administration faced by human beings. In recent era research and development has played a vital role of industrialization, improvement process, and personal and civic institutions development. At this time research has become an essential part of governmental and executive process for the solution of recognized problems. In short, research affects the economic, business, social and so many other developments in different areas in the society at large scale. These effects can be cited by observing changes in the following areas.

2.5.1 Need of R&D for National Development

Use of research in the universities and research institutions is essential for the development/progress of a nation. Research and development is a great source to explore new horizons for problem solving, so it plays a vital role for the improvement of economy, business and social life of the public in any country.

2.5.2 Business Development

Research and development is a main cause in source expansion. Business systems are neither well organized nor successful or adequate enough to improve business progression to the level that they make extensive social, economic and scientific/industrial assistance in developing nations. One main cause for this situation is that the phrase 'business development' is not comprehended practically and its affiliation is also not completely defined for resource enlargement. Ritu (2007) states that trade/business enlargement denotes extension and enhancement in the figure of fiscal, commerce, mineral, agricultural and/or service association having inexpensively and morally sound aims. Well organized use of resources to accomplish principles, goals and the existence of ethically sound business objectives would be a required state for business improvement.

2.5.3 Economic Development

Economic research has provided the foundation for various businesses, social and other technological studies especially in Pakistani context. According to Shank and Brown (2007) deficiency of data is the general objection of businessman, bankers, educators, health experts and welfare workers for making inexpensively workable plans to increase the average of income of the people and encourage them for contribution in economic development instead of a huge figure of economic research studies. To understand the problems of populations of various areas of the state, further research studies are essential. International situation of development must require methodological research in all the fields.

2.5.4 Agriculture Sector

Research and development process in agriculture sector is enhancing the economic benefits for the farmers. Now a day production of the crops is greatly increasing through easily

provision of agriculture loan, proper supervision of the agriculture farms, use of latest technologies to cultivate-harvest the crops and treating the agriculture farming as a commerce project (Mishra, 2005).

2.5.5 Industrial Sector

Research leaning to science is valuable when connected with industrial research and development i.e. enhancing industrial amenities, helping exporters on judging constant/steady marketplace for Pakistani manufactures.

2.5.6 Social Development

Well informed and educated people of a country use organized and reliable data as a source for making decisions to develop their living conditions in a continuous process called social development. For the solution of social problems and better understanding, many sociologists and other groups of social scientists of various countries have accomplished a large number of research studies, which have great importance. Such research studies are also required in Pakistan which possibly will facilitate us in understanding the levels of social problems and many different aspects of our social structure. The preparation of R&D strategy is required for the recognition of current social problems and their categorization (Rashid, 2010).

In Pakistan, the process of social improvement is very slow due to low standards of education, deprived economic strategy by administration, low medical facilities and so many other factors. For understanding problems of social life, some issues are so helpful which are described by researchers as: analyzing the effects of industrial growth on social life, observing public views about education and health, observing education problems at various stages, analyzing the effects of social veracities on trade and industry, life and investigating public views about national, regional and restricted administration strategies.

2.5.7 Commercial Benefits of Research and Development

The research and development gives new and technical ideas about production, advertisement and enhancing sales of products and services. Standardized goods and better services can help to boost sales, open new markets in various areas, increasing profits, achieving status, developing research product and magnetize exterior sponsorships and locating new

investors. It helps in decreasing expenses, increasing the value of offer, acquiring manufactured goods rapidly to marketplace. Picciano (2007) describes that research may take less substantial remuneration, possibly in form of information about market that could be valuable for business in future but does not have an urgent profitable request and intellectual property produced by investigation, advancement and work of art.

2.6 Paradigms of Research and Development

There are two main paradigms that form the basis of research in the social sciences. The crucial question that divides the two is whether the methodology of the physical sciences can be applied to the study of social phenomena. The paradigm that is rooted in the physical sciences is called the systematic, scientific or positivist approach. The opposite paradigm has come to be known as the qualitative, ethnographic, ecological or naturalistic approach. The advocates of the two opposing sides have developed their own values, terminologies, methods and techniques to understand social phenomena. However, since the mid–1960s there has been a growing recognition that both paradigms have their place. According to Singh (2007) the research purpose should determine the mode of inquiry, hence the paradigm. To indiscriminately apply one approach to all the research problems can be misleading and inappropriate.

A positivist paradigm lends itself to both quantitative and qualitative research. Researcher can conduct qualitative research within the positivist paradigm. However, distinction between qualitative data on the one hand and qualitative research on the other as the first is confined to the measurement of variables and the second to the use of methodology.

The supervisor believes that no matter what paradigm the researcher works within, he/she should follow to certain values regarding the control of bias and the maintenance of objectivity in terms of both the research process itself and the conclusions drawn. It is the application of these values to the process of information gathering, analysis and interpretation that enables it to be called a research process.

2.7 Qualitative and Quantitative Approaches of Research

Qualitative approach of research and development has special value for investigating complex and sensitive issues. For example, if someone interested in how people view topics like

God and religion, human sexuality, the death penalty, gun control and so on, he would be hard pressed to develop a quantitative methodology that more than summarizing a few key positions on these issues. While this does have its place (and its done all the time), if researcher really wants to try to achieve a deep understanding of how people think about these topics, some type of in depth interviewing is called probably.

Freebody (2003) explains that qualitative approach of research and development enables to explain the phenomena of interest in immense detail, in the unique words of the research participants. Actually a number of best qualitative researches are frequently published in book form, frequently in a fashion that more or less comes up to narrative story.

Walford (2001) describes that quantitative research excels at summarizing large amounts of data and reaching generalizations based on statistical projections. Qualitative research excels at "telling the story" from the participant's viewpoint and providing the rich descriptive detail that sets quantitative results into their human context.

In marking, quantitative research answers-questions that start with how many or how much while qualitative research speaks to issues that deal with why, how, what and in what way. It provides insights which help clients to see their products, services and ideas through the eyes of their target audience. On the other hand, qualitative research eases the decision making process for the clients by providing an in depth picture of the motivations and preconceptions or misconceptions of consumers. Quantitative research generally involves surveys while qualitative studies rely on observation or unstructured conversations with customers.

Quantitative and qualitative research methodologies differ in the philosophy that underpins their mode of inquiry as well as, to some extent, in methods, models and procedures used. Though the research process is broadly the same in both quantitative and qualitative research are differentiated in terms of the methods of data collection, the procedures adopted for data processing and analysis, and the style of communication of the findings. If research problem lends itself to a qualitative mode of inquiry, researcher is more likely to use the unstructured interview or observation as a method of data collection. When analyzing data in qualitative research goes through the process of identifying themes and describing what he has found out during interviews or observations rather than subjecting data to statistical procedures (Yates, 2004).

2.8 Limitations of Research and Development

Chaudhary (2010) describes following limitations of the research and development;

2.8.1 Limits of Social Research

Limitations on research are natural conditions that confine the range of a study and can influence its results. The restrictions that researchers impose personally, in order to contract the scope of a study are called delimitations. There are different types of limits on research.

2.8.2 Limits Imposed by Government

The pressure of government and authoritative groups in different areas is very powerful on researcher. The government controls over social research through censorships in non-democratic societies.

2.8.3 Limits by Politicians

In under developed countries, the political influences are very strong. In many situations, politicians use their power to limit research as they think that the particular area of research is controversial to them.

2.8.4 Banned Research

Research and development is banned due to social issues such as stem cell research or cloning. This type of banning closes the road to medical advances forever. In these situations researchers may perhaps work underground, away from the eyes of the government.

2.8.5 Financial Limitations

When the government is funding the research and development, it can have at least some regulations over researchers, with more federal control. For instance when a student gets a scholarship for PhD from Higher Education Commission of Pakistan, the student then has to follow the policy of HEC. While limiting research may hinder or prevent progression, the government has more of a say in the research. Researchers would be able to continue their work with government support. In addition, they would be held accountable for practices would be more visible to the public.

2.8.6 Privately Sponsored Research

Privately funded research could guide to shady practices. Sometimes researchers utilize their results of research to earn money, instead of common good of the society. They sell their findings of research to the black market or enemy country. The government speaks out that what is illegal. Researchers may choose to work illegally. Secret research is not regulated by the government, so the possibility arises of unethical practices. Researchers carry out their research, without having to answer to the public.

2.8.7 Time Limitations

Time restriction plays a vital role in limits research. For example the students have to complete their research within a specified period of time, so they try to choose only a topic which they can finish on time.

2.8.8 Limitations in Technical Development

Lack of technical knowledge is a limitation on research. Technical development can accelerate the research. For example, virtual environments are limited by the technical complexity required to build them. Technical restrictions in the simulation apparatus used to experience virtual environments.

2.8.9 Confidentiality of Data

Confidentiality of data is another limitation on research. Confidentiality pertains to the treatment of information that an individual has disclosed in a relationship of trust and with the expectation that it will not be disclosed to others without permission in ways that are inconsistent with the understanding of the original disclosure.

2.9 Limitations of Quantitative Research

According to Walford (2001) there are numerous limitations of quantitative research. Before making a decision to conduct audience research, a researcher must think of some vital limitations which are:

- Quantitative research approaches can take a number of weeks to many months to plan, execute, and evaluate. Therefore, widening the time required to fit in audience based

research into program planning. These approaches are resource intensive. A choice to tackle this limitation is to insert questions to ongoing omnibus marketing and opinion sampling surveys carry out by commercial entities.

- Quantitative research needs skills in sampling design issues, sampling methodologies, survey designing, statistical techniques, etc. Quantitative research also requires that all these techniques and issues are applied in a communications research perspective. The degree to which these expertise are used in scheduling and carrying out a quantitative research find out both the quality of the data and their generalizability to the whole population.
- The construction of a large number of surveys confines the number of questions that can be inquired. Moreover, the range of answers that respondent can give, the time every respondent has to answer questions and any type of interactive process with or among respondents also depends on the structure of the survey or questionnaire. Due to these reasons the data are limited in the amount and richness.

2.10 Limitations of Qualitative Research

Freebody (2003) explains that the findings of qualitative research cannot be directly generalized to the larger population being studied. This is the most important limitation of qualitative research. When the definition of the population is broad (e.g., elderly women), this is particularly true. There are several reasons for this limitation.

- Sometimes the participants are not selected randomly, this introduces a selection bias. The researcher should find out whether and how the individuals might be somewhat different from the population a large or the population segment of interest.
- The small number of participants in a typical qualitative research study is another reason. The too small number of participants may not be representative of the population. For instance, the focus groups or interviews are conducted only with a few members of a target audience. While the total population are in millions. Therefore, these few members of focus group or interview cannot meet the statistical assumptions to plan the results accuracy or reliability to the total audience.

- The conclusions drawn by the researchers about the actual occurrence of specific concerns, attitudes, or beliefs among the target audience is a limitation because the researcher bias may creep into these conclusions.
- In many situations, participants do not want to expose themselves or try not to present themselves negatively. They express their views that are consistent with social standards. This is known as social desirability bias. This bias may lead respondents to self censor their actual views, especially when they are in a group setting.
- The skill and experience of the researcher is another reason of this limitation. The dress, manner and verbal communication used by the interviewer may well have effect on the quantity and quality of information given by respondents. Therefore, the quality of the data collection and the results are highly dependent on the expertise of the interviewer and on the firmness of the analysis.

2.11 Research and Development a Way of Examining the Practices

Research and development is undertaken within most professions. More than a set of skills, research is a way of thinking, examining critically the various aspects of day to day professional work, understanding and formulation of guiding principles that govern a particular procedure, and developing and testing new theories for the enhancement of the research practices. It is habit of questioning, what is happening and a systematic examination of the observed information to find answers, with a view to instituting appropriate changes for a more effective professional service (Kumar, 2005).

2.12 Applications of Research and Development

Hamersley (2007) describes that research and development techniques applied entirely in nature are used primarily for professional consolidation, understanding, development and advancement. As just mentioned, the questions that can be raised about any profession which were directly or indirectly provide a service such as health (nursing, occupational therapy, physiotherapy, community health, health promotion and public health), education, town planning, library studies, psychology, business studies and social work can be considered from four different perspectives:

1. The services provider;

2. The service administrator, manager and/ planner;
3. The service consumer, and
4. The professional

It is impossible to list all the issues in every discipline but this framework can be applied to most disciplines and situations in the humanities and the social sciences to identify from the viewpoint of the above perspectives, the possible issues in researcher owned academic field.

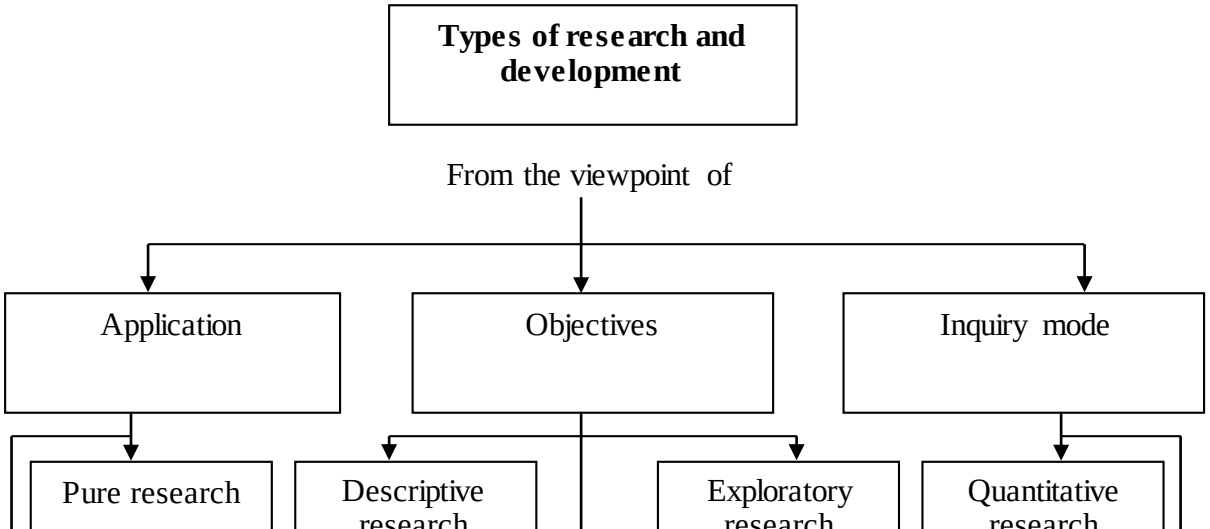
2.13 Classifications of Research and Development

Research and development can be classified from three perspectives

- Application of the research study;
- Objectives in undertaking the research;
- Inquiry mode employed.

These three classifications are not mutually exclusive – that is a research study classified from the viewpoint of 'application' can be classified from the perspectives of 'objectives' and 'inquiry mode employed'. For example, a research project may be classified as pure or applied research (from the perspective of application), as descriptive correlation, explanatory or exploratory (from the perspective of objectives) and as qualitative or quantitative (from the perspective of the inquiry mode employed) (Gorard, 2001).

Figure 2.1: *Research in Education*



Source: Best and Kahn (2006).

2.13.1 Application

Research is concerned with the development, examination, verification and refinement of research methods, procedures, techniques and tools that form the body of research methodology. Pure research includes developing a sampling technique that can be applied to a particular situation, developing a methodology to assess the validity of a procedure, developing an instrument, say, to measure the stress level in people, and finding the best way of measuring people's attitudes. The knowledge produced through pure research is sought in order to add to the existing body of knowledge of research method.

Most of the research in the social sciences is applied. In other words the research techniques, procedures and methods that form the body of research methodology are applied to the collection of information about various aspects of a situation, issue, problem or phenomenon so that information gathered can be sued in other ways such as for policy formulation, administration, and the enhancement of understanding of a phenomenon (McEwan, 2003).

2.14 Objectives of the Research Studies

If researcher examines a research study from the perspective of its objectives, broadly a research endeavor can be classified as descriptive, correlational, explanatory or exploratory. A study classified as descriptive research attempts to describe systematically a situation, problem, phenomenon, service or program, or provides information about say, the living conditions of a community, or describes attitudes towards an issue. The main emphasis in a correlational research study is to discover or establish the existence of relationship/association/ interdependence between two or more aspects of a situation. Explanatory research attempts to

clarify why and how there is a relationship between two aspects of a situation or phenomenon. The fourth type of research, from the viewpoint of the objectives of a study, is called exploratory research. This is when a study is undertaken with the objectives either to explore an area where little is known or to investigate the possibilities of undertaking a particular research study. When a study is carried out to determine its feasibility it is also called a feasibility study or pilot study. It is usually carried out when a researcher wants to explore areas about which she has little or no knowledge (Manion, 2011).

Table 2.1

Types of research studies from the viewpoint of objectives

Types of research	Main theme	Aim	Examples
Descriptive research	To describe what is prevalent	**To describe what is prevalent regarding:** • A group of people • A community • A phenomenon • A situation • A program • An outcome	• Socioeconomic characteristics of residents of a community • Attitudes of students towards quality of teaching • Types of service provided by an agency • Needs of a community • Sale of product • Attitudes of nurses towards death and dying • Attitudes of workers towards management • Number of people living in a community • Problems faced by a new immigrants • Extent of occupational mobility among immigrants • Consumers likes and dislikes with regard to a product • Effects of living in a house with domestic violence • Strategies put in place by a company to increase productivity of workers.

Correlational research	To ascertain if there is a relationship	**To establish or explore:** • A relationship • An association • An interdepen-dence	• Impact of a program • Relationship between stressful living and incidence of heart attacks. • Impact of technology on employment • Impact of maternal and child health services on infant mortality • Effectiveness of a marriage counseling service on extent of marital problems. • Impact of an advertising campaign on sale of a product • Impact of incentives on productivity of workers. • Effectiveness of an immunization program in controlling infections disease
Explanatory research	To explain why the relationship is formed	**To explain:** • Why a relationship, association or interdependence exists • Why a particular event occurs	• Why does stressful living result in heart attacks? • How does technology create unemployment / employment? • How do maternal and child health services affect infant mortality? • Why do some people have a positive attitude towards an issue while others do not? • Why does a particular intervention work of some people and not for others?

	• Why do some people use a product while others do not? • Why do some people migrate to another country while others do not? • Why do some people adopt a program while others do not?

2.15 Inquiry Mode of Research and Development

The third perspective in our topology of research and development concerns with the process researcher adopts to find answers to research questions. Broadly speaking, there are two approaches to inquiry, the structured approach and the unstructured approach. According to Bartlett (2009) the structured approach to inquiry is usually classified as quantitative research and unstructured as qualitative research. In the structured approach everything that forms the research process – objectives, design sample, and the questions that you plan to ask of respondents is predetermined. The unstructured approach, by contrast, allows flexibility in all these aspects of the process. The structured approach is more appropriate to determine the extent of a problem, issue, or phenomenon, and the unstructured, to explore its nature. Both approaches have their place in research. Both have their strengths and weaknesses. Therefore you should not 'lock' researcher self into solely quantitative or qualitative research. The choice of a structured or unstructured approach and of a quantitative or qualitative mode of inquiry should depend upon:

- Aim of researcher inquiry – exploration, confirmation or quantification.
- Use of the findings – policy formulation or process understanding.

The distinction between quantitative and qualitative research, in addition to the structured/unstructured process of inquiry, is also dependent upon some other considerations which are briefly presented in the above table.

The study is classified as qualitative if the purpose of the study is primarily to describe a situation, phenomenon, problem, or event. The information is gathered through the use of variables measured on nominal or ordinal scales (Qualitative measurement scales), and the

analysis is done to establish the variation in the situation, phenomenon or problem without quantifying it. The description of an observed situation, the historical enumeration of events, an account of the different opinions people have about an issue, and a description of the living conditions of a community are examples of qualitative research.

On the other hand, the study is classified as a quantitative study if you want to quantify the variation in a phenomenon, situation, problem or issue, if information is gathered using predominantly quantitative variables, and if the analysis is geared to ascertain the magnitude of the variation.

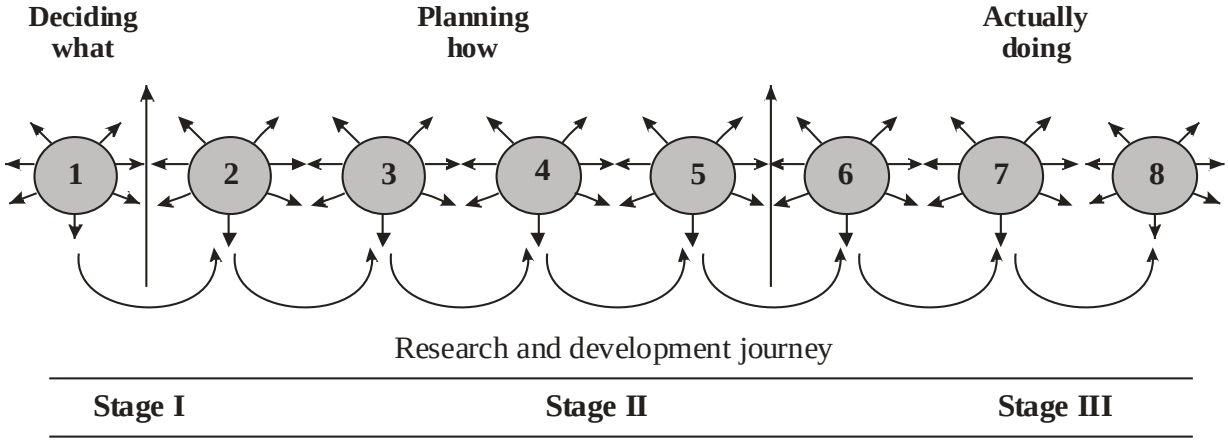
2.16 The Research and Development Process: an Eight Step Model

Research methodology is taught as a supporting subject in several ways in many academic disciplines at various levels by people committed to a variety of research paradigms. Though paradigms vary in their contents and substance, their broad approach to inquiry, in the author's opinion, is similar. Such ideas have also been expressed by Festinger and Katz (1976), who in the foreword of their book Research Methods in Behavioral Sciences say that 'although the basic logic of scientific methodology is the same in all fields, its specific techniques and approaches will vary, depending upon the subject matter'. Therefore, the model developed here is generic in nature and can be applied to a number of disciplines in the social sciences. It is based upon a practical and step by step approach to a research inquiry and each step provides a smorgasbord of methods, models, and procedures (Singh, 2007).

Suppose researcher wants to go out for a drive. Before researcher starts, researcher must decide where he/she wants to go and then which route to take. If researcher knows the route, researcher does not need to consult a street directly. But if researcher does not, researcher would need to use one researcher problem and will get compounded if there are more than one route. Researcher need to decide which one to take. The research process is very similar to undertaking a journey. As with researcher drive, for a research journey there are also two important decisions to make. The first is to decide what researcher wants to find out about or, in other words, what research questions researcher wants to find answers to have decided upon researcher research questions or problems, researcher then need to think how to go about finding their answers. The path to finding answers to researcher research questions constitutes research methodology. Just as there are posts along the way to researcher travel destination, so there are practical steps

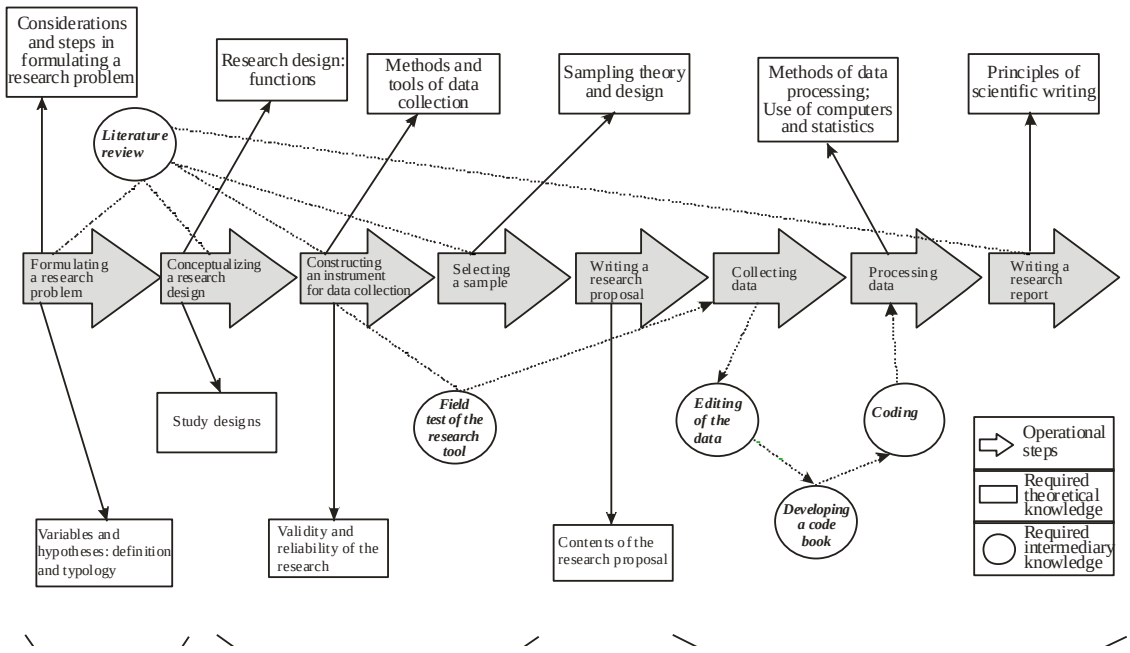
through which researcher must pass through in his / her research journey in order to find the answers to research questions. With experience researcher can change it. At each operational step in the research process researcher is required to choose from a multiplicity of methods procedures and models of research methodology which will help the researcher to best achieve objectives. This is where researcher knowledge base of research methodology plays a crucial role.

Figure 2.2: *The journey of research and development touch each post and select methods and procedures appropriate for researcher journey.*



Source: Research methodology and data presentation Singh and Bajpai (2007).

Figure 2.3: *The process of research and development*



Source: Research methodology: a step by step guide for beginners Ranjit Kumar (2005).

This diagram revolves around the theoretical knowledge required to undertake each operational step and follows the same sequential progression as is needed to undertake a research investigation. For each operational step, the required theoretical knowledge is further organized, in different chapters, around the operational step to which, in the authors opinion, it is most logically related. Again, for a beginner, it is important to study this diagram to relate the theoretical knowledge to the operational steps (Kumar, 2005).

The following sections of this chapter provide a quick glance at the whole process to acquaint with the various tasks need to undertake to carry out researcher study, thus giving some idea of what the research journey involves.

2.17 Steps in Planning a Research Study

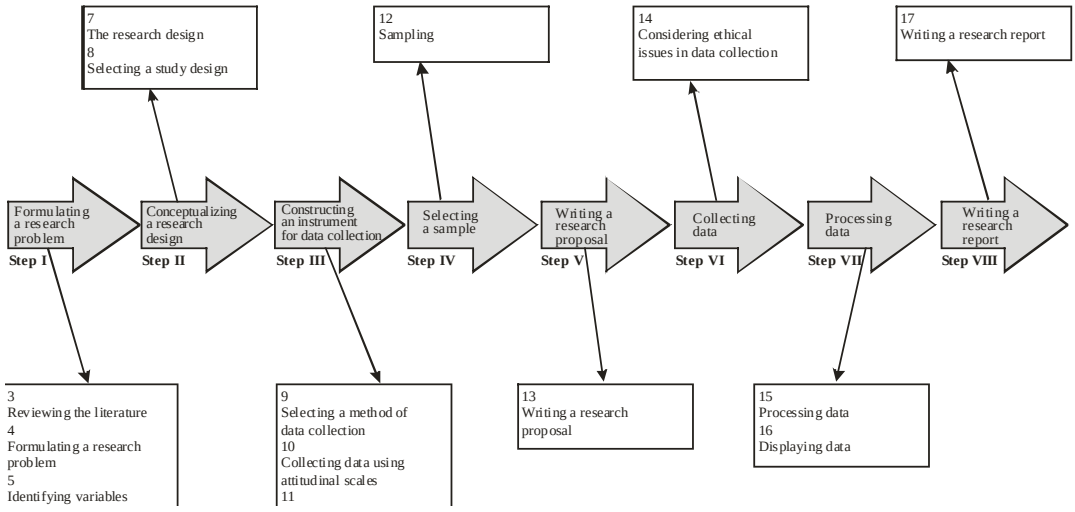
2.17.1 Step I: Formulating a Research Problem

Formulating a research problem is the first and the most important step in the research process. A research problem identifies the destination: it should tell about research supervisor and readers what the intentions behind a particular research are. The more specific and clearer are the better, as everything that follows in the research process study design, measurement procedures, sampling strategy, frame of analysis and the style of writing of researcher dissertation or report is greatly influenced by the way in which research problem is formulated. Hence, researcher should give it considerable and careful thought at this stage. The main function of formulating a research problem is to decide what researcher wants to find out about.

2.17.2 Step II: Conceptualizing a Research Design

An extremely important feature of research is the use of appropriate methods. Research involves systematic, controlled, valid and rigorous exploration and description of what is not known and establishment of associations and causation that permit the accurate prediction of outcomes under a given set of conditions. It also involves identifying gaps in knowledge, verification of what is already known, and identification of past errors and limitations. The strength of what find largely rests on how it was found.

Figure 2.4: *Operational steps of methodology of research and development*



Source: Research methodology: a step by step guide for beginners Ranjit Kumar (2005).

2.17.3 Step III: Constructing an Instrument for Data Collection

Anything that becomes a means of collecting information for research study is called a 'research tool' or a 'research instrument'. For example, observation forms, interviews schedules, questionnaires and interview guides are all classified as research tools.

The construction of a research tool is the first 'practical' step in carrying out a study. Researcher will need to decide how researcher is going to collect data for the proposed study and then construct a research instrument for data collection.

2.17.4 Step IV: Selecting a Sample

The accuracy of research findings largely depends upon the way researcher selects the sample. The basic objective of any sampling design is to minimize, within the limitation of cost, the gap between the values obtained from sample and those prevalent in the population. The underlying premise in sampling is that, if a relatively small number of units is selected, it can

provide with a sufficiently high degree of probability a fairly true reflection of the sampling population that is being studied.

2.17.5 Step V: Writing a Research Proposal

Now, step by step, researcher has done all the preparatory work. Next is to put everything together in a way that it provides adequate information, for research supervisor and others, about research study. This overall plan tells a reader about research problem and how the researcher is planning to investigate. It is called a research proposal. Broadly, a research proposals main function is to detail the operational plan for obtaining answers to research questions. In doing so it ensures and reassures the reader of the validity of the methodology to obtain answers accurately and objectively.

2.18 Steps in Conducting a Study

2.18.1 Step VI: Collecting Data

Having formulated a research problem, developed a study design, constructed a research instrument and selected a sample, researcher then collects the data from which researcher draws inferences and conclusions for the research study. Many methods could be used to gather the required information. As a part of the research design, researcher decided upon the procedure wanted to adopt to collect research data. At this stage researcher actually collects the data. For example, depending upon researcher plans, researcher might commence interviews, mail out a questionnaire, conduct group discussions or make observations. Collecting data through any one of the methods may involve some ethical issues.

2.18.2 Step VII: Processing Data

The way to analyze the information researcher collected largely depends upon two things:

1. Type of information descriptive, quantitative, qualitative or attitudinal.
2. The way researcher wants to communicate findings with readers.

There are two broad categories of report: quantitative and qualitative. As mentioned earlier, the distinction is more academic than real as in most studies, it is needed to combine quantitative and qualitative methodologies. Nevertheless, there are some solely qualitative and

some solely quantitative studies. In addition to the qualitative quantitative distinction, it is equally important for data analyzing that researcher considers whether the data is to be analyzed manually or by a computer.

2.18.3 Step VIII: Writing a Research Report

Writing the report is the last and, for many, the most difficult step of the research processes. The report informs the world what has been done, discovered, and conclusions drawn from the research findings. If the researcher is clear about the whole process, he/she will also be clear about the way to write the research report. Research report is written in an academic style and can be divided into different chapters and or sections based upon the main themes of study.

2.19 The Work Flow of Research and Development

The work flow of research and development depend on the functions associated with the department. There are several major functions such as follows:

1. Research and development for new products
2. Product maintenance and enhancement
3. Quality and regulatory compliance

2.19.1 Research and Development for New Products

David (2007) describes that the primary function of R&D department is to conduct researches for new products and develop new solutions. Each product has a finite commercial life. In order to be competitive, the universities or research institutes continuously need to find ways for new technological development of product range. When researching and developing new products, both the R&D managers and their staff take responsibility of performing the following key tasks:

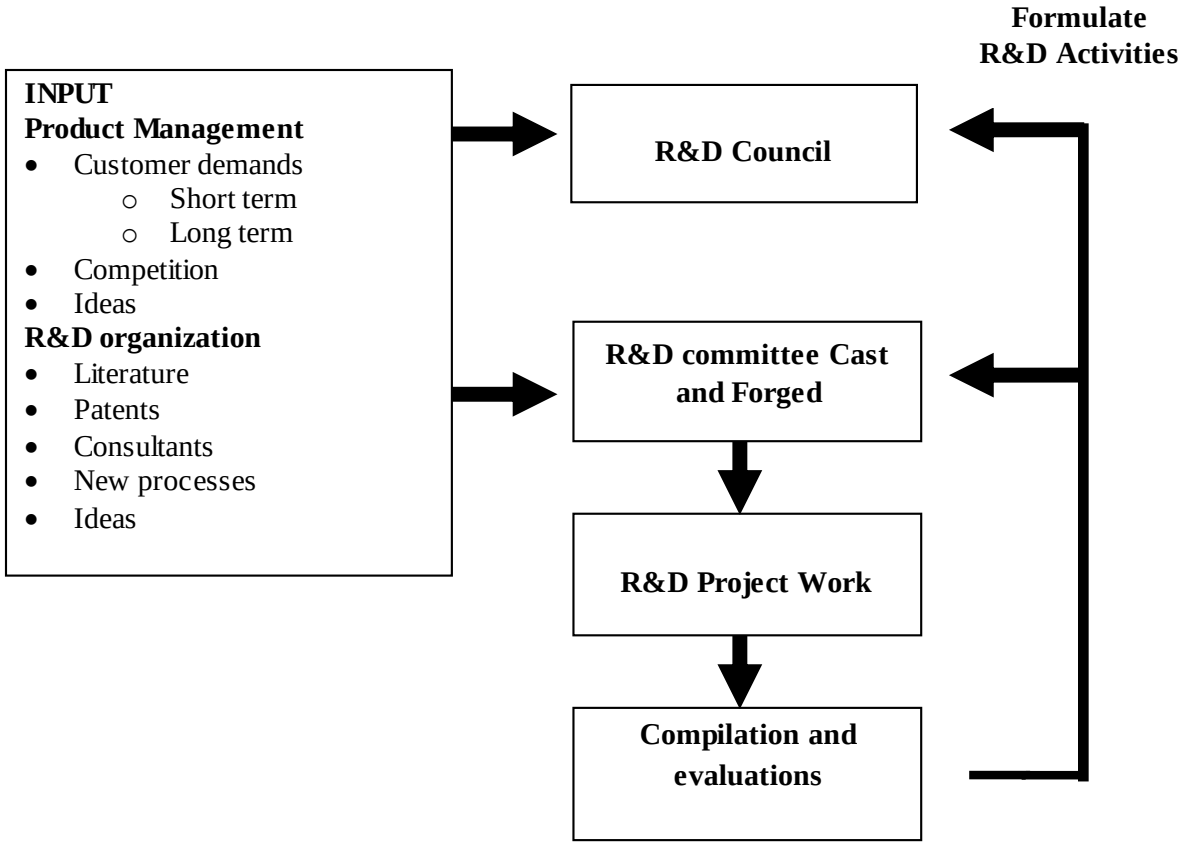
1. Ensuring the new product meets the product specification
2. Researching the product according to allocated budget
3. Checking if the product meets production costs
4. Delivering products in time and in full range
5. Developing the product to comply with regulatory requirements and specified quality levels

The R&D managers can organize the workflow for research and development of new products. Their task templates can be used for researches of typical products as well as for a new product specification development. Manager allows adding new workflow with specific task statuses (Potter, 2006).

2.19.2 Product Management and Enhancement

Probably, this is the most important of R&D department. It helps to keep the university's product range ahead of the competition and enhance the life of products. Existing products should be maintained ensuring that they can be manufactured according to desired specifications. For instance, an element required for an existing product may become obsolete. When this situation happens, the department is expected to discover an alternative quickly so that the product manufacturing is not postponed. At the same time, the commercial life of a product may be extended through enhancing it in some way like giving it extra features, improving its performance, or making it cheaper to manufacture, etc. Many companies maintain and enhance their product range, especially those ones which are engaged in microelectronics sector. The task manager allows fulfilling this function through controlling each stage of product manufacturing and monitoring task performance. The R&D managers can assign tasks to engineers and technicians who are responsible for maintaining the product and finding new components for its improvement (David, 2007).

Figure 2.5: *General R&D Model*



Source: http://www.google.com, dated 15-01-2012.

2.19.3 Quality and Regulatory Compliance

Quality is a major issue and R&D department is deeply involved in ensuring quality of new products and attaining the required levels of regulatory requirements. In cooperation with the quality assurance department, R&D department develops a quality plan for new products. When a company sells a product on the marketplace, it should keep regulatory compliance with legal requirements. For example, a product sold in the European community should comply with the relevant European directives. By introducing the tasks manager into the workflow, the R&D department can establish effective cooperation with QA department through sharing tasks and projects aimed to development of quality plans for new products. The R&D managers can attach regulatory documents to the tasks and share them between engineers, technicians and scientists (Walford, 2001).

2.19.3.1 Planning the Research Project

In order to stay above rivals, a company needs to ensure that its products and solutions are enhanced and updated on a regular basis and have all the functionalities as expected by the customers. Most organizations, especially software development companies, focus their spending on research and development because they understand that innovative products and services are key factors to the revenue growth. At the same time, they also know it is equally crucial to be focused on the existing products maintenance is vital to ensure that revenue from the production and sales of existing product range are not lost and customers are not disappointed with it. Product improvement allows companies to increase commercial life of products and keep them ahead of the competition by giving extra features, improving its performance or making it cheaper to produce, etc.

Best and Khan (2006) are of the view that R&D department is responsible for planning tasks for product maintenance and improvement. The planning process is based on conducted marketing researches, received customer requests and own researches. The project product maintenance and improvement is aimed to find out what should be added and fixed in current product version basing on customer feedback and researches. The project may have such tasks:

1. Gather research and feedback data
2. Develop improvement concept
3. Create specification and prototype
4. Test prototype through multiple iterations
5. Approve prototype
6. Create new modified product
7. Test product through customer feedback
8. Make additional amendment to product
9. Launch modified product
10. Build and submit report

During this project R&D team looks for solution which would meet customer needs and increase product value. The team leader should carefully plan each task in the project which could be reached by using the task manager. The software allows to set task due dates and create the project schedule. The team leader can plan project for a week or a month and use daily

organize to distribute workload more effectively. All documentation, images, requests and tables needed for the project planning could be attached to the tasks as files or hyperlinks.

Keep the project on track during the development process the team leader should manage the team performance. If the project is overdue or delayed for some reason, the company will lose profits, and customer satisfaction may decline as the new product is postponed. That's why it is vital for the company that the product improvement project will be completed on time and without delays. The task manager allows ensuring the project fulfillment according to schedule by tracking task progress and controlling employee performance. The program shows task progress in real time and the team members can quickly communicate with each other. The task manager allows users to set task reminders which significantly simplify the project tracking. Notification system shows current progress and points to upcoming deadlines and procrastinated tasks. The program makes it easy to track task lists by using filters. The team leader can filter tasks by date started and date completed (UoG, 2010).

Reporting the project report on the product maintenance and improvement project shows what work has been done. In general, the results of the project show the level of enhancement for the new product and what expectations are met. By using the task manager, at the end of the project the team leader can create report on the tasks in text view. He can customize the report by selecting which tasks attributes are to be included. For example, it may be such attributes as general, assignment, history, notes, etc. in the task field 'comments' the team leader can leave his conclusion on the project and include it into the report. The report can be easily published on web site of the company so all stakeholders may watch the project results.

2.19.3.2 Planning Project Stages and Tasks

New product development is vital for a company that wants to be competitive. Each company needs to know what its customers want in order to fill any gaps in the market. When starting a new product research, R&D department builds a new product development research team and the team leader plans tasks for the project. New product development (NPD) is a complex project which includes the product concept, the prototyping, the marketing strategy, and the maintenance. Inherently, any new product launch is risky. To reach success in this field, it is required to map out a through plan which accurately states tasks and defines schedules with priorities to the most promising areas of new product research (Gay, 2005).

The NPD project may be broken down into the following stages and tasks:

2.20 Stages of Research and Development Project

2.20.1 Idea Development

- Make preliminary researches and evaluations of the market demand
- Estimating potential income and return on investment from new idea
- Generate product idea
- Check idea for technical feasibility

2.20.2 Prototype Development

- Make specifications for prototype
- Create prototype
- Test prototype and provide quality assurance

2.20.3 Product Launch

- Conduct consumer testing and get feedback
- Develop marketing plan
- Launch product
- Provide product maintenance

When the department management decides to develop a new product triggered by external market researches, a flexible project management tool is needed to optimize the use of project resources. By using the task manager, R&D department can conduct researches and initiate new product development projects. In task tree view the project leader can build project tree and split it into main stages. Each task stage can be specified with tasks. The project leader can plan tasks from starting; finishing dates and prioritizes to do list (McBurney, 2001).

2.21 Tasks of Research and Development (R&D) Project

2.21.1 Tracking Project Progress

Once work has begun on the project for new product development and research, it should be tracked to ensure everything is running according to the plan. The project leader should watch the project like a hawk. It means tracking each aspect of the project and ensuring delivery time.

Depending on the complexity and number of employees on each task, this process can be difficult. Issues with product researches and technical assessment can appear faster than they can be settled. The project team should be provided with effective communication tool which allows managing changes and be focused on prioritized tasks. Task manager offers solution for effective project tracking and team communicating. It allows monitoring and tracking task performance in real time. The tasks within R&D project can be controlled any time by the project leader through notifications panel. The project leader can supervise tasks of each employee, make task changes and leave comments. The project leader can also track task performance through charts panel. This panel is convenient to track several NPD projects. For example, R&D department runs three projects: "NPD Project 1", "NPD Project 2" and "NPD project 3".

2.22 Quality and Regulatory Compliance

2.22.1 Program Planning

Quality and regulatory compliance is one of the major functions of research and development department. The department team is focused and committed to providing quality auditing and consulting services. The goal is to provide quality consulting and generate recommendations in order to ensure compliance with the regulations, laws, and policies and procedures enforced by the government regulatory agencies, profile organizations, and other regulatory authorities. Dorman (2000) describes that this function assumes close cooperation between R&D team and quality assurance department. In the regulatory affairs, the team plans and develops program for regulatory work and quality compliance. Program focuses on preparing of pre-approval inspections as well as providing problem solving and solution of compliance and enforcement issues. Example of program items could be:

- Developing and submitting research documentation for new products
- Working closely with regulatory authorities to ensure that regulatory angles are covered in R&D projects
- Obtaining guidance for documentation from regulatory agencies
- Monitoring analysis articles of related government documents, regulations and court cases
- Conducting pre-approval inspection and compliance assessments

To organize team collaboration and close teamwork R&D department can use task manager.

2.22.2 Keeping Track of Compliance

R&D department management with executive responsibility needs to keep track of the regulatory affairs, quality assurance, and compliance functions. This means taking control over resources and their performance in program. To provide high quality, the management should be responsible for attaining business quality and compliance success. According to Deem (2006) the management responsibilities can be summarized by the following tasks:

- Becoming knowledgeable about applicable regulations and requirements
- Taking responsibility for compliance and holding the entire organization responsible
- Setting and monitoring effectiveness metrics
- Managing changes and setting task priorities based upon risk
- Allocating or reallocating resources

By using the task manager, the team leader can track each task related to program and be knowledgeable about current progress. The software allows management to be fully engaged in the transparent progress of program. The team leader can monitor resource assignments and track current activities in real time. Email notification messages system in the task manager allows keeping track of program progress being away from the office. The team leader can share his management responsibilities by assigning supervisors in watch list.

2.22.3 Program Reporting

Regulatory and quality compliance needs to be reported to view achieved results in program development. Detailed report will allow analyzing each step made in the development and ensure that compliance is aligned with the organization's business goals and risk management strategies. Ultimately, the goal of regulatory and quality compliance report is ensuring that the compliance as well as the letter of the law is embraced in every corner of the organization. By using the task manager, the team leader can build task report on program development. In the task manager, there is also option to export tasks of the project into excel sheet so that such a report will be convenient for detailed analysis of the tasks (Bartell, 2003).

2.23 Research and Development as an Investment

From the perspective of investment theory, R&D has a number of characteristics that make it different from ordinary investment. First and most importantly, in practice fifty per cent or more of R&D spending is the wages and salaries of highly educated scientists and engineers. Their efforts create an intangible asset, the firm's knowledge base, from which profits in future years will be generated. With two consequences, one substantive and one that affects empirical work in this area. First, the equilibrium required rate of return to R&D may be quite high simply to cover the adjustment costs. Second, and related to the first, is that it will be difficult to measure the impact of changes in the costs of capital, because such effects can be weak in the short run due to the sluggish response of R&D to any changes in its cost. A second important feature of R&D investment is the degree of uncertainty associated with its output. This uncertainty tends to be greatest at the beginning of a research program or project, which implies that an optimal R&D strategy has an options-like character and should not really be analyzed in a static framework. R&D projects with small probabilities of great success in the future may be worth continuing even if they do not pass an expected rate of return test (Hall, 2002).

2.24 Functions of Research and Development (R&D)

Fox, Martin and Green (2007) describes following functions of research and development;

- **Relevance with Country's Need:** R&D ensures research environment of research institutes and departments of public and private universities relevance with country's need.
- **Enhancing quality of research institutes:** Function of R&D is to upgrade quality of research institutes of universities according to the national goals.
- **Developing bridge between research institutes and national goals:** Function of R&D is to develop bridge between research institutes and national goals.
- **Facilitation from research benefits:** Role of R&D is to facilitate the public/private sector from the research benefits of universities.
- **Assistance:** R&D supports in obtaining grants from the public private sector and foreign agencies for promoting research projects of universities.

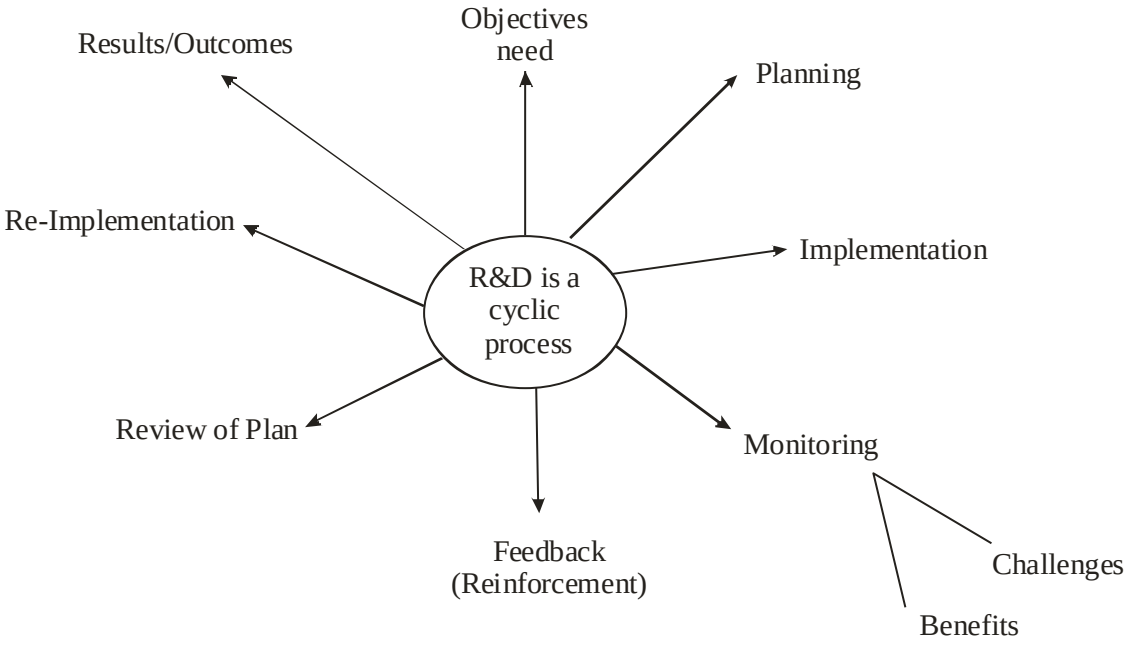
- **Funds generalizing:** R&D generate funds through sponsored projects/companies and consultancy services for further up-gradation of libraries, computing facilities, laboratories and research facilities in public universities.
- **Coordination with functional institutions:** R&D develops coordination with relevant functional institutions for practical training and subsequent employment of research scholars.
- **Activate/encourage research environment:** R&D encourages and activates research activities, mechanism and environment in order to upgrade the overall quality of teaching and learning in public universities.
- **Abreast with latest development:** R&D keeps the faculties, departments, institutes, and centers of universities abreast of the latest development in the respective areas of specialization.
- **Dissemination of research findings:** R&D disseminates research findings through conferences, seminars, and workshop.

2.25 Tasks of Research and Development (R&D) at Higher Education

- **Strategy implementation:** To implement the policies and strategies of research in the universities and research institutions of higher education is the major task of research and development (R&D) center.
- **Innovations as well as improvements:** Research and development (R&D) center works for innovations as well as improvements through the research process of the various departments in the universities.
- **Promote quality education:** Main function of research and development (R&D) center is to promote quality of research work and education.
- **Sort out new methods of teaching, learning and research:** Research and development (R&D) center works to sort out new methods of teaching, learning and research in the universities and institutions of higher education.
- **Practice in a cyclic manner:** Research and development (R&D) center is a cyclic process and practice in a cyclic manner. This cyclic process is very effective to enhance productivity at higher education.

Figure 2.6: *Conceptual Framework of R&D Cycles Process*

Conceptual Framework of R&D



Source: Self-created

- **Decision making:** Research and development (R&D) council takes bold decision to ensure the quality of research work in the universities or institutions of higher education.
- **Speed up research activities:** Main function of research and development (R&D) center is to speed up research activities in the departments/institutions of higher education.
- **Linkage with national and international academic institutions:** Research and development (R&D) center works for linkage with national and international academic institutions of higher education to exchange research expertise.

2.26 HEC's Focus on Research and Development

Higher Education Commission (HEC) executes programs and projects which ensure sustainability of a progressive research culture, and flow of knowledge to and from the business and the industrial sector. To reduce the cultural gap between Pakistani academia and industrial clientele different initiatives in shape of projects have been taken to improve the quality of production for capturing international market. The quality of research directly translates into the socio economic development of a nation. There is a conviction on part of international

researchers and academia that research integrates itself into the tapestry of life, and plays a pivotal role in defining the way forward. It is this very understanding which drives the priority portfolio of the developed countries. Being sensitive to this fact, the promotion of research and development has been the hallmark of all the endeavors of Higher Education Commission, Pakistan (News and Views, 2012).

Figure 2.7: *Higher Education Commission Strategic Aims for R&D*

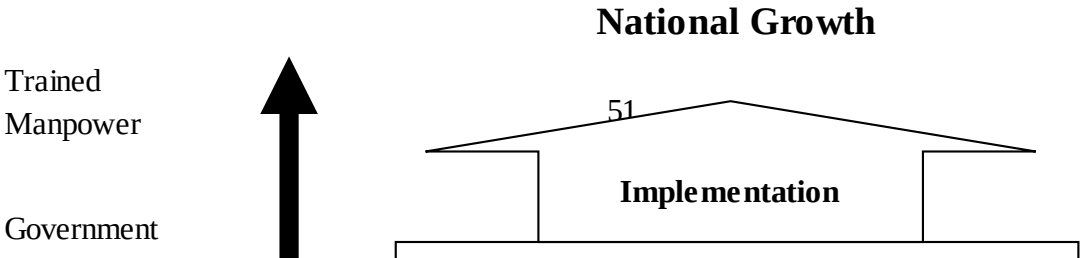
Core	Faculty Development	Improving Access and Learning	Excellence in Research	Relevance to National Priorities
Support	**Infrastructure Development:** Physical, Technology			
	Good Governance and Management			
	Quality Assurance: Standards, Assessment, Accreditation			

Source: http://www.hec.gov.pk

The research and development division of the HEC has assumed the leading role by formulating a comprehensive guiding policy, which is positioned in the light of the cutting edge challenges faced by the nation. The HEC has adopted a strategic and wholesome approach by helping the development and strengthening of research infrastructure within the universities, with intent to catalyze the research endeavors undertaken by the universities. All the programs and projects executed by the HEC are designed to augment the very concept of research and development, whether it is part of R&D division or any other supporting division.

In this regard the establishment of business-technology incubators in the universities has been envisioned and has started to materialize. These incubators would ensure an atmosphere where viable startup companies-entrepreneurships can grow and prosper. These incubator graduates have the potential to create opportunities, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies. The incubators have a greater impact on the economy when they maintain ties with the university because of the impact on three important stakeholders' entrepreneurs, universities and research scholars (Isani and Virk, 2005).

Figure 2.8: *Higher Education Fuels National Growth*



HEC

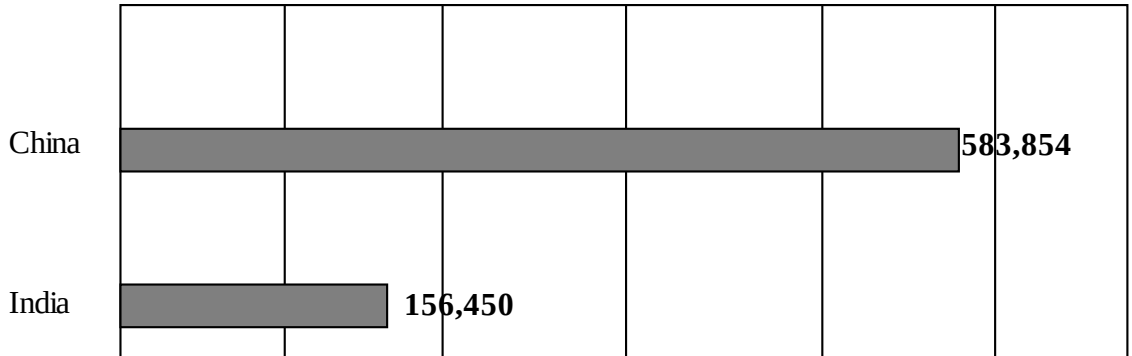
Higher Education: Knowledge Base

Source: http://www.hec.gov.pk

There is a conscious effort for innovation and commercialization of the research, which would spill over into economic prosperity of Pakistan. However, the research commercialization is only possible if the research undertaken by the universities is able to attract the industrial sector, which needs proper assessment of industrial priority areas by a central point. Hence, to develop and strengthen the nexus of the research institutions and the industry, there is an effort to ensure quality research and that too for field of study which is of utmost priority for the country.

Furthermore, 'science and technology parks' are being developed around the world as a means of stimulating start up and growth of technologically intensive, knowledge based businesses, and to facilitate the linkages between the researchers and the industrial communities. The research and development division of the HEC advocates establishment of technology parks throughout the country and the business incubation centers would augment these parks. HEC works according to a coherent policy which addresses the national needs and defines the national future paradigm. The R&D division of HEC is properly positioned to formulate a national level policy and ensure its adherence throughout the geographically distributed academic community (National Educational Policy, 2009).

Figure 2.9: *Number of Researchers at Tertiary Level*



Source: http://www.hec.gov.pk

2.27 Research and Development Mechanism in Higher Education Institutions/Universities

Research and development mechanism has been defined in different ways. According to Bako (2005) R&D process at higher education institutions, is the framework in which researchers and supervisors, in collaboration with stakeholders and/or funding bodies, collectively build capacity and intellectual capital for the benefit of all. Research and development mechanism at university is a mechanism that allows us to understand and evaluated research activity.

Research and development mechanism of higher education institutions cannot take place overnight. It entails careful planning and constant process of development. A strong research and development mechanism can enhance faculty and students' research productivity and the overall impact of research in society. University faculty members are required to become teachers, researchers and service-oriented professionals and developing such a culture is not simple and straightforward. The process requires professional approach and a strong process with encouraging research culture (Hazelcorn, 2005).

Salazar (2006) believed that research and development mechanism of an institution of higher education indicates (a) the quality of research, (b) good administrative practices, (c) international collaboration, (d) Institutional research strategy (e) financial reward system, (f)

infrastructure development, and (g) there is a presence of ethical policies, and (h) availability of research funding. According to Bako (2005) research mechanism is influenced by (a) the nature of the institution's environment which may support the research activities or not, (b) acceptable levels of performance that is the performance of institutional personnel may be up to the mark in the environment provided at the institution or their performance level may decrease due to different undesirable factors, (c) research policy is planned strategically, (d) inter-institution collaboration must be prioritized because no institution can survive separately, thus, it needs national and international collaborations to maintain its survival and integrity. Therefore research collaborations are of greater value, (f) work behavior emanating from the motivated staff to work for the institution.

Geuna and Martin (2003) are of the opinion that institutional pursuit of a strong research and development capacity has led to managerial efforts to encourage and support research mechanism. It is possible if they have a strong vision of research and development at higher education level and the quality of that research can also not be overlooked. Quality of research exposes academic staff to new information and sharing of socio-cultural ideas with others. However, the studies indicate that universities in the developing world have retained strong teaching functions and weak research output. They need distinctive characteristics which correlate strongly with their respective cultures (Bartell, 2003).

Universities often possess goals that are unclear and difficult to measure in that mechanism due to lot of factors that affect those goals to be achieved. The poor research mechanism in the developing world leads to the question such as: Is it the mission, goals and objectives, values, procedures, or leaders that are responsible for the success of institutions of higher education, or is it something less concrete and more informal and abstract? One of the responses to this question is our lack of understanding about the characteristics of research and development mechanism in improving institutional performance and inability to address the challenges faced by higher education (ASHE, 2003).

2.27.1 The university of the Punjab Lahore; Office of Research Innovation and

Commercialization (ORIC)

2.27.1.1 Introduction

In line with the policy of HEC and in pursuance of vice chancellor's directives for streamlining the management of research initiatives and programs, there was a need to re-enforce the existing research centers already working at the university of the Punjab for not only sustaining but also improving the trends of the research activities having an impact for the improvement of areas concerning economic, industrial, social and academic development and their accelerated advancements for achieving the national objectives (http://www.oric.pu.edu, dated 12-03-2012).

2.27.1.2 Vision and Mission Statement

The mission of the office of research innovation and commercialization (ORIC) is to develop, expand, enhance and manage the university's research programs and to link research activities directly to the educational, social and economic priorities of the university and its broader community. ORIC will also be responsible for assuring that the quality of research reflects the highest international standards and advances the stature of the university among the world's best research institutions.

ORIC will also positively contribute in developing research leadership to play their singular role in transforming the economic focus of the country through internationally recognized research outcomes and in line with the on-going policy of national research program for the universities for building the national economy. In view of the significant increase in number of post graduate students involved in research, enhancement in research projects, increase in publications and enhanced possibility of commercialization of research; it is equally important to build-up the capacity of the academic institutions of the university of the Punjab to manage all research related activities. ORIC will positively set the pace to match up to the challenges in field of research and innovation (http://www.pu.edu.pk).

2.27.1.3 Intended Objectives

ORIC has self-adopted its mandate to seek to enhance the environment for all research activities and scholarship schemes by:-

- Developing the university's strategic research directions and policies.

- Increasing and diversifying external research funding.
- Improving integration of research and education at all levels of the university.
- Improving translation of research into the public benefit.
- Strengthening university-industry relationships.
- Promoting entrepreneurship, technology-transfer and commercialization activities that energize and support the local and national economy.
- Promoting and enhancing cross-cutting and multi-disciplinary research initiatives while working out incentives and awards' schemes for world class research and publications.
- To critically enhance research activities in P.U.'s institutes/colleges/departments and also protect intellectual property generated as a consequence of research activities

2.27.1.4 Development and Promotion of Research Activities

ORIC will develop programs and activities that will:-

- Increase funding for research from all public and private sources.
- Establish and maintain excellent relationships with donors and stakeholders.
- Oversee proposal development and submission.
- Support commercialization, licensing, etc, of university research products.

2.27.1.5 University – Industrial Linkages and Technology Transfer

ORIC will promote the development of public-private partnerships:-

- In support of university research initiatives..
- Link the university's research community with the needs and priorities of the corporate sector.
- Develop opportunities for applied research and explore opportunities for technology transfer.
- Commercialization of university research.
- To follow-up of commercialization process of research products

2.27.1.6 Management and Administration

A separate structure and establishment for ORIC has been made functional in the University of Punjab since March 2010. The office of research innovation & commercialization is headed by a director supported by deputy director, administrative officer, a research associate

and a stenographer. It is housed temporarily in institute of quality and technology management, the University of Punjab (http://www.pu.edu.pk).

2.27.2 The University of Gujjrat, Pakistan; Centre for Research and Development

Research and development is the backbone of university and institutions of higher learning where knowledge is not only transferred but consistently generated, ideas are evolved, hypotheses are developed and proved, their applications are demonstrated and prototypes are built for fabrication through the industry for the benefits of the community. This necessitates the need to establish the directorate of research and development with the aim to facilitate and co-ordinate research activities in UoG departments, set up consultancy service (CS) and technology incubation center (TIC)/Technology Park create linkage with other national as well as international academic institutions, R&D and industrial organizations. The directorate's job scope encompasses the following areas (http://www.uog.edu.pk, dated 12-03-2012).

2.27.2.1 Objectives

1. To ensure that high quality research of direct relevance to our country's needs, pertaining to both public and private sectors.
2. To establish linkages between UoG departments-institutes-centers and industry both in the public and private sectors and to facilitate contract research benefit to the UoG and public/private sectors.
3. To assist in obtaining research grants from the public/private sector and foreign agencies.
4. To generate R&D funds through sponsored projects and consultancy services for further up gradation of libraries, computing facilities, laboratories and research facilities at UoG.
5. To co-ordinate placement of students at different stages of their education with relevant organizations for practical training and subsequent employment.
6. To encourage and activate research activities in order to upgrade the overall quality of teaching and learning within UoG.
7. To keep the UoG faculty abreast of the latest developments in their respective areas of specialization.
8. To disseminate research findings through conferences/seminars and workshops etc.

2.27.2.2 Future Research and Training Plan

The center's agenda for research includes current key population issues. These include urbanization, migration, environment, public health and reproductive behavior. These initiatives will provide an opportunity to students as well as teachers to sharpen their research skills and dredge up their knowledge of empirical studies with expertise in data analysis. Another major research project under consideration is Socio-demographic Mapping of Punjab. This survey will be designed with a vision to establish benchmark indicators on socioeconomic and demographic conditions of the people of Punjab at district and provincial levels. Survey findings will be helpful in identifying information about the pace of demographic transition vis-a-vis the developmental momentum in the stratified districts of Punjab. It will further help identify future requirements of labor force and highlight the dependency ratio in selected districts of Punjab.

The center, by conducting various surveys, will develop a substantive database which will be used by faculty, staff and students for further analysis, preparation of theses and dissertations, classroom instruction, and for planning of programs or development of policies. Although the database will serve the entire campus, it will be most useful for those in social sciences such as population sciences, economics, sociology, psychology, as well as medicine, public health, education and information science, and public policy. This center is also planning to start short courses in the fields of gender studies, reproductive health, criminology, and demography, quantitative and qualitative techniques of population data analysis. Training workshops will also be conducted in data analysis techniques, presentation of data, communication skills, teaching methodology and human resource management (http://www. uog. edu.pk, dated 12-03-2012).

2.27.3 The University of Brighton's (UK); Center of Research and Development

2.27.3.1 Introduction

Research in the creative and performing arts, architecture, design, media and the humanities is at the forefront of a thriving research culture at the University of Brighton. The faculty of arts has systematically pursued an explicit strategy of disciplinary and interdisciplinary research, inter-relating critical theory, contemporary practices and their histories. This has generated fresh fields of interdisciplinary enquiry stimulating insights that question current practices and foster new understandings. The center for research and

development (CRD) for the faculty of arts was established in 1998 and is among the UK's leading centers for high quality interdisciplinary research in the arts, design and humanities and is designed to bring together the research community.

2.27.3.2 Major Objective of R&D

Its key objective is to lead and enhance the faculty's research culture.

2.27.3.3 Functions of the R&D

Functions Its functions include monitoring the research performance of individuals, groups and centers, developing strategies to support new and emerging research, identifying sources of funding and bursaries and ensuring that applications to research councils/bodies are of the highest quality.

2.27.3.4 Benefits of R&D

The CRD provides a supportive research infrastructure for the faculty's community offering assistance, funding guidance, mentoring and dissemination for the development and delivery of research projects. The space includes dedicated research accommodation and study space, staff offices, exhibition and presentation spaces; seminar rooms and video-conferencing facilities.

2.27.3.5 The Doctoral Center of R&D

The doctoral center is a key unit within the center for research and development and provides a key role in leading the faculty's postgraduate research and doctoral provision and building a lively and stimulating community and research training for students and supervisors (internal and external). The doctoral center has a dedicated administrative team and is responsible for organizing research days and specialist seminars. Working with the University of Brighton doctoral college, it oversees the registration, supervision, progression, quality assurance and examination of doctoral students and manages the university's accreditation of research degree provision at University College of the creative Arts.

2.28 Restructuring Process of R&D in Pakistan

Pakistan as a developing country is facing number of challenges to promote research and development process. The universities are trying to adopt the measures to promote research at

higher education level. In Pakistan, universities can contribute a lot to solve the problems that the country encounters. There are also plenty of chances that universities can avail to promote the process of research and development under the umbrella of higher education commission (HEC). HEC is playing a significant role since its establishment to promote research in higher education institutions. Though researchers face a number of problems in conducting research because universities are still at initial stage to facilitate researchers and their academic staff but HEC has taken many initiatives to facilitate universities for research. A dramatic change has been seen regarding research publications in the universities of Pakistan for the last few years. Researchers and research institutes are speedily working on research papers because institutions are getting awareness of the 47 developments through research. Keeping the value of research and development vital for the universities, Higher Education Commission initiated national digital library program. The basic purpose of national digital library was to flourish research culture in universities. National digital library program has greater impact on university research culture since its inception. National digital library received success in collaboration with program for enhancement of research information (PERI); that is basically the provision of infrastructure for digital library program. Now a greater number of journals in many disciplines are being published online in Pakistan and the researchers have access to the thousands of books and journals for their research. The Institute of Research Promotion (IRP) was established at higher education level to promote research activities and develop research culture at the universities with the cooperation and guidance of academicians and the industrialists. Another important task behind establishing this network was to meet the challenges by conducting research individually or collectively at national level.

Higher Education Commission of Pakistan awards various indigenous and foreign scholarships to the talented students for different research programs. There is a big lot of HEC scholars in indigenous and foreign universities for MS/PhD that will help to uplift the standard of research at universities after a couple of years and also strengthen the research collaboration at international level. The purpose of launching lots of scholarships by HEC is to develop research culture according to international norms. It will bring a tremendous change in research culture at Pakistani universities. Getting motivation from the HEC's initiative, different universities also tried to establish special research centers to promote research culture. For example university of education initiated SPERP (Society for Promotion of Educational

Research in Pakistan) to address the research related issues and help promoting research culture at the university. The idea behind this program was to establish a network for dialogue with policy makers, funding agencies and national and international research organizations to uplift the standard of education and research at university level. Likewise Islamic international University Islamabad also established a research center to collaborate at national and international level for research seminars, conferences, symposia and research trainings at university level. These types of institutions can bridge the gaps among public and corporate sectors, universities and research institutes by conducting research activities at 48 national and international levels; as IRP has facilitated various industrial research projects, theses at doctoral level and research papers in areas of economic and social sciences. It also regularly conducts a series of seminars and workshops to share research experiences & findings, and to promote research collaborations; as it has research scholars, corporate consultants, academicians and internationally reputed research organizations associated with it (http://www.irp.edu.pk/aboutus.aspx).

Now universities have access to electronic journals like any advanced country. HEC now represents all public-private and other research and development organizations to negotiate with different publishers. HEC fully funded universities of public sector and 50% to private sector universities. It depends on universities how to manage their resources and make developments. Though HEC has technical teams to monitor resource allocation and utilizations in universities but still universities need to focus on managing their resources to develop them as research-oriented institutions. There is a significant increase in research productivity after the induction of HEC.

2.29 R&D Situation in Global/Comparative Perspective

2.29.1 United States of America

In the U.S, which is a leading country in science and technology, the funding for research and development has changed its pattern. The federal share for R&D has been decreasing over the period of last 10 years. However the decrease in federal share for R&D has been compensated by the corresponding increase in the industry share at the national level. Therefore it's sustaining the country's research on the world scene as a leading country in the world. In the recent good days of US economy, the investments in research and development grew by 6.5

percent and in the last two decades, the overall US GDP grew by almost 4 percent, bettering the historical averages. Federal support for higher education R&D rose by 2.1 percent. Further, much larger percentage increase in academic research and development however, helped to lower the federal share of national total to below 30% lowest since a period of last two decades. Another advantage for strengthening the sustainability of R&D in science, the US adopted the strategy of making use of global science and the US companies entered countries to the tune of about 5100 over a period of last two decades. The US companies invested about three times more in foreign cooperative research and development than the domestic similar expenditure. This resulted in an increase of 20% in co-authored research publications with foreign collaborators than compared to just 12% a decade earlier.

Another useful trend for the sustainability of US R&D institutions was the change in approach of the universities to concentrate more on patenting their research. The patents increased from about 250 per year in 1970 to about 3100 in the year 1998. While this shift in approach of the universities towards patented R&D is noticeable today there is also a desire of US to lead the world in scientific research of large size or mega science research projects (MSRP). Such projects need large scale investment and contribute to the strength of not only large basic research but also helps the evolution of applied research. But more than that, these projects will prove for the US a source of great national strength in science and technology (Broin, 1998).

2.29.2 UK

University's research and development efficiency is measured and they are accountable for what they are producing in the field of research. UK is the typical example of this system. It introduced research assessment exercise (RAE) in 1986 as a formal system of evaluation of individual research, departments and the projects and after every four to six years, universities in UK submit their research and development outputs for quality rating. On the basis of this rating British higher education funding councils allocate funds for research to universities and higher education institutions (Deems, 2006, Gauna & Martin 2003, Ito & Brotheridge, 2007). RAE faced much criticism on evaluation schemes it gains the support from British Government in 2008 to continue its practices due to its positive effects on research culture. This system

encouraged university research culture and resource allocation in area of research excellence (RAE, 2008).

Overall expenditures on research and development in the UK have been decreasing as a percent of GDP since the last two decades. In contrast to this there has been a considerable increase in higher education expenditure on R&D in the UK (HERD) as a percentage of GDP. The result however, has been an overall fall of total gross expenditure on R&D in the UK (GERD) relative to GDP from the early 1990s to date despite a modest recovery at the beginning of this century. Moreover, in international comparative terms the overall spend on higher education R&D in the UK relative to GDP seems to be weakening over time (Shelley, 2010).

The higher education R&D in the UK has been weakened in the result of the world financial crisis. Moreover since the crisis began the UK's principal competitors have increased higher education R&D at a faster rate. At the same time the relative contribution of business enterprise to the funding of R&D in the UK higher education system has declined significantly (Hughes, & Mina, 2012).

2.29.3 Japan

Research studies indicate that Japan has over the years invested relatively more in basic science research than in application of technology. This was based on the realization that strong development in research leads to better innovation for application of science in industry which means both in quality and quantity production. The number of researchers in Japan has increased over the years, both in the universities, research institutes as well as in companies. Moreover, the trends in budget for grants-in-aid for scientific research have been progressively increasing and it increased by 2.5 times over 10 years. Over a period of 20 years from last two decades the researchers in universities increased about 1.6 times while such an increase for companies has been about 2.62 times in the same period. This shows a trend of significant increase in the research and development for science and technology.

Also the R&D funding increased about 20% for universities and 65.2% for companies over a period of last ten years. However, the important thing to note is that the universities are spending relatively more on basic research [about 53% of the allocated budget] while the companies spend correspondingly 6.6% on basic research and 71.3% on the development, therefore the requirement of the companies being more on production oriented R&D. The

improvement to research and development efforts in the country and the support to post-doctoral research were given special attention in a special programme to support about 10,000 post-doctoral fellowships. In the last decade this increased from over 30 times.

These research measures improved the world ranking of Japan in quality of research as indicated by 'citations of research' published and it placed Japan among the first 5 nations in most of the scientific disciplines and at ranking No.2 in Agricultural and Material Sciences. This relative shift towards basic sciences not only increases the product quality of Japanese goods but also strengthens the economic sustainability. Already the Nobel Prize for chemistry for the year 2000 was shared by a Japanese Chemist, in the area of conducting polymers. Japan is found to be a strong country in the world both economically and research wise. Japan exercised a systematic approach to the monitoring techniques for efficient production to attain improvement in R&D (Butt N.M, 2000).

2.29.4 Germany

In Germany several systems have been followed to coordinate the research output which is mainly done at the universities and research institutes to the industry requirements. German universities in recent years have specific liaison officers who interact with industries for research collaboration. The university professors themselves have also direct contacts with industries to find their problems and solve them through research. On the other hand industry has specific research departments to interact with professors at the universities. In this way in Germany considerable research has been sponsored by the industries and in return these industries have derived benefits for their products utilizing the research done at the universities.

Recently in Germany, the government foundations have played the coordinating role as bridges between the universities or research institutes and the industry. Such foundations have very competent research based scientists and engineers. The foundation identifies the problems of industry and hands it over to the concern university or the research institute where the problem could be solved. Such schemes in recent years have proved very useful, particularly in Germany.

Germany is in the fortunate position of having an excellent R&D infrastructure. The Steinbeis Foundation acts as an interface between academic researchers and business. It has proved very successful as a bridge between the universities or research institutes and the

industry. Its efforts have reduced the gap between the research outcome and its application. The foundation picks up simple problems from industry, say if the chimney installed at the top of a house by a certain company does not work so efficiently. The foundation takes such a project to the relevant research institute which solves this problem and produces a chimney of a better and desired efficiency. There are host of such small or large projects which the foundation handles. The Steinbies Foundation has branches throughout Germany and even in foreign countries and has proved very effective in providing means of efficient application of research to a better industrial production (Fruhwald, 1998).

In Germany, the initiative for excellence was launched in 2005 to improve the quality of academic research and development. It has three dimensions: (a) The creation of research schools for young scientists that will provide structured PhD programs within an excellent research environment and a broad area of science; (b) The creation of excellence clusters in cooperation with non-university research institutions, universities of applied science and industry; (c) The funding of up to ten selected universities under the heading of "Future concepts for top class research at universities", selected on account of their having at least one excellence cluster, one research school and an overall strategy for them to become an internationally recognized "beacon of science". In 2008 the German research foundation and the science council have presented a joint position paper on the further development beyond 2011, assessing the interim results positively and arguing for a continuation along the existing lines with increased funding to ensure sustainability of the desired structuring effects.

2.29.5 China

China is now the second largest nation in terms of higher education R&D spending. The country has been increasing its academic R&D spending by roughly 10 percent each year, even during the 2008 to 2009 recession. Gruber (2011) illustrated that in China the continued expansion of R&D, is both inspiring in amount and worrisome from a U.S. competitive perspective. The Chinese are doing everything in their power to grow and develop through an increasing understanding and emphasis on research and technology. Even most of their highest ranking political leaders are engineers. The strongest focus for material research will be nanotechnology, which is linked to the need for brighter. Open innovation has been fundamental

to major industrial developments of current times. The society in which everyone and everything are connected in real time will change the way of innovation and collaboration (Jiatao, 2010).

In 2006, R&D spending in China had reached RMB 300 billion (U.S $40 billion). Improving research at China's University Research Institutes has been an important component of the national science and technology strategy. The University Research Institutes dispersed 26% of the China's expenditure on R&D. Since 2000, China's universities have received more than 50% of their R&D funding from the government. In 2006, there were 4.1 million Chinese engaged in scientific and technological activities, including 2.8 million scientists and engineers. China's development of a system of peer-reviewed, merit-based competitive funding for basic research and for evaluating science and technology results has the potentials to stimulate more innovative and world class research efforts at China's University Research Institutes in the future (Clancy, 2011).

China has sanctioned a series of special policies to encourage the establishment of international R&D alliances and centers. Foreign R&D centers in China can import certain equipment duty free. China now seeks to attract foreign investment in R&D because it hopes that such investments will have positive effects. The government apparently hopes that collaboration with foreign firms will enable local university research institutes and firms to get involved in more advanced research, improve their research capacity and improve their R&D management. In addition, foreign companies represent an additional source of R&D financing at a time when public financing for R&D is limited.

2.29.6 Saudi Arabia

In Saudi Arabia, R&D at public and private sector is facing several challenges starting form its underlying environment through to demand and consumption. The number of universities and research institutions of higher education has grown, but research output is much less than developed countries. The Arab world has not implemented a number of international best practices of R&D in the universities and research institutions of higher education. Most industrial countries provide financing to encourage their level of international collaboration while neglecting researchers to collaborate at international and regional level. Research expenditure is comparable to that of less developed countries but there is limited supply of research, especially in area of social sciences but more less than developed countries.

International collaboration with Saudi Arabia is high due to funding availability and private sector does little R&D leading to low output and few patents. Availability of scientists and researchers is higher than developing countries and much of research is not innovative and is not published international countries but less than OECD countries and other R&D leaders (Tahseen, 2012).

In Saudi Arabia 90% of research is in applied fields, however, research does not match with the supply and demand. Government has bought advanced technology but there is limited regional research collaboration in Arab world due to weak government policy making in research and innovation. According to Tahseen (2012), regional collaboration can be increased with travel grants and more assistance. Developed countries' research funding comes form the private sector and the number of patents in the Arab world is very low. Insufficient institutional resources lead to decline in the level of funding graduates, which is turn limits research. Clustering initiatives can fast track development of research. Funds and institutions necessary for research community are lacking infrastructure in the Arab world. Research in universities and associated centers is often too academic. Commercial opportunities exist in the provision of research that sheds light on the Arab business environment, politics, culture, and society. The high number of PhD holders in science and technology may explain the lack of research in areas other than applied fields.

2.29.7 Pakistan

In 2002, the University Grants Commission (UGC) was restructured as the Higher Education Commission (HEC) to bring about standardisation of higher education programmes in Pakistan and bring these into line with global standards. The HEC has become the major source of funding and control of higher education institutions including universities. It also provides guidelines to the universities aimed at enabling them to meet international quality standards through collaboration and cooperation (Government of Pakistan, 2009a).

Pakistan ranks 34th in the list of countries, ranked for their R&D spending. Although the changing government policies, rising prices, taxation policies, lack of energy sources and lack of coordination in the field of R&D are the major obstacles. According to the accesable data, in 1998 there were 32 universities and degree awarding institutes in public and private sector. Total 155 major R&D organizations were working in which 41% were working in the field of

agriculture. At federal level these were administered by 13 controlling agencies. In Pakistan, total citation of research papers was 499 and its share in the world's authorship was 0.08 percent. Only 2 percent of the 18-23 age groups were enrolled at the university level and about 98 percent of youth do not have access to higher education in Pakistan (Higher Education Commision, 2005).

According to the available data, in 2005 all the universities and centers of excellence in Pakistan, collectively produced 918 PhDs and 1170 scholars were sent abroad. Out of these 740 returned, 581 got employed and rest were jobless which left the country. Total no. of R&D manpower was 14500. Total of 2528 PhDs were in science subjects out of which 25% work in research. Total of 35000 patents registered by Pakistan patent office and only 35 percent of these were for engineering sciences. Few science and technology protocols have been signed with Iran, Egypt and Romania. PCSIR has published 4000 papers and 110 scientists received PhDs degrees from universities in Pakistan undertaking research at PCSIR research laboratories. In Pakistan, discipline wise distribution of research scientists working in R&D organizations was; 43.85% agricultural sciences, 10.44% chemistry, 0.21% computer sciences, 1.91% health and medicine, 0.85% biotechnology, 0.31% mathematics, 3.62% earth sciences, 12.58% engineering, 5.44% meteorology, 6.47% physics, 13.52% biology, 1.07% others (Pakistan Council for Science and Technology, 2005).

According to World Bank (2010) the researchers in R&D (per million people) were 161.89 in Pakistan. Researchers in R&D are professionally engaged in the creation of new knowledge, products, processes, methods or systems and in the management of the projects concerned. In Pakistan, we have well known research institutions of merit like for example PINSTECH (The premier R&D institute of Pakistan Atomic Energy Commission, in the area of nuclear and physical sciences), KRL (in uranium enrichment and metallurgical sciences), and HEJ (for chemical sciences). Since these centers of excellence are new in age, their sustainability for future, keeping the level of eminence they have attained, will depend on the availability and consequent replacement of retiring persons by competent people in the years to come. A careful attention of the government is required to this aspect to ensure the needs of sustainability of these institutions.

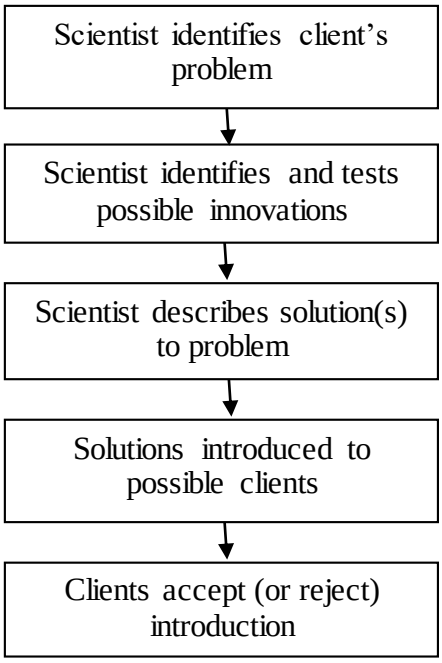
HEJ, (the Hussain Ebrahim Jamal) Institute in Chemistry established at Karachi University with the vision of famous Chemist Prof. Salim-ul-Zaman Siddiqui and led successfully with further expansion by Prof. Dr. Atta-ur-Rahman, an eminent Chemist, has produced a large number of PhD scientists and this is a good vision for sustainability of the HEJ Institute as a centre of excellence in Chemistry for years to come (The News, 2001).

2.30 General Research and Development Models

2.30.1 The Dissemination/Diffusion R&D Model

The R&D model known as supply side dissemination/diffusion research and development approach have five phases. At first scientist study the nature of client`s problem and identify the factors that create the problem. Then, keeping in mind the circumstances and nature of the problem, they think about the innovative tests or instruments to evaluate the existing problem. The experts describe the possible solutions of the problem before the client. The client thinks about different aspects of the solution process and decides to accept or reject such problem solving technique. Lacy (1998), described the characteristics based on case study of dissemination/diffusion R&D model such as; supply side dissemination, top down approach to problems solving, successfully employed during the green revolution, non-adoption is considered resistance form clients, and does not consider adoption by clients.

Figure 2.10: Dissemination/diffusion Research and Development Model

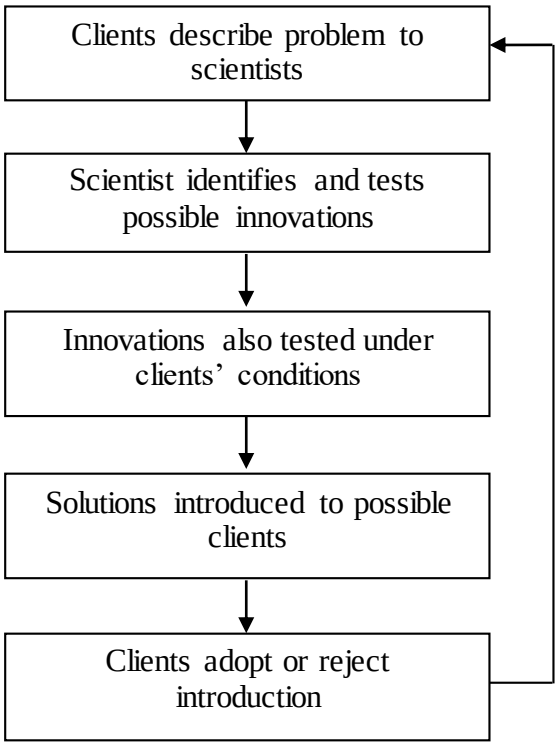


Source: http://www.google.com, dated 17-02-2012.

2.30.2 The Induced Innovation R&D Model

The R&D model known as demand-side induced innovation research and development approach has five steps. At first step, the client describes nature of the problem before the scientists. The scientists study the nature of client`s problem and identify the factors that create the problem. Then, accordance with the circumstances and nature of the problem, they think about the innovative tests or instruments to measure the existing problem under the client`s conditions. The experts describe the possible solutions of the problem before the client. The client thinks about different aspects of the solution process and decides to adopt or reject such problem solving technique at introduction stage. Lacy (1998), described the characteristics based on case study of induced innovation R&D model such as; demand – side problem identification (FSR&D), essentially remains a top-down approach to problem solving, clients are expected to learn from scientists, non-adoption and adoption offer information to scientists, and begins and ends with clients.

Figure 2.11: *Induced innovation Research and Development model*

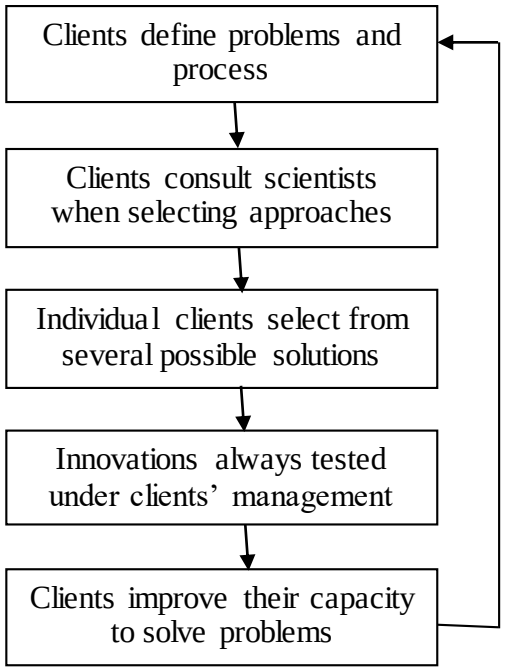


Source: http://www.google.com, dated 17-02-2012.

2.30.3 The Participatory R&D Model

The R&D model known as participatory research and development approach has five stages. At first stage, the clients define nature and process of the problems before the scientists. The clients consult with the scientists when selecting the approaches. Then, according to the circumstances and nature of the problem, the clients individually select the innovative tests to assess the problem from several possible solutions. The innovations always tested under clients` management with the consultation of scientists. The clients personally improve their capacity to solve the problem. Lacy (1998), described the characteristics based on case study of participatory R&D model such as; clients define problems and possible solutions through consultation with scientists, indigenous technical knowledge strongly features within the research process, based upon empowerment of clients and allows for greater site specificity, clients evaluate impacts, scientists learn from clients and this model begins and ends with clients.

Figure 2.1: *Participatory Research and Development Model*



Source: http://www.google.com, dated 17-02-2012.

2.30.4 The Comparison of the Phases of three General R&D Models

In light of the above detailed description of three general R&D models, comparison of the phases, key stakeholder and its role is as under;

Phases	*Diffusion*	*Innovation*	*Participatory*
Problem ID	Researcher	Both	Client
Treatment ID	Researcher	Researcher	Client
Process	Researcher	Both	Client
Evaluation	Researcher	Researcher	Client
Purpose	Publish	Validate	Empower

Source: http://www.google.com, dated 17-02-2012.

2.31 Summary

This chapter aimed to provide background information about research & development (R&D) and current situation of R&D at university level in Pakistan. The existing research & development models in national and international universities were briefly discussed in this chapter. The purpose of this reviewing the literature was to get insight into the field and arguments that why researcher selected this current and emerging issue regarding research & development.

CHAPTER 3

RESEARCH METHODOLOGY AND PROCEDURE

This chapter deals with research methodology and procedure of the study to follow to complete this research study. The major purpose of this research study was to analyze the current mechanism of research and development (R&D) at university level in Pakistan. It was an exploratory as well as descriptive research study. Therefore both qualitative and quantitative methods were used for data analysis. The main focus of the study was to analyze the challenges of current research and development mechanism and to recommend appropriate strategies for improving the situation of R&D in the public sector general universities of Pakistan. Keeping in view, the related literature review in chapter two and objectives of the study, the questionnaire was developed and administered accordingly. The detail of the steps and the adopted research methods to complete the study as followed;

1. Design of the study
2. Population
3. Sampling
4. Development of research tools
5. Data collection
6. Statistical Analysis

This study was to analyze the existing mechanism of research & development (R&D) in the public sector universities to see the process of implementation, level of successes of research & development initiatives and challenges faced by the research & development institutions. This was analyzed item wise and factor (domain) wise role of research & development council, product management of research & development, planning process of research & development, implementation phase of research & development, technical assistance of research and development, feedback of research and development, outcomes of research and development, and the challenges of research & development in the universities of public sector. The Statement of the problem was “Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan”.

3.1 Research Methodology

The study was descriptive in nature; therefore survey approach was considered appropriate and adopted for its completion.

3.2 Population

The population of the study consisted on:

1. Research supervisors, chairmen and/or heads of departments, deans of faculties, and chairmen of BASR working in public sector general universities in Pakistan.
2. Heads of research & development centers, officials of research & development and officials of quality assurance cells in public sector Pakistani universities.

3.3 Sampling and Sample

The multistage sampling based on three stages was adopted for study which according to Connolly (2007) serve as the foundation of all statistical tests.

Stage I: Sampled Universities

At stage one sample was taken from all the provinces including Gilgit-baltistan, and federal area of Pakistan. All of the 23 (100%) general universities working in public sector were selected. Medical, Engineering, Agriculture, and Women universities were exclused. Eight (08) public sector universities were selected from the Punjab. Three (03) general universities were selected from Sindh. Seven (07) public sector general universities were selected from Khyber P.K. One (01) general university was selected form Azad Jammu and Kashmir (AJK). One (01) general university was selected from Baluchistan Province. One (01) general university was selected as sample from Gilgit-baltistan and two (02) public sector universities were selected as sample from Islamabad, the Capital of Pakistan. Higher Education Commission (HEC) from Islamabad was also included in the sample. Gay (2005) described that “for smaller population, say N = 100 or fewer, there is little point in sampling, survey the entire population. So hundred percent is considered appropriate sample size for survey studies having the population size of only ten or twenty”.

Stage II: Sampled Departments

At stage two the sections or departments of research and development (R&D), QEC, ORIC and/or alternate system as; natural sciences, social sciences and arts & humanities in all the public sector general universities of Pakistan was taken as a sample. Sample was spread and ideally representative of the population. According to Best and Khan (2003) in survey research the sample should be large enough than experimental researches to represent the population.

Stage III: Sampled Personnel

At stage three therefore, stakeholders of R&D council such as, vice chancellors, deans, chairmen, heads of departments, research supervisors, chairmen of the BASR, and all the officials or personnels working in the research and development (R&D) centers were included in the sample. The size of sample was rationalized as Cohen, Manion and Morrison (2008) and Jyothi (2007) suggested to select form the size of population i.e. "if the population of a research study is 100,000 and above, the size of sample should be 384 as appropriate". The researcher included (690) participants as a sample for this research, which was slightly above to the actual suggested, just to maintain if any error of counting representation accuracy. The sample of the study consisted of thirty (30) respondents from each university including ten (10) research supervisors, five (05) chairpersons and/ or heads of teaching departments, five (05) deans of faculties, one (01) head and five (05) officials of the research & development center, and four (04) official working in quality assurance cells taken randomly from the population.

Table 3.1

Sample of the study

No.	Title	Punjab	Sindh	Balochistan	Khyber PK	Federal Area	Total
1 2	Population	08	03	01	07	04	23
	Sample	30 x 8 =240	30 x 3 = 90	30 x 1 = 30	30 x 7 =210	30 x 4 = 120	690

3.4 Development of Research Instruments

The problem was explored in quantitative way because the current practices of research and development (R&D) at university level were analyzed better through the questionnaire. The

respondents were free to describe the existing set up, the issues and challenges faced by R&D at universities. So, there were five (05) separate questionnaires for the managers and officials of R&D, research supervisors, head of departments-chairman and deans of faculties.

The questionnaires were based on R&D domains such as; existing setup and structure of R&D, functions and roles of R&D, efforts and initiatives taken for R&D, plans and innovations of R&D and effective products of R&D at universities. Informal discussion with the respondents such as researchers and managers of R&D, head of departments-chairman, and dean of faculties were also included in the study. This discussion was serving as supportive research instruments to verify the data provided by the respondents. The questionnaire was developed for the research study according to the consideration that all the respondents of population were educated and could read and comprehended the printed words.

The following types of items/questions were included in questionnaires.

- Open ended
- Close ended
- Five point Likert-Scale

3.5 Categories and Types of Items

3.5.1 First Part: General Information

First part of each questionnaire was developed for general information i.e. name, university, and department, designation, qualification, discipline, publications and research students.

3.5.2 Second Part

3.5.2.1 Role of Research and Development (R&D) Council

- Item No. 1 developed for Vice Chancellor encourages initiatives of the research and development center.
- Item No. 2 developed for Dean of faculty facilitates and monitors research process of the faculty members.
- Item No. 3 developed for Chairman of the department ensures quality of research in the department.

- Item No. 4 developed for Head of Research and development (R&D) center gives roadmap for research and development.
- Item No. 5 developed for Active Role of Supervisor during research process
- Item No. 6 developed for Chairman Board of Advance Studies and Research (BASR) approves the research proposals timely.

3.5.2.2 Product Management of Research and Development (R&D)

- Item No. 7 developed for Research institutes provide market based knowledge and information technology
- Item No.8 developed for Research institutes/departments design market based software.
- Item No. 9 developed for Research institutes/departments design market based hardware.
- Item No. 10 developed for Research institutes produce human resource management (HRM) personnel.
- Item No. 11 developed for Research institutes organize need based resources for human resource development (HRD)
- Item No. 12 developed for Research institutes strengthen financial status of the customers.
- Item No.13 developed for Research institutes create literature according to the market demand.
- Item No. 14 developed for Research institutes produce scientists for further research and innovations.

3.5.2.3 Planning Process of Research and Development (R&D)

- Item No. 15 developed for Research and development (R&D) center formulates policy matters for research mechanism of the university.
- Item No. 16 developed for Research and development (R&D) center formulates research projects in light of the research findings.
- Item No. 17 developed for Research and development (R&D) center designs rules and regulations to facilitate the researchers during research process.
- Item No. 18 developed for Research and development (R&D) center develops strategic plan to enhance quality of the research work.

- Item No. 19 developed for Research and development (R&D) center plans research projects according to national goals.
- Item No. 20 developed for Research and development (R&D) center prepares research activities according to the demand of global trends.
- Item No. 21 developed for Research and development (R&D) center design job description for research technocrats.
- Item No. 22 developed for Research institutes prepare rules and regulations for research and development.
- Item No. 23 developed for Research and development institutes launch long-term policies for research advancement.
- Item No. 24 developed for Research and development institutes launch short-term research projects.

3.5.2.4 Implementation Phase of Research and Development (R&D)

- Item No. 25 developed for Research and development (R &D) conducts conferences/seminars or symposiums for improving research culture.
- Item No. 26 developed for Research and development (R&D) center arranges professional development workshops to enhance research expertise among the faculty members.
- Item No. 27 developed for Research and development (R&D) center introduces innovative practices to improve research mechanism.
- Item No. 28 developed for Research and development (R&D) center provides management information system to the research institution.
- Item No. 29 developed for Research and development (R&D) center signs agreements between national and foreign agencies on the research projects.
- Item No. 30 developed for Research and development (R&D) center takes specific measures for improving quality of the research institutes.
- Item No. 31 developed for Research and development (R&D) center manage to sign agreement between private and public sector.
- Item No.32 developed for Research and development (R&D) center arranges study tours of researcher and research supervisors for improving research expertise.

- Item No. 33 developed for Research institutes/departments implement research and development (R&D) policies.
- Item No. 34 developed for Research institutes/departments establish sound organization for research and development.

3.5.2.5 Monitoring Networks of Research and Development (R&D)

- Item No. 35 developed for Research and development (R&D) ensure to follow the restrictions for the running research projects.
- Item No. 36 developed for Research and development (R&D) centers to monitors the quality assurance mechanism of the research institutions on regular basis.
- Item No. 37 developed for Research institutes/department create competitive environment for research and development.
- Item No. 38 developed for Research and Development centers ensure to follow the quality assurance of research process.
- Item No. 39 developed for Research institutes/departments provide security to its stakeholders during research process.

3.5.2.6 Technical Assistance of Research and Development (R&D)

- Item No. 40 developed for Research and development (R&D) center provides technical assistance for research activities.
- Item No. 41 developed for Research and development (R&D) center to assist the research supervisors through information communication technologies.
- Item No.42 developed for Research and development (R&D) center facilitate the researchers through latest print media.
- Item No. 43 developed for Research and development (R&D) center equips science laborites with modern apparatus for experimentation.
- Item No. 44 developed for Research and development (R&D) center supports libraries through inter-library loan projects.
- Item No.45 developed for Research and development (R&D) center facilities computer labs through latest computer technologies.

- Item No. 46 developed for Research and development (R&D) center recommends scholarly assistance for research students.

3.5.2.7 Financial Assistance for Research and Development (R&D)

- Item No. 47 developed for Research and development (R&D) center generate funds through available resources to enhance research quality.
- Item No. 48 developed for Research and development (R&D) center supports research activities through research grants.
- Item No. 49 developed for Research and development (R&D) generate funds from internal university resources.
- Item No. 50 developed for Research and development (R&D) contacts with national donor agencies for fund raising to promote research activities.
- Item No. 51 developed for Research and development (R&D) center develop links with foreign donor agencies for capital and human assistance.

3.5.2.8 Feed Back of Research and Development Mechanism (R&D)

- Item No. 52 developed for Research and development (R&D) center launches research projects to increase funds for university income.
- Item No. 53 developed for Research recommendations provide feedback to the social sector.
- Item No. 54 developed for Research institutions/departments improve their performance through feedback of the functional institutions.

3.5.2.9 Coordination between Local and International Institutions

- Item No. 55 developed for Research and development (R&D) center develops co-ordination among different local research institutions.
- Item No. 56 developed for Research and development (R&D) center collaborate with national and international research institutes for developing research quality.
- Item No. 57 developed for Research and development (R&D) center develops co-ordination between research and functional institutions.
- Item No. 58 developed for Research and development (R&D) builds interaction between external agencies and research institutes.

3.5.2.10 Outcomes of Research and Development (R&D) Mechanism

- Item No. 59 developed for Research and development (R&D) design need based assessment for research projects.
- Item No. 60 developed for Research and development (R&D) provides trained manpower to the local industry.
- Item No. 61 developed for Research and development (R&D) center provides HRM for good governance of the institutions.
- Item No. 62 developed for Research and development (R&D) prepares expert artisan to strengthen the labor market.
- Item No. 63 developed for Research and development (R&D) center develops bridge between research institutions and social sector of the community.
- Item No. 64 developed for Research and development (R&D) center facilitates public sector through the results of research activities.
- Item No. 65 developed for Research and development (R&D) centers provide skilled manpower for development of the society.
- Item No. 66 developed for Research and development (R&D) centers provide research experts to the university and research institutes.

3.5.2.11 Challenges of Research and Development (R&D) Mechanism in the University

- Item No. 67 developed for Research and development (R&D) mechanism is too lengthy.
- Item No. 68 developed for Research and development (R&D) center lacks research expertise in the university.
- Item No. 69 Academia gives less priority to the research and development process.
- Item No. 70developed for Research and development (R&D) center suffers lack of funds.
- Item No. 71developed for Personal liking and disliking influence the research and development (R&D) process.
- Item No. 72 developed for developed for unstable policies influence the performance of research and development (R&D) mechanism.
- Item No. 73 developed for Lack of co-ordination exists among stake holders of research and development (R&D) mechanism.

- Item No. 74 developed for Lack of professional competency of HRD personnel affects the research and development (R&D) mechanism.

3.6 Administration of Questionnaires

The respondents from each population were asked to indicate their level of conformity with statement. The rate of administration and return was as follow:

Table 3.2

Rate of responses

S. No	Name of Universities	Deans / Chairman / HODs			Research Supervisors			R&D / QA Personnel		
		Administered	Return	Response Rate	Administered	Return	Response Rate	Administered	Return	Response Rate
1	Punjab University Lahore	10	10	100%	10	10	100%	10	10	100%
2	GC University Lahore	10	10	100%	10	10	100%	10	10	100%
3	University of Education Lahore	10	10	100%	10	10	100%	10	10	100%
4	BZU Multan	10	10	100%	10	10	100%	10	10	100%
5	IUB Bahawalpur	10	10	100%	10	10	100%	10	10	100%
6	GCU Faisalabad	10	10	100%	10	10	100%	10	10	100%
7	University of Sargodha	10	10	100%	10	10	100%	10	10	100%
8	University of Gujjrat	10	10	100%	10	10	100%	10	10	100%
9	Karachi University	10	10	100%	10	10	100%	10	10	100%
10	Sindh University Jamshors	10	10	100%	10	10	100%	10	10	100%
11	Shah Latif University Khairpur	10	10	100%	10	10	100%	10	10	100%
12	Balochistan University Quetta	10	10	100%	10	10	100%	10	10	100%
13	Peshawar University, Peshawar	10	10	100%	10	10	100%	10	10	100%
14	Islamia College University Peshawar	10	10	100%	10	10	100%	10	10	100%
15	Gomal University D.I Khan	10	10	100%	10	10	100%	10	10	100%
16	HazaraUniveristy (KPK)	10	10	100%	10	10	100%	10	10	100%
17	Bannu University (KPK)	10	10	100%	10	10	100%	10	10	100%
18	Abdul Wali Khan University	10	10	100%	10	10	100%	10	10	100%
19	Northern University, Noshehra	10	10	100%	10	10	100%	10	10	100%
20	Quaid-e-Azam University Islamabad	10	10	100%	10	10	100%	10	10	100%
21	Islamic International University Islamabad	10	10	100%	10	10	100%	10	10	100%
22	Azad Kashmir University	10	10	100%	10	10	100%	10	10	100%
23	Karakaram International University	10	10	100%	10	10	100%	10	10	100%

The respondents from each population were asked to indicate their level of conformity with each statement on the following five point scales with categories in table 3.2.

Table 3.3

Descriptions	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Scores	1	2	3	4	5

The researcher conceived the concept of scoring from Gay (2005) and converted the scores allotted to responses into mean score formula as follows:

Formula for Mean Score

Mean Score	=	$x = \sum x/n$
F(sa)	=	Frequency of strongly agreed
F(a)	=	Frequency of agreed / frequently / Good / Many responses
F(ud)	=	Frequency of undecided / uncertain / satisfactory / some responses
F(da)	=	Frequency of disagree
F(sda)	=	Frequency of strongly disagreed never no.
N	=	Total number of responses

3.7 Pilot Testing

The research instruments were pilot tested to make the instruments valid and reliable. First of all, the proposal of the study was presented to all the faculty members and researchers in the department of education in the university together with its research instrument for their validation. After the presentation, a question-answer session was held to refine the proposal and the instrument in the light of faculty members' and researchers' comments. The instrument was again being distributed to teachers and researchers in the department after making the recommended changes and was finalized after the revision. Now the research instrument was ready to be launched in the field to test the reliability. There was a pilot study at The Islamia University of Bahawalpur so that the reliability of the instrument may be assured. In the light of comments and feedback of researchers and managers of R&D department to the instrument, there was again some necessary refinement. Thus, the pilot testing was completed to make sure reliability and validity of the research instrument. After the completion of the pilot testing, responses were fed on SPSS 17 and following results were extracted from the pilot testing.

Table 3.4

Reliability Statistics

Sr. No	Number of Items	Cronbach's alpha
Questionnaire for Deans	74	0.791
Questionnaire for Chairpersons	74	0.789
Questionnaire for Research Supervisors	74	0.797
Questionnaire for Directors R&D	74	0.785
Questionnaire for Directors QAC	74	0.796

According to the table 3.3 the calculated reliability of the research instruments were found 0.791 by Deans, 0.789 Chairpersons, 0.797 Research Supervisor, 0.785 Directors R&D and 0.796 Directors QAC that are reliable and valid because 0.70 and above values are reliable (Inglalill, 2007).

3.8 Study of the Documents

A Performa was constructed on (Appendix-D) the selected general universities of public sector in Pakistan.

3.9 Data Collection

The researcher collected the data personally from the selected general universities at public sector in Pakistan. The permission to collect the data was obtained from vice chancellors (V.C) who were the administrative heads of the universities in Pakistan. The authorization was also being sought from the registrars, directors of R&D centres, directors BASR and directors of ORIC from where the data was to be collected.

3.10 Data Analysis

The collected data was analyzed with the help of software Statistical Package for Social Sciences (SPSS) version 17 by using statistical formulas of t-test, correlation, regression, analysis of variance, simple mean and percentage. The effect of the different factors on research and development (R&D) was analyzed item wise and as a whole also. The problems faced by research and development R&D managers and researchers was also be analyzed. After obtaining results from the analysis, the findings were reported and on the basis of these findings,

appropriate measures were suggested and a model was proposed for research and development (R&D) at university level in Pakistan.

Data was arranged and analyzed by applying percentage and mean (Likert Scale) five options were calculated for each statement. The responses were to indicate the degree to which respondents agreed or disagreed to each statement by ticking (✓) one of the five options.

For positive statement the scores assigned to each option were as follows.

Strongly Agree (SA)	=	5	Agree (A)	=	4
Undecided (UD)	=	3	Disagree (DA)	=	2
Strongly Disagree (SDA)	=	1			

Whereas for negative statement the order of scores assigned to each option were reversed i.e.

Strongly Agree (SA)	=	1	Agree (A)	=	2
Undecided (UD)	=	3	Disagree (DA)	=	4
Strongly Disagree (SDA)	=	5	(Connolly, 2007).		

3.11 Percentage

It is a way to express a number as a fraction of 100. For example, "sixty-five percent" denoted as 65% is equal to 65 / 100, or 0.65. Percent sign “%”is used to represent this. Percentages are used to compare two are more than two different quantities (differences among the marks of students) and to estimate how one quantity is relative to another quantity (increases in prices) (Bhatti, 2001).

3.12 Research Ethics

Consideration of ethical issue was an integral part throughout this research study. Care was taken to maintain the anonymity of the institution and research sample participating in the study. The participants’ willingness to take part in the study and prior permission from the heads of institutions and respondents were taken before embark upon to this research study. Participants actual names unless their permission was not be used. The researcher took care not to impose his personal views or opinions during discussion with the participants.

3.13 Summary

This chapter describes a detailed research methodology and procedure of the study. The major focus of this chapter was to describe about the sample and sampling techniques, research instrument and process of validity and reliability of research instrument. It also includes data collection procedure and data analysis in the light of statistical formulas. Analysis and interpretation of quantitative and qualitative data will be presented in next chapter.

CHAPTER 4

ANALYSIS AND INTERPRETATIONS OF DATA

This research study aimed to analyze the current research and development mechanism in the general universities of public sector in Pakistan. The design of this study was descriptive in nature; thus the questionnaire was used for data collection. The collected data was tabulated and analyzed using chi-square, mean score, one way ANOVA, frequency and by simple percentage methods. The detailed analysis of data presented as follows:

Table 4.1

Vice Chancellor encourages initiatives of the Research and Development (R&D) center.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Encouragement of the Vice Chancellor	Frequency	73	142	11	340	124	690	1.286	3.43
	Percentage	10.6	20.5	1.6	49.3	18	100		

The Vice Chancellor is an executive head of the university and is responsible for developing an appropriate policy to enhance research productivity in the university. The data in table 4.1 indicated the role of vice chancellor to strengthen R&D mechanism in the university. According to the data analysis less that half 49.3% of the respondents agreed and 18% of the respondents strongly agreed with the statement that Vice Chancellor encourages initiatives of the research and development center. However, 20.5% of the respondents disagreed and 10.6% of the respondents strongly disagreed with the statement, whereas 1.6% of the respondents were undecided about it. In overall majority (67.3%) of the respondents were of the view that vice chancellors encourages initiatives of the research and development centers. The mean score 3.43 supported the statement. It showed that vice chancellors encourage the initiatives of research & development centers in the universities. The value of S.D was (1.286).

Table 4.2

Dean of faculty facilitates and monitors research process of the faculty members.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Monitoring of dean of faculty	Frequency	79	179	15	310	107	690	1.310	3.10
	Percentage	11.4	25.9	2.2	44.9	15.5	100		

Dean is an administrative head of the faculty and looks after its academic matters including teaching and research in the departments functioning under the faculty. S/he also participates in planning process of regarding research and development in the university. The data in table 4.2 described the role of dean of faculty regarding research and development mechanism. According to the data analysis less than half 44.9% of the respondents agreed and 15.5% of the respondents strongly agreed to the statement that dean of faculty facilitates and monitors research work of the faculty members. However, 25.9% of the respondents disagreed and 11.4% strongly disagreed to the statement, whereas 2.2% of the respondents were undecertain about it. In overall majority (60.4%) of the respondents were of the view that dean of faculty facilitates and monitors research work of the faculty members. The mean score (3.10) supported the statement. It showed that deans of faculties facilitated and monitored research work in their respective faculties. The value of S.D was (1.310).

Table 4.3

Chairman of the department ensures quality of research in the department.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Chairman ensures quality of research	Frequency	72	172	11	322	113	690	1.295	3.34
	Percentage	10.4	24.9	1.6	46.7	16.4	100		

The Chairman is an administrative head of department and is responsible to ensure quality of research work of the supervisors and researchers in the department. The data in table 4.3 indicated the role of chairman regarding research work in the department. According to the data analysis less than half 46.7% of the respondents agreed and 16.4% of the respondents strongly agreed to the statement that the chairman ensures quality of research work in the department. However, 24.9% of the respondents disagreed and 10.4% of the respondents strongly disagreed with the statement, whereas 1.6% respondents were uncertain about it. In overall majority (63.1%) of the respondents were of the view that the chairmen of the departments ensure quality of research process in the department. The mean score (3.34) supported the statement. It showed that chairmen of the department ensure quality of research work in the department. The value of S.D was (1.295).

Table 4.4 *Director of R&D center gives roadmap for research and development.*

Director of R&D center gives roadmap for research and development.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Roadmap for R&D	Frequency	94	239	11	270	76	690	1.314	2.99
	Percentage	13.6	34.6	1.6	39.1	11	100		

Head of research and development center gives roadmap for R&D mechanism in the universities. She/he coordinates with the research supervisors and heads of departments to facilitate them in research work. She/he officially manages the record of national and international publications and research projects. The data in table 4.4 explored the role of head of R&D center regarding R&D mechanism in the universities. According to the data analysis 39.1% of the respondents agreed and 11% of the respondents respondents strongly agreed to the statement that head of R&D center gives roadmap for research and development mechanism in the universities. However 34.6% of the respondents disagreed and 13.6% of the respondents strongly disagreed with the statement, whereas 1.6% of the respondents were uncertain about the role of R&D head. In overall about half (50.1%) of the respondents were of the view that the heads of research and development centers give roadmap for R&D in the universities. The mean score (2.99) supported the statement. It showed that heads of research & development centers give roadmap for research and development in the universities. The value of S.D was (1.314).

Table 4.5

Role of research supervisor during research process

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Supervisor involves actively during research process?	Frequency	50	176	10	299	155	690	1.283	3.48
	Percentage	7.2	25.5	1.4	43.3	22.5	100		

The role of research supervisor is very important in the department. She/he is responsible to involve actively with the researchers during research work. The data in table 4.5 described the role of research supervisors during research work in the department. According to the data analysis less than half 43.3% of the respondents agreed to the statement and 22.5% of the respondents strongly agreed to the statement that research supervisors involve actively with the researchers during research work in the department. However, 25.5% of the respondents disagreed and 7.2% of the respondents strongly disagreed with the statement, however 1.4% of the respondents were undecided about it. In overall majority (65.8%) of the respondents were of the view that research supervisors involve actively during research process in the universities. The mean score (3.48) supported the statement. It showed that research supervisors involve actively with the researchers during research process. The value of S.D was (1.283).

Table 4.6

Chairman Board of Advanced Studies and Research (BASR) approves the research proposals timely.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Approval of research proposals	Frequency	75	262	6	253	94	690	1.314	3.04
	Percentage	10.9	38	0.9	36.7	13.6	100		

Chairman board of advanced studies and research (BASR) is responsibal to conduct meetings regularly and approves the research proposals timely. The data in table 4.6 indicated the role of chairman BASR in the universities. According to the data analysis 38% of the respondents disagreed and 10.9% of the respondents strongly disagreed to the statement that chairmen of the BASR conduct meetings regularly and approve the research proposals timely in the concerned university. However 36.7% of the respondents agreed and 13.6% of the respondents strongly agreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall more than half (50.3%) of the respondents were of the view that the chairmen board of advance studies and research conduct meetings regularly and approve the research proposals timely in the concerned university. The mean score 3.04 supported the statement. It showed that chairmen of the BASR conduct meetings regularly and approve the research proposals timely. The value of S.D was (1.314).

Table 4.7

Research institutes provide market based knowledge and information technology

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Market based knowledge	Frequency	94	248	6	251	91	690	1.341	3
	Percentage	13.6	35.9	0.9	36.4	13.2	100		

The research institutes of higher education provide market based knowledge and information technology to the industry and private sector on their demand. The data in table 4.7 described the role of research institutes of higher education to provide market based knowledge and information technology. According to the data analysis 36.4% of the respondents agreed and 13.2% of the respondents strongly agreed to the statement that the research institutes provide market based knowledge and information technology to the industry. However 35.9% of the respondents disagreed and 13.6% of the respondents strongly disagreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall less than half 49.6% of the respondents were of the view that the research institutes provided market based knowledge and information technology to the industry. The mean score 3.0 supported the statement. It showed that less than half research institutes provide market based knowledge and information technology to the industry. The value of S.D was (1.341).

Table 4.8

Research institutes/departments design market based software.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Market based software	Frequency	93	304	15	202	76	690	1.295	2.80
	Percentage	13.5	44.1	2.2	29.3	11	100		

One of the main functions of research and development (R&D) council is to design market based software for the academic institutions and industry. The research institutes and departments in the universities designed market based software on the demand of public institutions and industry. The data in table 4.8 indicated the role of the research institutes/departments to design market based software. According to the data analysis 44.1% of the respondents disagreed and 13.5% of the respondents strongly disagreed with the statement that the research institutes/departments in the universities did not design market based software for the public institutions and industry. However, 29.3% of the respondents agreed and 11% of the respondents strongly agreed with the statement, whereas 2.2% of the respondents were undecided about it. In overall, most 57.6% of the respondents were of the view that the research institutes/departments in the universities did not design market based software for the public institutions and industry. The mean score 2.80 supported the statement. It showed that the research institutes did not design market based software for the public institutions and industry. The value of S.D was (1.295).

Table 4.9

Research institutes/departments design market based hardware.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Market based hardware	Frequency	87	290	18	220	75	690	1.295	2.86
	Percentage	12.6	42	2.6	31.9	10.9	100		

The research institutes and departments design market based hardware for use in the universities and private industry on their demand. The data in table 4.9 showed the role of research institutes/departments to design market based hardware. According to the data analysis 42% of the respondents disagreed and 12.6% of the respondents strongly disagreed with the statement that the research institutes/departments did not design market based hardware for the universities and industries. However 31.9% of the respondents agreed and 10.9% of the respondents strongly agreed with the statement, whereas 2.6% of the respondents were undecided about the statement. In overall, most 54.6% of the respondents were of the view that research institutes did not design market based hardware for the universities and industries. The mean score 2.86 did not support the statement. It showed that the research institutes did not design market based hardware for the universities and industry. The value of S.D was (1.295).

Table 4.10

Research institutes produce human resource management (HRM) personnel.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
HRM personnel	Frequency	73	263	12	255	87	690	1.296	3.03
	Percentage	10.6	38.1	1.7	37	12.6	100		

The human resource management (HRM) personnel are necessary for all the public and private institutions. For this purpose the universities and research institutes produce HRM personnel to work in the private firms and industry. The data in table 4.10 described the role of research institutes to produce human resource management (HRM) personnel. According to the data analysis 37% of the respondents agreed and 12.6% of the respondents strongly agreed with the statement that the research institutes/departments produced human resource management (HRM) personnel. However, 38% of the respondents disagreed and 10.6% of the respondents strongly disagreed with the statement, whereas 1.7% of the respondents were undecided about it. In overall, less than half 49.6% of the respondents were of the view that research institutes produced human resource management personnel to work in the private firms and industry. The mean score 3.03 supported the statement. It showed that the research institutes produced human resource management personnel for the private firms and industry. The value of S.D was (1.296).

Table 4.11

Research institutes organize need based resources for human resource development (HRD)

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Resources for HRD	Frequency	73	259	6	274	78	690	1.284	3.04
	Percentage	10.6	37.5	0.9	39.7	11.3	100		

The purpose of human resource development (HRD) is to enhance the performance and efficiency of working people in the universities and industrial sector. The responsibility of research institutes is to organize need based resources for the HRD. The data in table 4.11 indicated the role of the research institutes to organize need based resources for human resource development. According to the data analysis 39.7% of the respondents agreed and 11.3% of the respondents strongly agreed with the statement that research institutes organized need based resources for human resource development. However 37.5% of the respondents disagreed and 10.6% of the respondents strongly disagreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall, more than half 51% of the respondents were of the view that research institutes/departments organized need based resources for human resource development in the universities and industrial sectore. The mean score 3.04 supported the statement. It showed that research institutes organized need based resources for human resource development for the working people in universities and industrial sectore. The value of S.D was (1.284).

Table 4.12

Research institutes strengthened financial status of the customers.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Financial status of customer	Frequency	103	307	15	211	54	690	1.259	2.72
	Percentage	14.9	44.5	2.2	30.6	7.8	100		

The research institutes of higher education generate resources to strengthen financial status of the customers. The data in table 4.12 described the role of the research institutes to strengthen financial status of the customers. According to the data analysis 44.5% of the respondents disagreed and 14.9% of the respondents strongly disagreed with the statement that research institutes to strengthen financial status of the customers. However 30.6% of the respondents agreed and 7.8% of the respondents strongly agreed with the statement, whereas 2.2% of the respondents were undecided about it. In overall, majority 59.4% of the respondents were of the view that research institutes did not strengthen financial status of the customers. Mean score 2.72 did not support the statement. It showed that research institutes did not strengthen financial status of the customers. The value of S.D was (1.259).

Table 4.13

Research institutes create literature according to the market demand.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Literature for market demand	Frequency	80	252	5	301	52	690	1.253	2.99
	Percentage	11.6	36.5	0.7	43.6	7.5	100		

The research institutes of higher education create and design new literature according to the market demand. For this purpose R&D centers assists the research institutes and departments to create market based literature. The data in table 4.13 identified the role of the research institutes to create literature according to the market demand. According to the data analysis 43.6% of the respondents agreed and 7.5% of the respondents strongly agreed to the statement that research institutes create literature according to the market demand. However, 36.5% of the respondents strongly disagreed and 11.6% of the respondents strongly disagreed with the statement whereas 0.7% of the respondents were undecided about it. In overall, more than half 51.1% of the respondents were of the view that the research institutes created literature according to the market demand. The mean score 2.99 supported the statement. It showed that the research institutes created literature according to the market demand. The value of S.D was (1.253).

Table 4.14

Research institutes produce scientists for further research and innovations.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Scientists for research & innovations	Frequency	62	228	12	298	90	690	1.270	3.18
	Percentage	9	33	1.7	43.2	13	100		

The purpose of research institutes at higher education is to produce research scientists for further research and innovations. The data in table 4.14 expressed the role of the research institutes to produce scientists for further research and innovations. According to the data analysis 43.2% of the respondents agreed and 13% of the respondents strongly agreed to the statement that research institutes produce scientists for further research and innovations. However, 33% of the respondents disagreed with the statement and 9% of the respondents strongly disagreed with the statement, whereas 1.7% of the respondents were undecided about it. In overall, most (56.2%) of the respondents were of the view that research institutes at higher education produce scientists for further research and innovations. The mean score (3.18) supported the statement. It showed that the research institutes at higher education produce scientists for further research and innovations. The value of S.D was (1.270).

Table 4.15

Research & Development center formulates policy matters for research mechanism of the university.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research policy	Frequency	74	248	9	288	71	690	1.272	3.05
	Percentage	10.7	35.9	1.4	41.7	10.3	100		

The formulation of policy matters for research mechanism is the task of research and development (R&D) centers in the universities and research institutions. The experts review the existing policies and critically discuss with the stakeholders for necessary amendments. The data in table 4.15 described that the research and development centers formulate policies for research mechanism in the universities. According to data analysis 41.7% of the respondents agreed and 10.3% of the respondents strongly agreed to the statement that R&D center formulate policies for research mechanism of the university. However, 35.9% of the respondents disagreed and 10.7% of the respondents strongly disagreed with the statement, whereas 1.4% of the respondents were undecided about it. In overall, most (52%) of the respondents were of the view that R&D centers formulate policies for research mechanism in the universities. The mean score (3.05) supported the statement. It showed that research & development centers formulate ploicies for research mechanism in the universities. The value of S.D was (1.272).

Table 4.16

Research & Development center formulates research projects in light of the research findings.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research projects	Frequency	84	229	20	278	79	690	1.296	3.06
	Percentage	12.2	33.2	2.9	40.3	11.4	100		

The formulation of new research projects in light of research findings is one of the functions of research & development centers in the research institutes at higher education. The research projects are the source revenue for the research institutes. The data in table 4.16 indicated the role of R&D centers to formulate research projects in light of research findings. According to the data 40.3% of the respondents agreed and 11.4% of the respondents strongly agreed to the statement that R&D centers formulate research projects in the light of research findings. However, 33.2% of the respondents disagreed and 12.2% of the respondents strongly disagreed with the statement, whereas 2.9% of the respondents were undecided about it. In overall, more than half (51.7%) of the respondents were of the view that R&D centers formulate research projects in the light of research findings. The mean score (3.06) supported the statement. It showed that research & development centers formulate research projects in the light of research findings. The value of S.D was (1.296).

Table 4.17

R&D center designs rules and regulations to facilitate the researchers during research process.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Rules and regulations	Frequency	64	213	29	294	90	690	1.262	3.19
	Percentage	9.3	30.9	4.2	42.6	13	100		

The research is a systematic process therefore; it demands specific rules and regulations. It is responsibility of the research & development centers to design rules and regulations to facilitate the researchers during the research process. The data in table 4.17 described the role of research & development centers to design rules and regulations. According to the data analysis 42.6% of the respondents agreed and 13% of the respondents strongly agreed to the statement that research & development centers design rules and regulations to facilitate the researchers during research process. However, 30.9% of the respondents disagreed and 9.3% of the respondents strongly disagreed with the statement, whereas 4.2% of the respondents were undecided about it. In overall, most (55.6%) of the respondents were of the view that research & development centers design rules and regulations for the researchers during research process. The mean score (3.19) supported the statement. It showed that research & development centers design rules and regulations for the researchers during research process. The value of S.D was (1.262).

Table 4.18

Research & Development center develops strategic plan to enhance quality of the research work.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Quality of research	Frequency	64	259	16	262	89	690	1.280	3.08
	Percentage	9.3	37.5	2.3	38	12.9	100		

Th purpose of research & development centers at higher education is to enhance the quality of research work in the universities. The data in table 4.18 expressed the role of research & development centers to develop strategic plan to enhance quality of research work. According to the data analysis 38% of the respondents agreed and 12.9% of the respondents strongly agreed to the statement that research & development centers develope strategic plan to enhance the quality of research work. However, 37.5% of the respondents disagreed and 9.3% of the respondents strongly disagreed to the statement, whereas 2.3% of the respondents were undecided about it. In overall, more than half (50.9%) of the respondents were of the view that research & development centers develop strategic plan to enhance the quality of research work. The mean score (3.08) supported the statement. It showed that about half of research & development centers develop strategic plan to enhance the quality of research work. The value of S.D was (1.280).

Table 4.19

Research & Development center plans research projects according to the national goals.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
National research projects	Frequency	71	320	9	210	80	690	1.276	2.87
	Percentage	10.3	46.4	1.3	30.4	11.6	100		

The responsibility of research & development centers is to plan and design research projects according to the national goals. The national and international research projects provide opportunities to transfer knowledge and skills. Th data in table 4.19 explored the role of research & development centers to plan research projects according to national goals. According to the data 46.4% of the respondents disagreed and 10.3% of the respondents strongly disagreed to the statement that research & development centers plan the research projects according to national goals. However, 30.4% of the respondents agreed and 11.6% of the respondents strongly agreed to the statement, whereas 1.3% of the respondents were undecided about it. In overall, most (56.7%) of the respondents were of the view that research & development centers did not plan research projects according to the national goals. The mean score (2.87) did not supported the statement. It showed that research & development centers did not plan research projects according to the national goals. The value of S.D was (1.276).

Table 4.20

Research & Development center prepares research activities according to the demand of global trends.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research activities to global demand	Frequency	67	314	5	245	59	690	1.236	2.88
	Percentage	9.7	45.5	0.7	35.5	8.6	100		

The research activities according to demand of global trends is an important function of the research & development centers at higher education. The data in table 4.20 described the role of research & development centers to prepare research activities according to the demand of global trends. According to the data analysis 45.5% of the respondents disagreed and 9.7% of the respondents strongly disagreed to the statement that research & development centers prepare research activities according to the demand of global trends. However, 35.5% of the respondents agreed and 8.6% of the respondents strongly agreed to the statement, however 0.7% of the respondents were undecided about the statement. In overall, most (55.2%) of the respondents were of the view that research & development centers did not prepare research activities according to the demand of global trends. The mean score (2.88) did not supported the statement. It showed that research & development centers did not prepare research ctivities according to the demand of global trends. The value of S.D was (1.236).

Table 4.21

Research & Development centers design job descriptions for research technocrats.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Job description for research technocrats	Frequency	60	329	5	233	63	690	1.230	2.87
	Percentage	8.7	47.4	0.7	33.8	9.1	100		

The research technocrats play an important role to promote quality of research work at higher education. The research & development centers design job descriptions for research technocrats to join the research institutes and serve here. The data in table 4.21 indicated the role of research & development centers to design job descriptions for research technocrats. According to the data analysis 47.4% of the respondents disagreed and 8.7% of the respondents strongly disagreed to the statement that research & development centers design job descriptions for research technocrats. However, 33.8% of the respondents agreed and 9.1% of the respondents strongly agreed with the statement, whereas 0.7% of the respondents were undecided about it. In overall, most (56.1%) of the respondents were of the view that research & development centers did not design job descriptions for research technocrats. The mean score (2.87) did not support the statement. It showed that research & development centers did not design job descriptions for the research technocrats. The value of S.D was (1.230).

Table 4.22

Research institutes prepare rules and regulations for research & development.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Rules and regulations for R&D	Frequency	42	208	7	343	90	690	1.206	3.33
	Percentage	6.1	30.1	0.1	49.7	13	100		

The research institutes prepare rules and regulations for research & development mechanism to promote research productivity at higher education. The data in table 4.22 described role of research institutes to prepare rules and regulations for research & development mechanism. According to the data analysis 49.7% of the respondents agreed and 13% of the respondents strongly agreed to the statement that research institutes prepare rules and regulations for research & development mechanism at higher education. However, 30.1% of the respondents disagreed and 6.1% of the respondents strongly disagreed with the statement, whereas 0.1% of the respondents were undecided about the statement. In overall, majority (62.7%) of the respondents were of the view that research institutes prepare rules and regulations for research & development mechanism at higher education. The mean score (3.33) supported the statement. It showed that research institutes prepare rules and regulations for research & development mechanism to promote research productivity at higher education. The value of S.D was (1.206).

Table 4.23

Research & Development centers launch long-term policies for research advancement.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Long-term policies for research	Frequency	63	316	6	224	81	690	1.27	2.92
	Percentage	9.1	45.8	0.9	32.5	11.7	100		

The research & development is a platform to formulate research policies at higher education. The research & development centers launch long term research policies for advancement and innovations of research process in the universities. The data in table 4.23 described role of research & development centers to launch long-term research policies for advancement in the universities. According to the data 45.8% of the respondents disagreed and 9.1% of the respondents strongly disagreed to the statement that research & development centers launch long term research policies for advancement. However, 32.5% of the respondents agreed and 11.7% of the respondents strongly agreed, with the statement, whereas 0.9% of the respondents were undecided about it. In overall, most (54.9%) of the respondents were of the view that research & development centers did not launch long term research policies for advancement and innovations. The mean score (2.92) did not support the statement. It showed that research & development centers did not launch long term research policies for advancement and innovations in the universities. The value of S.D was (1.270).

Table 4.24

Research & Development centers launch short-term research projects.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Short-term research projects	Frequency	75	253	7	277	78	690	1.287	3.04
	Percentage	10.9	36.7	0.1	40.1	11.3	100		

The research & development center launch short-term research projects for the researchers in the universities. The data in table 4.24 expressed the role of research & development centers to launch short-term research projects. According to the data analysis 40.1% of the respondents agreed and 11.3% of the respondents strongly agreed to the statement that research & development centers launch short term research projects for the researchers in the universities. However, 36.7% of the respondents disagreed and 10.9% of the respondents strongly disagreed to the statement, whereas 0.1% of the respondents were undecided about the it. In overall, more than half (51.4%) of the respondents were of the view that research & development centers launch short term research projects for researchers in the universities. The mean score (3.04) supported the statement. It showed that research & development centers launch short term research projects for researchers in the universities. The value of S.D was (1.287).

Table 4.25

R&D conducts conferences, seminars or symposiums for promoting reseach culture.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Conferences for improving research culture	Frequency	52	225	7	305	101	690	1.261	3.26
	Percentage	7.5	32.6	0.1	44.2	14.6	100		

The research conferences, seminars and symposiums promote research culture in the universities. The research & development centers organize to conduct national and international research conferences, seminars and symposiums to promote research culture. The data in table 4.25 described the role of research & development centers to conduct research conferences and seminars. According to the data analysis 44.2% of the respondents agreed and 14.6% of the respondents strongly agreed to the statement that research & development centers conduct research conferences and seminars to promote research culture in the universities. However, 32.6% of the respondents disagreed and 7.5% of the respondents strongly disagreed to the statement, whereas 0.1% of the respondents were undecided about it. In overall, majority (58.8%) of the respondents were of the view that research & development centers conduct research conferences and seminars to promote research culture in the universities. The mean score (3.26) supported the statement. It showed that research & development centers conduct research conferences and seminars to promote research culture in the universities. The value of S.D was (1.261).

Table 4.26

R&D center arranges professional development workshops to enhance research expertise among the faculty members.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Professional development workshops	Frequency	62	258	4	281	84	690	1.275	3.09
	Percentage	9.1	37.4	0.6	40.7	12.2	100		

The professional development workshops enhance research expertise and innovative skills among faculty members. It is responsibility of research & development centers to arrange the professional development workshops specially for young faculty members in the universities. The data in table 4.26 explored the role of research & development centers to arrange professional development workshops in the universities. According to the data analysis 40.7% of the respondents agreed and 12.2% of the respondents strongly agreed with the statement that research & development centers arrange workshops to enhance research exertise among faculty members. However, 37.4% of the respondents disagreed and 9.1% of the respondents strongly disagreed with the statement, whereas 0.6% of the respondents were undecided about it. In overall, more than half 52.9% of the respondents were of the view that research & development centers arrange professional development workshops to enhance research expertise among the faculty members. The mean score (3.09) supported the statement. It showed that research & development centers arrange professional development workshops to enhance research expertise among the faculty members. The value of S.D was (1.275).

Table 4.27

Reseaerch & development (R&D) center introduces innovative practices to improve research mechanism.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Innovative practices to improve research mechanism	Frequency	58	292	9	251	80	690	1.261	3.00
	Percentage	8.4	42.3	1.3	36.4	11.6	100		

The innovativation in research process is necessary part of the research culture in the universities and/or institutions of higher education. The research & development centers introduce innovative practices to improve the research mechanism in the universities. The data in table 4.27 described the role of research & development centers to introduce innovative research practices in the universities. According to the data analysis 42.3% of the respondents disagreed and 8.4% of the respondents strongly disagreed to the statement that research & development centers introduce innovative practices to improve the research mechanism. However, 36.4% of the respondents agreed and 11.6% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were undecided about it. In overall, more than half 50.7% of the respondents were of the view that research & development centers did not introduce innovative practices to improve research mechanism. The mean score (3.00) did not support the statement. It showed that research & development centers did not introduce innovative practices to improve the research mechanism. The value of S.D was (1.261).

Table 4.28

Research and Development (R&D) center provides management information system to the research institution.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Management information system for research institution	Frequency	59	275	8	278	70	690	1.245	3.04
	Percentage	8.6	39.9	1.2	40.3	10.1	100		

The management information system is necessary to increase efficiency of the researchers and research institutes. It is responsibility of research and development (R&D) centers to provide management information system to the research institutions. The data in table 4.28 described the role of research & development centers for providing management information system. According to the data analysis 40.3% of the respondents agreed and 10.1% of the respondents strongly agreed to the statement that research & development centers provide management information system to the research institution. However, 39.9% of the respondents disagreed and 8.6% of the respondents strongly disagreed with the statement, whereas 1.2% of the respondents were undecided about the statement. In overall, about half 50.4% of the respondents were of the view that research & development centers provide management information system to the research institution. The mean score (3.04) supported the statement. It showed that research & development centers provide management information system to the research institutes. The value of S.D was (1.245).

Table 4.29

R&D center signs agreements between national and foreign agencies for the research projects.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Agreement with foreign agencies	Frequency	59	297	8	262	64	690	1.235	2.96
	Percentage	8.6	43	1.2	38	9.3	100		

The research expertise and talent exchange through the local and foreign research projects. The collaborative research projects provide new knowledge and skills to researchers in the research institutes at higher education. One of the functions of research & development center is to sign agreements between national and foreign agencies for the research projects. The data in table 4.29 described the role of research & development centers to sign agreement between national and foreign agencies for the research projects. According to the data analysis 43% of the respondents disagreed and 8.6% of the respondents strongly disagreed to the statement that research & development centers sign agreement between national and foreign agencies for the research projects. However, 38% of the respondents agreed and 9.3% of the respondents strongly agreed, whereas 1.2% of the respondents were undecided about it. In overall, more than half 51.6% of the respondents were of the view that research & development centers did not sign agreements between national and foreign agencies in the universities. The mean score (2.96) did not support the statement. It showed that research & development centers did not sign agreements between national and foregion agencies in the universities. The value of S.D was (1.235).

Table 4.30

R&D center takes specific measures for improving quality of the research institutes.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Specific measures for improving quality	Frequency	44	292	8	288	58	690	1.197	3.03
	Percentage	6.4	42.3	1.2	41.7	8.4	100		

The research & development centers take specific measures to improve the quality of research institutes. The data in table 4.30 expressed the role of research & development centers to take specific measures for improving the quality of research institutes at higher education. According to the data analysis 42.3% of the respondents disagreed and 6.4% of the respondents strongly disagreed to the statement that research & development centers take specific measures to improve quality of research institutes. However, 41.7% of the respondents agreed and 8.4% of the respondents strongly agreed to the statement, whereas 1.2% of the respondents were uncertain about it. In overall, about half 50.1% of the respondents were of the view that research & development centers take specific measures to improve the quality of research institutes. The mean score (3.03) supported the statement. It showed that about half of the research & development centers take specific measures to improve the quality of research institutes. The value of S.D was (1.197).

Table 4.31

R&D centers manage to sign agreement between private and public sector.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Charter between private and public sector	Frequency	55	328	09	229	55	690	1.232	2.90
	Percentage	08	47.5	1.3	33.2	08	100		

The research & development centers manage to sign research agreements between public institutes and private sector. It is basic purpose of the research & development centers to collaborate private and public sector to promote research culture. The data in table 4.31 described the role of research & development centers to sign research agreements between private and public sector. According to the data analysis 47.5% of the respondents disagreed and 08% of the respondents strongly disagreed to the statement that research & development center manage to sign agreement between private and public sector. However, 33.2% of the respondents agreed and 08% of the respondents strongly agreed, whereas 1.3% of the respondents were undecided about it. In overall, most 55.5% of the respondents were of the view that research & development centers did not manage to sign agreement between private and public sector. The mean score (2.90) did not support the statement. It showed that research & development centers did not manage to sign agreement between private and public sector. The value of S.D was (1.232).

Table 4.32

R&D center arranges study tours of researchers and supervisors for improving research expertise.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Study tours for researchers and supervisors	Frequency	70	304	9	201	106	690	1.324	2.96
	Percentage	10.1	44.1	1.3	29.1	15.4	100		

The research & development centers arrange study tours to improve the research expertise among researchers and supervisors in research institutions. The data in table 4.32 described the role of research & development centers regarding study tours. According to the data analysis 44.1% of the respondents disagreed and 10.1% of the respondents strongly disagreed to the statement that research & development centers arranged study tours for the researchers and supervisors to improve the research expertise. However, 29.1% of the respondents agreed and 15.4% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were undecided about it. In overall, most 54.2% of the respondents were of the view that research & development centers did not arrange study tours for researchers and research supervisors to improve research expertise. The mean score (2.96) did not support the statement. It showed that most of research & development centers did not arrange study tours for researchers and supervisors to improve research expertise. The value of S.D was (1.324).

Table 4.33

Research institutes/departments implement R&D policies.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Implementation of the policies	Frequency	57	290	4	260	79	690	1.26	3.02
	Percentage	8.3	42	0.6	37.7	11.4	100		

The research institutes implement the policies of research & development centers for further research and innovations. The data in table 4.33 expressed the role of research institutes to implement the policies of research & development centers. According to the data analysis 42% of the respondents disagreed and 8.3% of the respondents strongly disagreed to the statement that research institutes implement research & development policies. However, 37.7% of the respondents agreed and 11.4% of the respondents strongly agreed to the statement, whereas 0.6% of the respondents were undecided about it. In overall, more than half 50.3% of the respondents were of the view that research institutes implement the research & development policies for further research and innovations. The mean score (3.02) supported the statement. It showed that more than half of research institutes did not implement the policies of research & development centers for further research and innovations. The value of S.D was (1.260).

Table 4.34

Research institutes-departments establish sound organizations for R&D.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Establish sound organization for research	Frequency	64	304	7	251	64	690	1.242	2.92
	Percentage	9.3	44.1	1	36.4	9.3	100		

The research institutes establish sound organizations for research & development centers in the universities. The data in table 4.34 explored the role of research institutes in establishing sound organizations for research & development. According to the data analysis 44.1% of the respondents disagreed and 9.3% of the respondents strongly disagreed to the statement that research institutes establish sound organizations for research & development. However, 36.4% of the respondents agreed and 9.3% of the respondents strongly agreed with the statement, whereas 1% of the respondents were uncertain about it. In overall, most 53.4% of the respondents were of the view that research institutes-departments did not establish sound organizations. The mean score (2.92) did not support the statement. It showed that most of research institutes did not establish sound organizations for research & development in the universities. The value of S.D was (1.242).

Table 4.35

R&D center ensures to follow the restrictions for the running research projects.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Check and balance of research projects	Frequency	75	275	7	259	74	690	1.28	2.97
	Percentage	10.9	39.9	1	37.5	10.7	100		

The research & development centers ensure the researchers and supervisors to follow the restrictions for the running research projects. The data in table 4.35 described the role of research & development centers regarding to follow the restrictions for running research projects in the universities. According to the data analysis 39.9% of the respondents disagreed and 10.9% of the respondents strongly disagreed to the statement that research & development center ensure to follow the restrictions for running research projects. However, 37.5% of the respondents agreed and 10.7% of the respondents strongly agreed with the statement, whereas 1% of the respondents were undecided about it. In overall, more than half 50.8% of the respondents were of the view that research & development center did not ensure to follow the restrictions for running research projects. The mean score (2.97) did not support the statement. It showed that more than half of the research & development centers did not ensure the researchers and supervisors to follow the restrictions for running research projects in the universities. The value of S.D was (1.280).

Table 4.36

R&D centers monitor the quality assurance mechanism of the research institutions on regular basis.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Quality assurance mechanism	Frequency	58	295	7	258	72	690	1.248	2.99
	Percentage	8.4	42.8	1	37.4	10.4	100		

The research & development centers monitor the quality assurance mechanism of research institutions on regular basis. The data in table 4.36 indicated the role of research & development centers regarding the quality assurance mechanism of research institutes. According to the data analysis 42.8% of the respondents disagreed and 8.4% of the respondents strongly disagreed to the statement that R&D centers monitored the quality assurance mechanism. However, 37.4% of the respondents agreed and 10.4% of the respondents strongly agreed to the statement, whereas 1% of the respondents were undecided about it. In overall, more than half (51.2%) of the respondents were of the view that research & development centers did not monitor the quality assurance mechanism. The mean score (2.99) did not support the statement. It showed that more than of the research & development centers did not monitor the quality assurance mechanism of research institutions on regular basis. The value of S.D was (1.248).

Table 4.37

Research institutes and/ or teaching departments create competitive environment for R&D.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Competitive environment for research	Frequency	76	261	8	249	96	690	1.318	3.04
	Percentage	11	37.8	1.2	36.1	13.9	100		

The research institutes and/ or teaching departments create competitive environment for research & development centers in the research work. The data in table 4.37 described the role of research institutes regarding competitive environment for research & development centers. According to the data analysis 37.8% of the respondents disagreed and 11% of the respondents strongly disagreed to the statement that research institutes and/ or teaching departments created competitive environment for research & development centers. However 36.1% of the respondents agreed and13.9% of the respondents strongly agreed, whereas 1.2% of the respondents were undecided about it. In overall, half 50% of the respondents were of the view that research institutes create competitive environment for research & development centers. The mean score (3.04) supported the statement. It showed that half of the research institutes and/ or teaching departments create competitive environment for the research & developments centers in the universities. The value of S.D was (1.318).

Table 4.38

R&D centers ensure to follow/ monitor the quality assurance of research work.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Quality assurance for research	Frequency	65	267	7	304	47	690	1.216	3
	Percentage	9.4	38.7	1	44.1	6.8	100		

The research & development centers ensure to follow and/ or monitor the quality assurance of research work in research institutes at higher education. The data in table 4.38 explored the role of research & development centers regarding the quality assurance of research process in the universities. According to the data analysis 44.1% of the respondents agreed and 6.8% of the respondents strongly agreed to the statement that research & development centers ensure to follow the quality assurance of research process. However, 38.7% of the respondents disagreed and 9.4% of the respondents strongly disagreed to the statement, whereas 1% of the respondents were undecided about it. In overall, more than half 50.9% of the respondents were of the view that research & development centers ensure to follow the quality assurance of research process. The mean score (3.00) supported the statement. It showed that more than half of the research & development centers ensured the quality assurance of research process in the universities. The value of S.D was (1.216).

Table 4.39

Research institutes-departments provide security to its stakeholders during research process.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Security for stakeholders	Frequency	61	313	9	244	63	690	1.233	2.91
	Percentage	8.8	45.4	1.3	35.4	9.1	100		

The research institutes and teaching departments provide security to researchers and supervisors during research process. The data in table 4.39 described the role of research institutes and teaching departments regarding provision of security during research process. According to the data analysis 45.4% of the respondents disagreed and 8.8% of the respondents strongly disagreed with the statement that research institutes and teaching departments provide security during research process to researchers and supervisors. However, 35.4% of the respondents agreed and 9.1% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were undecided about it. In overall, most (54.2%) of the respondents were of the view that research institutes and teaching departments did not provide security during research process to researchers and supervisors. The mean score (2.91) did not support the statement. It showed that majority of the research institutes and teaching departments did not provide security to the researchers and supervisors during research process. The value of S.D was (1.233).

Table 4.40

Research and Development (R&D) centers provide technical assistance for research activities.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Technical assistance for research activities	Frequency	62	261	7	293	67	690	1.262	3.18
	Percentage	9	37.8	1	42.5	9.7	100		

The research & development centers provide technical assistance to the supervisors and researchers for research activities. The data in table 4.40 described role of research & development centers regarding provision of technical assistance. According to the data analysis 42.5% of the respondents agreed and 9.7% of the respondents strongly agreed to the statement that research & development centers provide technical assistance for research activities. However, 37.8% of the respondents disagreed and 9% of the respondents strongly disagreed, whereas 1% of the respondents were undecided about the statement. In overall, more than half 52.2% of the respondents were of the view that research & development centers provided technical assistance for research activities. The mean score (3.18) supported the statement. It showed that more than half of the research & development centers provided technical assistance for research activities in the universities. The value of S.D was (1.262).

Table 4.41

R&D assists the supervisors through information communication technologies.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Facilitate the research supervisors	Frequency	56	241	6	298	89	690	1.262	3.18
	Percentage	8.1	34.9	0.9	43.2	12.9	100		

The research & development centers assist the research supervisors through providing information and communication technologies. The data in table 4.41 described the role of research & development centers regarding provision of information communication technologies to research supervisor. According to the data analysis 43.2% of the respondents agreed and 12.9% of the respondents strongly agreed to the statement that R&D centers assisted the research supervisors through information communication technologies. However, 34.9% of the respondents disagreed and 8.1% of the respondents strongly disagreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall, most (56.1%) of the respondents were of the view that research & development centers assisted research supervisors through information communication technologies. The mean score (3.18) supported the statement. It showed that most of the research & development centers assisted the research supervisors through information communication technologies. The value of S.D was (1.262).

Table 4.42

R&D centers facilitate the researchers through latest print media.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Facilitate the researchers	Frequency	60	281	10	245	94	690	1.287	3.05
	Percentage	8.7	40.7	1.4	35.5	13.6	100		

The research & development centers facilitate the researchers through providing latest print media for use in research work. The data in table 4.42 expressed role of research & development centers regarding facilitating researchers through latest print media. According to the data analysis 40.7% of the respondents disagreed and 8.7% of the respondents strongly disagreed to the statement that research & development centers facilitated the researchers through latest print media. However, 35.5% of the respondents agreed and 13.6% of the respondents strongly agreed with the statement, whereas 1.4% of the respondents were undecided about it. In overall, less than half 49.4% of the respondents were of the view that research & development centers facilitated researchers through providing latest print media. The mean value (3.05%) supported the statement. It showed that less than half of the research & development centers facilitated the researchers through latest print media in the universities. The value of S.D was (1.287).

Table 4.43

R&D centers equip science laborites with modern apparatus for experimentation.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Technologies for science laborites.	Frequency	51	306	10	248	75	690	1.239	2.99
	Percentage	7.4	44.3	1.4	35.9	10.9	100		

The research & development centers equip the science laboratories with modern apparatus for experimentation. The data in table 4.43 described the role of research & development centers regarding science laboratories to equip with modern apparatus for experimentation. According to the data analysis 44.3% of the respondents disagreed and 7.4% of the respondents strongly disagreed to the statement that research & development centers equip science laboratories with modern apparatus for experimentation. However, 35.9% of the respondents agreed and 10.9% of the respondents strongly agreed with the statement, whereas 1.4% of the respondents were undecided about it. In overall, more than half (51.7%) of the respondents were of the view that research & development centers did not equip science laboratories with modern apparatus for experimentation. The mean score (2.99) did not support the statement. It showed that more than half of the research & development centers equipped science laboratories with modern apparatus for experimentation. The value of S.D was (1.239).

Table 4.44

R&D centers support the libraries through inter-library loan projects.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Inter library loan project	Frequency	72	325	6	202	85	690	1.287	2.86
	Percentage	10.4	47.1	0.9	29.3	12.3	100		

The research & development centers support the libraries through inter-library loan projects to purchase the latest research books and updated material. The data in table 4.44 described the role of research & development centers regarding libraries supported through inter-library loan projects. According to the data analysis 47.1% of the respondents disagreed and 10.4% of the respondents strongly disagreed to the statement that research & development centers support libraries through inter-library loan project. However, 29.3% of the respondents agreed and 12.3% of the respondents strongly agreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall, most (57.5%) of the respondents disagreed with the statement that research & development centers did not support libraries through inter-library loan projects. The mean score (2.86) did not support the statement. It showed that most of the research & development centers supported the libraries through inter-library loan projects. The value of S.D was (1.287).

Table 4.45

R&D centers up-grade computer labs through latest computer technologies.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Updated computer labs	Frequency	59	255	8	268	100	690	1.29	3.14
	Percentage	8.6	37	1.2	38.8	14.5	100		

Research & development centers up-grade the computer labs through providing latest computer technologies. The data in table 4.45 indicated the role of research & development centers to up-grade computer labs through latest computer technologies in the universities. According to the data analysis 38.8% of the respondents agreed and 14.5% of the respondents strongly agreed to the statement that research & development centers up-grade computer labs through latest computer technologies. However, 37% of the respondents disagreed and 8.6% of the respondents strongly disagreed with the statement, whereas 1.2% of the respondents were undecided about it. In overall, most (53.3%) of the respondents were of the view that research & development centers up-graded the computer labs through latest computer technologies. The mean score (3.14) supported the statement. It showed that most of the research & development centers up-graded the computer labs through latest computer technologies in the universities. The value of S.D was (1.290).

Table 4.46

R&D centers recommend scholarly assistance for research students.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Scholarly assistance for researchers	Frequency	55	293	9	244	89	690	1.271	3.03
	Percentage	8	42.5	1.3	35.4	12.9	100		

The research & development centers provide scholarly assistance for research students. The data in table 4.46 described role of research & development centers regarding scholarly assistance for research students. According to the data analysis 42.5% of the respondents disagreed and 8% of the respondents strongly disagreed to the statement that research & development centers provide scholarly assistance for research students. However, 35.4% of the respondents agreed and 12.9% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were undecided about it. In overall, more than half 50.5% of the respondents were of the view that research & development centers did not recommend scholarly assistance for research students. The mean score (3.03) supported the statement. It showed that more than half of the research & development centers recommended scholarly assistance for research students. The value of S.D was (1.271).

Table 4.47

R&D centers generate resources through industrial sector to enhance the quality of research.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Generate funds for research	Frequency	71	312	6	236	65	690	1.252	2.87
	Percentage	10.3	45.2	0.9	34.2	9.4	100		

The research & development centers generate resources through industrial sector to enhance the quality of research. The data in table 4.47 described role of research & development centers regarding resources generate through industrial sector. According to the data analysis 45.2% of the respondents disagreed and 10.3% of the respondents strongly disagreed to the statement that research & development centers generate resources through industrial sector to enhance the quality of research. However, 34.2% of the respondents agreed and 9.4% of the respondents strongly agreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall, most 55.5% of the respondents were of the view that research & development centers did not generate resources through industrial sector to enhance the quality of research. The mean score (2.87) did not support the statement. It showed that most of the research & development centers did not generate resources through industrial sector to enhance the quality of research in the universities. The value of S.D was (1.252).

Table 4.48

R&D centers support research activities through research grants.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research grants	Frequency	52	269	9	263	97	690	1.274	3.12
	Percentage	7.5	39	1.3	38.1	14.1	100		

The research and development centers support research activities through research grants in the universities. The data in table 4.48 described the role of research & development centers regarding to support research activities through research grants. According to the data analysis 39% of the respondents disagreed and 7.5% of the respondents strongly disagreed to the statement that research & development centers support research activities through research grants. However, 38.1% of the respondents agreed and 14.1% of the respondents strongly agreed to the statement, whereas 1.3% of the respondents were undecided about it. In overall, most (52.2%) of the respondents were of the view that research & development centers supported research activities through research grants. The mean score (3.12) supported the statement. It showed that most of the research & development centers supported the research activities through research grants in the universities. The value of S.D was (1.274).

Table 4.49

R&D centers generate income from internal university resources.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Funds from internal resources	Frequency	63	325	7	215	80	690	1.266	2.89
	Percentage	9.1	47.1	1	31.2	11.6	100		

The research & development centers generate income from internal university resources. The data in table 4.49 described role of research & development centers regarding generating income from internal university resources. According to the data analysis 47.1% of the respondents disagreed and 9.1% of the respondents strongly disagreed to the statement that research & development centers generate funds from internal university resources. However, 31.2% of the respondents agreed and 11.6% of the respondents strongly agreed with the statement, whereas 1% of the respondents were undecided about it. In overall, most (56.2%) of the respondents were of the view that research & development centers did not generate income from internal university resources. The mean score (2.89) did not support the statement. It showed that most of research & development centers did not generate income from internal university resources. The value of S.D was (1.266).

Table 4.50

R&D contacts with national donors for donating funds to promote research activities.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Contact with national donor agencies	Frequency	54	342	12	189	93	690	1.27	2.89
	Percentage	7.8	49.6	1.7	27.4	13.5	100		

The research & development centers contact with national donors for fund raising to promote research activities. The data in table 4.50 explored the role of research & development centers regarding fund raising to promote research activities. According to the data analysis 49.6% of the respondents disagreed and 7.8% of the respondents strongly disagreed to the statement that research & development centers contact with donor agencies for fund raising. However, 27.4% of the respondents agreed and 13.5% of the respondents strongly agreed with the statement, whereas 1.7% of the respondents were undecided about it. In overall, most 57.4% of the respondents were of the view that research & development centers did not contact with donors for fund raising to promote research activities. The mean score (2.89) did not support the statement. It showed that most of the research & development centers did not contact with donor agencies for fund to promote research activities. The value of S.D was (1.270).

Table 4.51

R&D centers develop links with foreign donor agencies for capital and human assistance.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Links with foreign donor agencies	Frequency	57	336	7	193	97	690	1.286	2.91
	Percentage	8.3	48.7	1	28	14.1	100		

The research & development centers develop links with foreign donor agencies for capital and human assistance. The data in table 4.51 described role of research & development centers regarding developing links with foreign donor agencies for capital and human assistance. According to the data analysis 48.7% of the respondents disagreed and 8.3% of the respondents strongly disagreed to the statement that research & development centers develop links with foreign donor agencies for capital and human assistance. However, 28% of the respondents agreed and 14.1% of the respondents strongly agreed with the statement, whereas 1% of the respondents were undecided about it. In overall, most 57% of the respondents were of the view that research & development centers did not develop links with foreign donor agencies for capital and human assistance. The mean score (2.91) did not support the statement. It showed that most of the research & development centers did not develop links with foreign donor agencies for capital and human assistance. The value of S.D was (1.286).

Table 4.52

R&D centers launch research projects to increase fund for university income.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research projects to increase funds	Frequency	45	320	14	224	87	690	1.247	2.98
	Percentage	6.5	46.4	2	32.5	12.6	100		

The research & development centers launch research projects to increase funds for the university income. The data in table 4.52 described role of research & development centers regarding research projects to increase funds for university income. According to the data analysis 46.4% of the respondents disagreed and 6.5% of the respondents strongly disagreed to the statement that research & development centers launch research projects to increase funds for university income. However, 32.5% of the respondents agreed and 12.6% of the respondents strongly agreed to the statement, whereas 2% of the respondents were undecided about it. In overall, most (52.9%) of the respondents were of the view that research & development centers did not launch research projects to increase funds for university income. The mean score (2.98) did not support the statement. It showed that most of the research & development centers did not launch research projects to increase funds for university income. The value of S.D was (1.247).

Table 4.53

Research recommendations provide feedback to the society.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research recommendations	Frequency	48	320	6	231	85	690	1.254	2.98
	Percentage	7	46.4	0.9	33.5	12.3	100		

Th research activities provide feedback to society for social development through research recommendations. The data in table 4.53 described role of research recommendations regarding provision of feedback to the society. According to the data analysis 46.4% of the respondents disagreed and 7% of the respondents strongly disagreed to the statement that research recommendations provide feedback to society. However, 33.5% of the respondents agreed and 12.3% of the respondents strongly agreed with the statement, whereas 0.9% of the respondents were undecided about it. In overall, most (53.4%) of the respondents were of the view that research recommendations did not provide feedback to the society. The mean score (2.98) did not support the statement. It showed that most of the research recommendations did not provide feedback to the society. The value of S.D was (1.254).

Table 4.54

Research institution-teaching departments improve their performance through feedback of the functional institution ands/or industry.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Feedback of functional institutions	Frequency	64	299	7	234	86	690	1.282	2.97
	Percentage	9.3	43.3	1	33.9	12.5	100		

The research institutes and teaching departments at higher education improve their performance through feedback of functional institutions and/ or industry . The data in table 4.54 described role of research institutions and teaching departments regarding improving their performance through feedback. According to the data analysis 43.3% of the respondents disagreed and 9.3% of the respondents strongly disagreed with the statement that research institutes and teaching departments improve their performance through feedback of the functional institutes and/ or industry . However, 33.9% of the respondents agreed and 12.5% of the respondents strongly agreed with the statement, whereas 1% of the respondents undecided about it. In overall, most (52.6%) of the respondents were of the view that research institutes/ teaching departments did not improve their performance through feedback of functional institutes and/ or industry. The mean score (2.97) did not support the statement. It showed that most of the research institutions and teaching departments did not improve their performance through feedback of the functional institutions. The value of S.D was (1.282).

Table 4.55

R&D centers develop co-ordination among different universities to exchange research expertise.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Coordination among local research institutions	Frequency	53	278	9	278	75	690	1.237	3.06
	Percentage	7.7	40.3	1.3	40.3	10.4	100		

The research and development centers develop coordination among different universities to exchange research expertise. The data in table 4.55 expressed the role of research & development centers regarding coordinating different universities to exchange research expertise. According to the data analysis 40.3% of the respondents agreed and 10.4% of the respondents strongly agreed to the statement that research & development centers develop coordination among different universities to exchange research expertise. However, 40.3% of the respondents disagreed and 7.7% of the respondents strongly disagreed to the statement, whereas 1.3% of the respondents undecided about it. In overall, more than half (50.7%) of the respondents were of the view that research & development centers developed coordination among different universities to exchange research expertise. The mean score (3.06) supported the statement. It showed that more than half of the research & development centers developed coordination among different universities to exchange research expertise. The value of S.D was (1.237).

Table 4.56

R&D centers collaborate with national and international research institutions to improve quality of the research work.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Collaboration with international institutes	Frequency	63	294	9	249	75	690	1.26	2.97
	Percentage	9.1	42.6	1.3	36.1	10.9	100		

The research & development centers collaborate with national and international research institutes to improve quality of research work. The data in table 4.56 described the role of research & development centers regarding collaborating with national and international research institutes to improve quality of research work. According to the data analysis 42.6% of the respondents disagreed and 9.1% of the respondents strongly disagreed to the statement that research & development centers collaborate with national and international research institutions to improve quality of research work. However, 36.1% of the respondents agreed and 10.9% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were uncertain about it. In overall, more than half (51.7%) of the respondents were of the view that research & development centers did not collaborate with national and international research institutions to improve quality of research work. The mean value (2.97) did not support the statement. It showed that more than half of the research & development centers did not collaborate with national and international institutions to improve quality of research work. The value of S.D was (1.20).

Table 4.57

R&D centers develop co-ordination between research institutions and industry to ensure quality of research products.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Coordination with functional institutes	Frequency	57	307	7	239	80	690	1.26	2.97
	Percentage	8.3	44.5	1	34.6	11.6	100		

The research & development centers develop coordination between research institutes and industry to ensure quality of research products. The data in table 4.57 explored role of research & development centers regarding developing coordination between research institutes and industry to ensure quality of research products. According to the data analysis 44.5% of the respondents disagreed and 8.3% of the respondents strongly disagreed with the statement that research & development centers develop coordination between research institutes and industry to ensure quality of products. However, 34.6% of the respondents agreed and 11.6% of the respondents strongly agreed with the statement, whereas 1% of the respondents were undecided about it. In overall, most (52.8%) of the respondents were of the view that research & development centers did not develop coordination between research institutions and industry to ensure quality of products. The mean score (2.97) did not support the statement. It showed that most of the research & development centers did not develop coordination between research institutions and industry to ensure quality of products. The value of S.D was (1.260).

Table 4.58

R&D builds interaction between external agencies and research institutes.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Interaction with external agencies	Frequency	45	310	11	255	69	690	1.217	2.99
	Percentage	6.5	44.9	1.6	37.0	10	100		

The research & development centers build interaction between external agencies and research institutes. The data in table 4.58 described role of research & development centers regarding interaction between external agencies and research institutes. According to the data analysis 44.9% of the respondents disagreed and 6.5% of the respondents strongly disagreed to the statement that research & development centers build interaction between external agencies and research institutions. However, 37% of the respondents agreed and 10% of the respondents strongly agreed with the statement, whereas 1.6% of the respondents were undecided about it. In overall, most (51.4%) of the respondents were of the view that research & development centers did not build interaction between external agencies and research institutes. The mean score (2.99) did not support the statement. It showed that most of the research & development centers did not build interaction between external agencies and research institutes. The value of S.D was (1.217).

Table 4.59

R&D design need based assessment for research projects.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Need based assessment	Frequency	54	301	9	249	77	690	1.248	2.99
	Percentage	7.8	43.6	1.3	36.1	11.2	100		

The research & development centers design need based assessment for research projects. The data in table 4.59 described role of research & development centers regarding designing need base assessment for research projects. According to the data analysis 43.6% of the respondents disagreed and 7.8% of the respondents strongly disagreed to the statement that research & development centers design need based assessment for research projects. However, 36.1% of the respondents agreed and 11.2% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were uncertain about it. In overall, most (51.4%) of the respondents were of the view that research & development centers did not design need based assessment for research projects. The mean score (2.99) did not support the statement. It showed that most of the research & development centers did not design need based assessment for research projects. The value of S.D was (1.248).

Table 4.60

Research and Development (R&D) provides trained manpower to the local industry.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Trained manpower for local industry	Frequency	53	310	14	247	66	690	1.248	2.95
	Percentage	7.7	44.9	2	35.8	9.6	100		

The research & development centers provide trained manpower to the local industry. The data in table 4.60 expressed role of research & development centers regarding providing trained manpower to local industry. According to the data analysis 44.9% of the respondents disagreed and 7.7% of the respondents strongly disagreed to the statement that research & development centers provide trained manpower to the local industry. However, 35.8% of the respondents agreed and 9.6% of the respondents strongly agreed with the statement, whereas 2% of the respondents undecided about it. In overall, most (52.6%) of the respondents were of the view that research & development centers did not provide trained manpower to the local industry. The mean score (2.95) did not support the statement. It showed that most of the research & development centers did not provide trained manpower to the local industry. The value of S.D was (1.248).

Table 4.61

R&D centers provide human resource management for good governance to the institutions.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Human resource management	Frequency	68	276	7	237	102	690	1.315	3.04
	Percentage	9.9	40	1	34.3	14.8	100		

The research & development centers provide human resource management for good governance to the institutions. The data in table 4.61 described role of research & development centers regarding providing human resource management for good governance of institutes. According to the data analysis 40% of the respondents disagreed and 9.9% of the respondents strongly disagreed to the statement that research & development centers provide human resource management for good governance of institutions. However, 34.3% of the respondents agreed and 14.8% of the respondents strongly agreed with the statement, whereas 1% of the respondents were undecided about it. In overall, almost half 49.9% of the respondents were of the view that research & development centers provide human resource management for good governance of institutions. The mean score (3.04) supported the statement. It showed that almost half of research & development centers provided human resource management for good governance of research institutions and teaching departments in the universities. The value of S.D was (1.315).

Table 4.62

Research and Development (R&D) prepares expert artisans to strengthen the labor market.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Experts for labor market	Frequency	83	309	8	220	70	690	1.276	2.83
	Percentage	12	44.8	1.2	31.9	10.1	100		

The research & development prepare expert artisans to strengthen labor market. The data in table 4.62 explored role of research & development centers regarding preparing expert artisans to strengthen labor market. According to the data analysis 44.8% of the respondents disagreed and 12% of the respondents strongly disagreed to the statement that research & development centers prepare expert artisans to strengthen labor market. However, 31.9% of the respondents agreed and 10.1% of the respondents strongly agreed with the statement, whereas 1.2% of the respondents were undecided about it. In overall, most 56.8% of the respondents were of the view that research & development centers did not prepare expert artisan to strengthen the labor market. The mean score (2.83) did not support the statement. It showed that most of the research & development centers did not prepare expert artisans to strengthen the labor market. The value of S.D was (1.276).

Table 4.63

R&D centers develop bridge between research institutions and the community.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Bridge with social sector	Frequency	64	283	9	266	68	690	1.250	2.99
	Percentage	9.3	41	1.3	38.6	9.9	100		

The research & development centers develop bridge between research institutes and the community. The data in table 4.63 showed the role of research & development centers regarding developing bridge between research institutes and community. According to the data analysis 41% of the respondents disagreed and 9.3% of the respondents strongly disagreed to the statement that research & development centers developed bridge between research institutions and the community. However, 38.6% of the respondents agreed and 9.9% of the respondents strongly agreed with the statement, whereas 1.3% of the respondents were undecided about it. In overall, more than half (50.3%) of the respondents were of the view that research & development centers developed bridge between research institutions and the community. The mean score (2.99) did not supported tha statement. It showed that more than half of the research & development centers did not develop bridge between research institutes and the community. The value of S.D was (1.250).

Table 4.64

R&D centers facilitate public sector through the results of research activities.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Facilitate to public sector	Frequency	59	292	15	246	78	690	1.255	2.99
	Percentage	8.6	42.3	2.2	35.7	11.3	100		

The research & development facilitate the public sector through results of research activities. The data in table 4.64 described the role of research & development centers regarding facilitating public sector through results of research activities. According to the data analysis 42.3% of the respondents disagreed and 8.6% of the respondents strongly disagreed to the statement that research & development centers facilitate public sector through results of research activities. However, 35.7% of the respondents agreed and 11.3% of the respondents strongly agreed with the statment, whereas 2.2% of the respondents were undecided about it. In overall, more than half 50.9% of the respondents were of view that research & development center did not facilitate public sector through results of the research activities. The mean score (2.99) did not supported the statement. It showed that more than half of the research & development centers did not facilitate public sector through results of the research activities. The value of S.D was (1.255).

Table 4.65

Research and Development centers provide skilled manpower for development of the society.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Skilled manpower	Frequency	53	276	9	273	79	690	1.248	3.07
	Percentage	7.7	40	1.3	39.6	11.4	100		

The research & development centers provide skilled manpower for development of society. The data in table 4.65 explored the role of research & development centers regarding providing skilled manpower. According to the data analysis 40% of the respondents disagreed and 7.7% of the respondents strongly disagreed to the statement that research & development centers provide skilled manpower for development of society. However, 39.6% of the respondents agreed and 11.4% of the respondents strongly agreed to the statement, whereas 1.3% of the respondents were undecided about it. In overall, more than half (51%) of the respondents were of the view that research & development centers provided skilled manpower for development of society. The mean score (3.07) supported the statement. It showed that more than half of the research & development centers provided skilled manpower for development of society. The value of S.D was (1.248).

Table 4.66

R&D centers provide research experts to the university and research institutes.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Research experts	Frequency	49	238	7	298	98	690	1.257	3.23
	Percentage	7.1	34.5	1	43.2	14.2	100		

The research & development centers provide research experts to the university and research institutes for further research and innovations. The data in table 4.66 expressed the role of research & development centers regarding providing research experts to the universities and research institutes. According to the data analysis 43.2% of the respondents agreed and 14.2% of the respondents strongly agreed to the statement that research & development centers provide research experts to the universities and research institutes. However, 34.5% of the respondents disagreed and 7.1% of the respondents strongly disagreed, whereas 1% of the respondents were undecided about it. In overall, most 57.4% of the respondents were of the view that research & development centers provided research experts to the universities and research institutes. The mean score (3.23) supported the statement. It showed that most of the research & development centers provided research experts to the universities for further research and innovations. The value of S.D was (1.257).

Table 4.67

Research and Development (R&D) mechanism is too much lengthy.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Lengthy mechanism	Frequency	30	105	11	407	137	690	1.074	3.75
	Percentage	4.3	15.2	1.6	59	19.9	100		

The research & development mechanism is too much lenghty in the universities and institutes of higher education. The data in table 4.67 described the opinions of respondents regarding research & development mechanism. According to the data 59% of the respondents agreed and 19.9% of the respondents strongly agreed to the statement that research & development mechanism in the universities was too much lengthy. However, 15.2% of the respondents disagreed and 4.3% of the respondents strongly disagreed to the statement, whereas 1.6% of the respondents were undecided about it. In overall, majority (78.9%) of the respondents were of the view that research & development mechanism was too much lengthy in the public universities of Pakistan. The mean score (3.75) suppoted the statement. It showed that research & development mechanism in the public sector universities of Pakistan was too much lengthy. The value of S.D was (1.074).

Table 4.68

Research and Development (R&D) center lacks research expertise in the university.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Lack of research expertise	Frequency	35	124	15	402	114	690	1.108	3.63
	Percentage	5.1	18	2.1	58.3	16.5	100		

The research & development centers lack research expertise in the research institutes and public universities of Pakistan. The data in table 4.68 described that research & development centers lack research expertise in the universities. According to the data analysis 58.3% of the respondents agreed and 16.5% of the respondents strongly agreed to the statement that research & development centers face lack of research expertise. However, 18% of the respondents disagreed and 5.1% of the respondents strongly disagreed to the statement, whereas 2.1% of the respondents were undecided about it. In overall, majority 74.8% of the respondents were of the view that research & development centers faced lack of research expertise. The mean score (3.63) supported the statement. It showed that research & development centers faced lack of research expertise in the universities and institutes of higher education. The value of S.D was (1.108).

Table 4.69

Academia gives less priority to the research and development (R&D) process.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Less priority to research	Frequency	41	145	7	360	137	690	1.191	3.59
	Percentage	5.9	21	1	52.2	19.9	100		

The academia gives less priority to research & development mechanism in the public universities of Pakistan. The data in table 4.69 described that the academia gave less priority to the research & development process. According to the data analysis 52.2% of the respondents agreed and 19.9% of the respondents strongly agreed to the statement that academia gave less priority to the research & development process. However, 21% of the respondents disagreed and 5.9% of the respondents strongly disagreed to the statement, whereas 1% of the respondents were undecided about it. In overall, 72.1% of the respondents were of the view that academia gave less priority to the research & development process. The mean score (3.59) supported the statement. It showed that academia gave less priority in the public sector universities of Pakistan. The value of S.D was (1.191).

Table 4.70

Research and Development (R&D) center suffers from lack of funds.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Lack of funds	Frequency	45	126	16	343	160	690	1.204	3.65
	Percentage	6.5	18.3	2.3	49.7	23.2	100		

The research & development centers suffer from the lack of funds. The data in table 4.70 explored that research & development centers suffer from the challenge of lack of funds. Accoring to the data analysis 49.7% of the respondents agreed and 19.9% of the respondents strongly agreed to the statement that R&D centers were suffering from the challenge of lack of funds. However, 18.3% of the respondents disagreed and 6.5% of the respondents strongly disagreed to the statement, whereas 2.3% of the respondents were undecided about it. In overall, majority 72.9% of the respondents were of the view that research & development centers suffer from the lack of funds. The mean score (3.65) supported the statement. It showed that majority of the research & development centers suffer from the challenge of lack of funds. The value of S.D was (1.204).

Table 4.71

Personal liking and disliking influence the Research and Development (R&D) process

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Personal liking and disliking	Frequency	40	113	14	367	156	690	1.157	3.70
	Percentage	5.8	16.4	2	53.2	22.6	100		

The challenge of personal liking and disliking influence the research & development process. The data in table 4.71 described that personal liking and disliking influence the process of research & development. According to the data analysis 53.2% of the respondents agreed and 22.6% of the respondents strongly agreed to the statement that personal liking and disliking influence the research & development process. However, 16.4% of the respondents disagreed and 5.8% of the respondents strongly disagreed to the statement, whereas 2% of the respondents were undecided about it. In overall, 75.8% of the respondents were of the view that personal liking and disliking influenced the process of research & development. The mean score (3.70) supported the statement. It showed that the challenge of personal liking and disliking influenced the research & development process in the universities. The value of S.D was (1.157).

Table 4.72

Unstable policies influence the performance of Research and Development (R&D) mechanism.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Unstable policies	Frequency	41	102	14	373	161	690	1.146	3.74
	Percentage	5.9	14.8	2	53.9	23.3	100		

The research & development mechanism face the challenge of unstable research policies in research institutes at higher education. The data in table 4.72 described that unstable research policies influenced the research & development mechanism. According to the data analysis 53.9% of the respondents agreed and 23.3% of the respondents strongly agreed to the statement that unstable research policies influenced the research & development mechanism. However, 14.8% of the respondents disagreed and 5.9% of the respondents strongly disagreed, whereas 2% of the respondents were undecided about it. In overall, 77.2% of the respondents were of the view that unstable research policies influenced the research & development mechanism. The mean value (3.74) supported the statement. It showed that unstable research policies influenced the research & development mechanism in the universities. The value of S.D was (1.146).

Table 4.73

Lack of co-ordination exists among stakeholders of Research and Development (R&D) mechanism.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Lack of coordination	Frequency	30	116	12	400	132	690	1.090	3.71
	Percentage	4.3	16.8	1.7	58	19.1	100		

The lack of coordination among stakeholders of research & development mechanism is a serious challenge in the universities. The data in table 4.73 described that the lack of coordination among stakeholders of research & development mechanism is a serious challenge. According to the data analysis 58% of the respondents agreed and 19.1% of the respondents strongly agreed to the statement that lack of coordination among stakeholders of research & development mechanism is a serious challenge. However, 16.8% of the respondents disagreed and 4.3% of the respondents strongly disagreed with the statement, whereas 1.7% of the respondents were undecided about it. In overall, 77.1% of the respondents were of the view that lack of coordination among stakeholders is the serious challenge for research & development mechanisms. The mean score (3.71) supported the statement. It showed that the challenge of lack of coordination existed among stakeholders of the research & development mechanisms in the universities. The value of S.D was (1.090).

Table 4.74

Lack of professional competency of HRD personnel affects the R&D mechanism.

Statement	Category	Responses					Total	S.D	Mean
		SDA	DA	UD	A	SA			
Lack of professional competency	Frequency	36	116	20	356	23.5	690	1.151	3.71
	Percentage	5.2	16.8	2.9	51.6	23.5	100		

The professional competency of human resource development (HRD) personnel affects the research & development mechanism. The data in table 4.74 described that lack of professional competency of HRD personnel affected the research & development mechanisms. According to the data analysis 51.6% of the respondents agreed and 23.5% of the respondents strongly agreed to the statement that lack of professional competency of HRD personnel affected the research & development mechanisms. However, 16.8% of the respondents disagreed and 5.2% of the respondents strongly disagreed to the statement, whereas 2.9% of the respondents were undecided about it. In overall, 75.1% of the respondents were of the view that lack of professional competency of HRD personnel affected the research & development mechanisms. The mean score (3.71) supported the statement. It showed that lack of professional competency of HRD personnel affected the research & development mechanism. The value of S.D was (1.151).

Table 4.75

Role of Research and Development (R&D) Council

Statements	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Vice chancellor	215	31.2	11	1.6	464	67.20	690	100	1.286	3.43
Dean of faculty	258	37.4	15	2.2	417	60.40	690	100	1.310	3.27
Chairman of dept.	244	35.4	11	1.6	435	63.00	690	100	1.295	3.34
Head of R&D	337	48.5	6	0.9	347	50.06	690	100	1.314	3.01
Research Supervisor	337	48.9	6	0.9	347	50.02	690	100	1.283	3.00
Chairman BASR	323	49.5	6	0.9	342	49.60	690	100	1.314	2.98
(Overall mean %)	41.88%		1.35%		56.77%				3.16	

The role of research and development (R&D) council in the universities was first important factor of this research study. The data in table 4.75 explored the role of R&D council to promote research productivity in the universities. According to the data analysis 67.2% of the respondents agreed to the efforts of vice chancellors in taking research initiatives through research & development centers to provide technical and financial assistance. Data showed that 60.4% of the respondents agreed to the role of deans of faculties facilitate and monitor research process of the faculty members. Data indicated that 63% of the respondents agreed to the role of chairmen that ensure quality of research in department. Data revealed that 50.06% of the respondents agreed to the statement that heads of R&D centers gave roadmap for research & development. Data described that 50.02% of the respondents agreed to the statement that research supervisors involve actively during research work. Data expressed that less than half 49.60% of the respondents agreed to the statement that chairmen of BASR approve research proposals timely. In overall, most (56.77%) of the respondents were of the view that research & development council played active role to promote research productivity in the universities. The overall mean score 3.16 supported the statement. It showed that most of the stakeholders of research & development councils played significant role to promote research productivity in the universities.

Table 4.76

Product management of Research and Development (R&D)

Statements	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Market based knowledge	342	49.6	6	0.8	342	49.6	690	100	1.341	3.0
Market based software.	397	57.6	15	2.2	278	40.3	690	100	1.295	2.8
Market based hardware.	377	54.6	18	2.6	295	42.8	690	100	1.289	2.86
HRM personnel.	336	48.7	12	1.7	342	49.6	690	100	1.296	3.03
Resource for HRD	332	48.1	6	0.7	352	51.00	690	100	1.284	3.04
Financial resources for customers.	410	59.4	15	2.2	265	38.4	690	100	1.259	2.72
Literature for market demand.	332	48.1	5	0.7	353	51.2	690	100	1.253	3.09
Scientists for further research & innovation.	290	42.0	12	1.7	388	56.3	690	100	1.253	2.99
(Overall mean %)	51.01%		1.58%		47.4%				2.94	

The product management of research & development (R&D) in the universities was second important factor of this research study. The data in table 4.76 explored the current situation of product management of research & development in the universities. According to the data analysis 49.6% of the respondents agreed to the statement that research institutes provided market based knowledge and information technology. Data showed that 57.6% of the respondents disagreed to the statement that research institutes designed market based software. Data indicated that 54.6% of the respondents disagreed to the statement that research institutes design market based hardware. Data explored that 49.6% of the respondents agreed to the statement that research institutes produce human resource management personnel. Data expressed that 51% of the respondents agreed to the statement that research institutes organize

need based resources for human resource development. Data revealed that 59.4% of the respondents disagreed to the statement that research institutes strengthen financial status of customers. Data showed that 51.1% of the respondents agreed to the statement that research institutes create literature according to the market demand. Data described that 56.2% of the respondents agreed to the statement that research institutes produce scientists for further research and innovations. In overall, more than half (50.01%) of the respondents were of the view that research & development centers did not play significant role in the product management. The mean score (2.94) did not support the statement. It showed that more than half of the research & development centers did not play significant role in the product management.

Table 4.77

Planning process of Research and Development (R&D)

Statements	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Research policy	322	46.7	9	1.3	359	52	690	100	1.272	3.05
Research projects	313	45.4	20	2.9	357	51.7	690	100	1.296	3.06
Rules and regulations	277	40.1	29	4.2	384	55.7	690	100	1.262	3.19
Quality of research.	323	46.8	16	2.3	351	50.9	690	100	1.28	3.08
National research projects.	391	56.7	9	1.3	290	42	690	100	1.276	2.87
Research activities of global trends.	381	55.2	5	0.7	304	44.1	690	100	1.236	2.88
Job description for research technocrats.	389	56.4	5	0.7	296	42.9	690	100	1.23	2.87
Rules and regulations for R&D	250	36.2	7	1	433	62.8	690	100	1.206	3.33
Long-term policies for research advancement.	379	54.9	6	0.9	305	44.2	690	100	1.27	2.92
Short-term research projects.	328	47.5	7	1	355	51.5	690	100	1.287	3.04
(Overall mean %)	48.59%		1.63%		49.78%				3.03	

The planning process of research and development (R&D) in the universities was third important factor of this research study. The data in table 4.77 expressed the current situation of planning process of research & development in the universities. According to the data analysis 52% of the respondents agreed to the statement that R&D centers formulate policy matters for research mechanisms. Data showed that 51.7% of the respondents agreed to the statement that R&D centers formulated research projects in light of research findings. Data indicated that 55.6% of the respondents agreed to the statement that R&D centers designe rules and regulations to facilitate the researcher during research process. Data explored that 50.9% of the respondents agreed to the statement that R&D centers develop strategic plan to enhance quality of research work. Data expressed that 56.7% of the respondents disagreed to the statement that R&D centers plan research projects according to national goals. Data revealed that 55.2% of the respondents

disagreed to the statement that R&D centers prepare research activities according to demand of global trends. Data indicated that 56.1% of the respondents disagreed to the statement that R&D centers design job description for research technocrats. Data described that 62.7% of the respondents agreed to the statement that research institutes prepare rules and regulations for R&D. Data described that 54.9% of the respondents agreed to the statement that research institutes launch long term policies for research advancement. Data showed that 51.4% of the respondents agreed to the statement that R&D centers launch short term research projects. In overall, less than half (49.78%) of the respondents were of the view that R&D centers planned research policies and projects to ensure quality of research. The overall mean score (3.32) supported the statement. It showed that less than half of R&D centers planned the research policies and projects regularly to ensure the quality of research in the universities.

Table 4.78

Implementation phase of Research and Development (R&D)

Statement	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Research conferences	334	48.4	8	1.2	348	50.4	690	100	1.245	3.04
Staff development	356	51.5	8	1.2	326	47.3	690	100	1.235	2.96
Innovative practices	336	48.7	8	1.2	346	50.1	690	100	1.197	3.03
MIS for research	383	55.5	9	1.3	298	43.2	690	100	1.232	2.90
Agreements with foreign agencies.	374	54.2	9	1.3	307	44.5	690	100	1.324	2.96
Specific measures for improving the quality	374	54.2	9	1.3	307	44.5	690	100	1.324	2.96
Charter b/w private and public sector	347	50.3	4	0.6	339	49.1	690	100	1.26	3.02
Study tours	374	54.2	9	1.3	307	44.5	690	100	1.324	2.96
Policy Implementation	347	50.3	4	0.6	339	49.1	690	100	1.26	3.02
Sound organization for research development.	368	53.3	7	1.0	315	45.7	690	100	1.242	2.92
(Overall mean %)	52.06%		1.02%		46.84%				2.98	

The implementation phase of research and development (R&D) mechanism was fourth important factor of this research study. The data in table 4.78 explored the current situation of implementation phase of research & development in the universities. According to the data analysis 58.8% of the respondents agreed to the statement that R&D centers conduct conferences and seminars to improve research culture in the university. Data showed that 52.9% of the respondents agreed to the statement that R&D centers arrange professional development workshops to enhance research expertise among faculty members. Data indicated that 50.7% of the respondents disagreed to the statement that R&D centers arrange professional development workshops to enhance research expertise among faculty members. Data explored that 50.4% of the respondents agreed to the statement that R&D center provide management information system to the research institution. Data expressed that 51.6% of the respondents disagreed to the statement that R&D center provide management information system to the research institution.

Data revealed that 50.1% of the respondents agreed to the statement that R&D center take specific measures to improve quality of research institutes. Data depicted that 55.5% of the respondents agreed to the statement that R&D center manage to sign agreement between private and public sector. Data showed that 54.2% of the respondents disagreed to the statement that R&D center arrange study tours for researchers and supervisors to improve the research expertise. Data described that 50.3% of the respondents disagreed to the statement that research institutes implement R&D policies. Data showed that 53.4% of the respondents disagreed to the statement that research institutes establish sound organization for R&D.

In overall, most (52.06%) of the respondents were of the view that research institutes did not implement the tasks of R&D. The mean score (2.98) showed closer toward disagreed side which meant that most of the research institutes did not implement the tasks of R&D.

Table 4.79

Monitoring networks of Research and Development (R&D)

Statement	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Managing the research projects	350	50.7	7	1.0	333	48.3	690	100	1.28	2.97
Quality assurance mechanism.	353	51.2	7	1.0	330	47.8	690	100	1.248	2.99
Competitive research environment	337	48.8	8	1.2	345	50	690	100	1.318	3.04
Quality assurance for research development	332	48.1	7	1.0	351	50.9	690	100	1.216	3.00
Security for stakeholders	374	54.2	9	1.3	307	44.5	690	100	1.233	2.91
(Overall mean %)		**50.6%**		**1.17%**		**48.3%**				**2.98**

The monitoring network of research and development (R&D) was fifth important factor of this research study. The data in table 4.79 showed current situation of monitoring networks of research & development in the universities. According to the data analysis 50.8% of the respondents disagreed to the statement that research & development keep maintain the quality assurance of running research projects. Data indicated that 51.2% of the respondents disagreed to the statement that research & development monitored the quality assurance mechanism. Data showed that 50% of the respondents agreed to the statement that research institutes-departments created environment for research & development. Data explored that 50.9% of the respondents agreed to the statement that research & development centers ensured quality assurance of research process in the universities. Data expressed that 54.2% of the respondents disagreed to the statement that research institutes provided security during research process to its stakeholders. In overall, more than half (50.06%) of the respondents disagreed to the efficiency of monitoring networks of research & development centers. The mean score (2.98) supported the statement. It showed that more than half of the respondents disagreed to the monitoring networks of research & development centers.

Table 4.80

Technical assistance of Research and Development (R&D)

Statement	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Technical assistance.	323	46.8	7	1.0	360	52.2	690	100	1.262	3.18
To facilitate supervisor	297	43.0	6	0.9	387	56.1	690	100	1.262	3.18
To facilitate researcher	341	49.5	10	1.4	339	49.1	690	100	1.287	3.05
To equip the science labs.	357	51.7	10	1.4	323	46.9	690	100	1.239	2.99
Inter library loan project	397	57.5	6	0.9	287	41.6	690	100	1.287	2.86
Updated computer labs.	314	45.5	8	1.2	368	53.3	690	100	1.29	3.14
Scholarly assistance for researchers	348	50.4	9	1.3	333	48.3	690	100	1.271	3.03
(Overall mean %)		49.2%		1.16%		49.64%			3.06	

The technical assistance of research and development (R&D) in the universities is the sixth important factor of this research study. The data in table 3.80 expressed the current situation of technical assistance of research & development in the universities. According to the data analysis 52.2% of the respondents agreed to the statement that research & development centers provide technical assistance for the research institutes. Data showed that 56.1% of the respondents agreed to the statement that research & development centers facilitate the supervisors through latest instrumentation. Data illustrated that 49.5% of the respondents agreed to the statement that research & development centers facilitate the researchers through latest print media. Data explored that 51.7% of the respondents agreed to the statement that research & development centers equippe the science laboratories with modern technologies. Data indicated that 57.5% of the respondents disagreed to the statement that research & development

centers provide help through inter library loan project. Data showed that 53.3% of the respondents agreed to the statement that research & development centers facilitate computer labs through updated material and technologies. Data described that 50.4% of the respondents disagreed to the statement that research & development centers recommend scholarly assistance for research students. In overall, less than half (49.6%) of the respondents were of the view that research & development centers provided technical assistance to research institutes. The mean score (3.06) supported the statement. It showed that less than half of research & development centers provided technical assistance to the research institutes.

Table 4.81

Financial assistance for Research and Development (R&D)

Statement	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Research grants.	321	46.5	9	1.3	360	52.2	690	100	1.274	3.12
Funds from internal university resources.	388	56.2	7	1.0	295	42.8	690	100	1.266	2.89
Donor agencies for fund raising.	396	57.4	12	1.7	282	40.9	690	100	1.27	2.89
Donors for capital and human assistance.	393	57	7	1.0	290	42.0	690	100	1.286	2.91
Research projects for increasing funds.	365	52.9	14	2	311	45.1	690	100	1.247	2.98
(Overall mean %)		54%		1.4%		44.6%			2.96	

The financial assistance of research and development (R&D) in the universities was seventh important factor of this research study. The data in table 4.81 described the current situation of financial assistance for research & development process in the universities. According to the data analysis 52.2% of the respondents agreed to the statement that research & development centers provide research grants. Data showed that 56.2% of the respondents disagreed to the staement that research & development centers generate funds from internal university resources. Data indicated that 57.4% of the respondents disagreed to the staement that research & development centers contact with donors agencies for fund raising. Data expressed that 57% of the respondents disagreed to the statement that research & development centers contact with donors for capital and assistance. Data described that 52.9% of the respondents disagreed to the statement that research & development centers launch research projects for increasing funds. In overall, most 54% of the respondents were of the view that the research & development centers did not provide financial assistance for research institutes. The mean score 2.96 did not support the statement. It showed that most of research & development centers did not provide financial assistance for research institutes.

Table 4.82

Feedback of Research and Development (R&D) mechanisms for the society and the research institutes.

Statement	Responses								Std.	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Feedback for the social sector.	368	53.3	6	0.9	316	45.8	690	100	1.254	2.98
Feedback for research institutes	363	52.6	7	1.0	320	46.4	690	100	1.282	2.97
(Overall mean %)	52.95%		0.95%		46.1%				2.97	

The feedback of research and development (R&D) mechanism to the society and research institutes was the 8th important factor of this research study. The data in table 4.82 described the situation of feedback of research & development mechanism to the society. According to the data analysis 53.3% of the respondents disagreed to the statement that research & development centers give feedback to the society. Data described that 52.6% of the respondents disagreed to the statement that research & development centers give feedback to the research institutes. In overall, most (52.95%) of the respondents were of the view that research & development centers did not give feedback to the society and research institutes. The mean score (2.97) did not support the statement. It showed that research & development center did not give proper feedback to the society and research institutes.

Table 4.83

Coordination between local research institutions and international research institutions

Statement	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Coordination among local institutions.	331	48.5	9	1.3	353	51.2	690	100	1.237	3.06
Collaboration with international institutes.	357	51.7	9	1.3	324	47	690	100	1.26	2.97
Coordination with functional institutions.	364	52.8	7	1.0	319	46.2	690	100	1.26	2.97
Interaction with external agencies.	355	51.5	11	1.5	324	47	690	100	1.217	2.99
(Overall mean %)		51.13%		1.27%		48.13%			2.99	

The coordination between local research institutes and international research institutes was the 9th important factor of this research study. The data in table 4.83 described the current situation of coordination between local institutions and international institutions. According to the data analysis 51.2% of the respondents agreed to the statement that research & development centers develop coordination among local institutions. Data showed that 51.7% of the respondents disagreed to the statement that research institutes coordinate with functional institutes. Data indicated that 51.5% of the respondents disagreed to the statement that research institutes interact with external agencies. In overall, most (51.13%) of the respondents were of the view that research & development centers did not develope coordination among local research institutions and international institutions. The mean score (2.99) did not support the statement. It showed that most of the research & development centers did not develop coordination among local research institutes and international research institutes.

Table 4.84

Outcomes of Research and Development (R&D) mechanism

Statements	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Need based assessment	355	51.4	9	1.3	326	47.3	690	100	1.248	2.99
Trained manpower for local industry	363	52.6	14	2.0	313	45.4	690	100	1223	2.95
HRM for research institutions.	344	49.9	7	1.0	339	49.1	690	100	1.315	3.04
Experts for labor market	392	56.8	8	1.2	290	42.0	690	100	1.276	2.83
Bridge with social sector	347	50.3	9	1.3	334	48.4	690	100	1.25	2.09
Facilitate to the public sector.	351	50.8	15	2.2	324	47	690	100	1.255	2.99
Skilled manpower to the society.	329	47.7	9	1.3	352	51.0	690	100	1.257	3.23
Research experts to the university.	287	41.6	7	1.0	396	57.4	690	100	1.074	3.75
(Overall mean %)	50.14%		1.41%		48.45%				2.98	

The outcomes of research and development (R&D) mechanism in the universities are the 10th important factor of this research study. The data in table 4.84 described the current situation of outcomes of research & development in the universities. According to the data analysis 51.4% of the respondents disagreed to the statement that R&D centers design need based assessment for research projects. Data showed that 52.6% of the respondents disagreed to the statement that research & development centers provide trained manpower to the local industry. Data expressed that 49.9% of the respondents disagreed to the statement that research & development centers provide human resource management for good governance of the institutes. Data explored that 56.8% of the respondents disagreed to the statement that research & development centers prepare experts for labor market. Data described that 50.3% of the respondents disagreed to the

statement that research & development centers develop bridge between research institutes and society. Data indicated that 50.9% of the respondents disagreed to the statement that research & development centers facilitate public sector through results of the research activities. Data showed that 51% of the respondents agreed to the statement that research & development centers provide skilled manpower to the society. Data described that 57.4% of the respondents agreed to the statement that R&D centers provide research experts to the university and research institutes. In overall, more than half (50.14%) of the respondents disagreed to the outcomes of research & development in the university. The mean score (2.98) did not support the statement. It showed that more than half of the respondents did not seem satisfied to the outcomes of research & development (R&D) centers.

Table 4.85

Challenges of Research and development (R&D) mechanism in the university

Statement	Responses								S.D	Mean
	Disagree		UD		Agree		Total			
	F	%	F	%	F	%	F	%		
Lengthy mechanism	135	19.7	11	1.6	544	78.7	690	100	1.074	3.75
Lack of expertise.	159	23.0	15	2.2	516	74.8	690	100	1.108	3.63
Less priority to R&D	186	27	7	1.0	497	72.0	690	100	1,191	3.59
Lack of funds.	171	24.7	16	2.3	503	73	690	100	1.204	3.65
Personal liking and disliking	153	22.8	14	2	523	75.8	690	100	1.157	3.70
Unstable policies	143	20.7	14	2	534	77.3	690	100	1.146	3.74
Lack of coordination	146	21.2	12	1.7	532	77.1	690	100	1.090	3.71
Lack of professional competency.	152	22.0	20	2.9	518	75.1	690	100	1.151	3.71
(Overall mean %)	22.64%		1.96%		75.48%				3.68	

The challenges of research and development (R&D) process in the universities was the 11th important factor of this research study. The data in table 4.85 explored the challenges of research & development mechanism in the universities. According to the data analysis 78.9% of the respondents agreed to the statement that research & development mechanism is too much lengthy. Data showed that 74.8% of the respondents agreed to the statement that research & development center lacks research expertise in the universities. Data indicated that 72.1% of the respondents agreed to the statement that academia gives less priority to the research & development process. Data explored that 72.9% of the respondents agreed to the statement that research & development centers suffer the lack of funds. Data described that 75.8% of the respondents agreed to the statement that personal liking and disliking influence the research & development process. Data depicted that 77.2% of the respondents agreed to the statement that unstable policies influence the research & development mechanism. Data showed that 77.1% of the respondents agreed to the statement that lack of coordination among stakeholders of the research & development mechanism. Data revealed that 75.1% of the respondents agreed to the statement that lack of professional competency of HRD personnel affect the research &

development mechanism. In overall, majority (75.48%) of the respondents were of the view that research & development centers faced several challenges in the universities. The mean score (3.68) supported the statement. It showed that research & development centers faced several challenges in the universities.

Table 4.86

Overall analysis of R&D factors

Sr. No.	Factors	Responses				
		Disagree %	Undecided %	Agree %	Total %	Mean
1	Role of Research and Development council	41.88	1.35	56.77	100%	3.25
2	Product management of R&D mechanism	51.01	1.58	47.40	100%	2.94
3	Planning process of R&D mechanism	48.59	1.63	49.78	100%	3.32
4	Implementation phase of R&D	52.06	1.02	46.84	100%	2.98
5	Monitoring networks of R&D	50.60	1.17	48.30	100%	2.98
6	Technical assistance of R&D	49.20	1.16	49.64	100%	3.06
7	Financial assistance of R&D	54.00	1.40	44.60	100%	2.96
8	Feedback of research and development	52.95	0.95	46.10	100%	2.97
9	Coordination of research and development	51.13	1.27	48.13	100%	2.99
10	Outcomes of research and development	50.14	1.41	48.45	100%	2.98
11	Challenges of research and development	22.64	1.96	75.48	100%	3.68
Total Percentage (Average)		47.93	1.06	51.01	100%	3.10

The data in table 4.86 described the overall analysis of research & development (R&D) mechanism at university level in Pakistan. According to the data analysis 56.77 % of the respondents were agreed to the role of research & development council. Data showed that more than half 51.01 % of the respondents were disagreed to the product management of research & development. Data described that less than half 49.78 % of the respondents were agreed to the planning process of research & development. Data expressed that most 52.06 % of the respondents were disagreed to the implementation phase of research & development. Data indicated that more than half 50.60 % of the respondents were disagreed to the monitoring networks of research & development. Data revealed that less than half 49.64 % of the respondents were agreed to the technical assistance of research & development. Data illustrated

that most 54% of the respondents were disagreed to the financial assistance of research & development. Data showed that most 52.95 % of the respondents were disagreed to the feedback of research & development. Data explored that more than half 51.13 % of the respondents were disagreed to the coordination of research & development. Data indicated that almost half 50.14 % of the respondents were disagreed to the outcomes of research & development. Data described that majority 75.48 % of the respondents were agreed that research & development centers faced various challenges in the universities. In overall, more than half (51.01%) of the respondents were of the view that research & development face several issues and challenges. The overall mean score (3.10) supported the statements. It showed that more than half of the respondents admitted to face the challenges of research & development in the research institutes of higher education.

Table 4.87

Comparison of R&D situation at region/province

Sr. No.	Region/Province	Responses					
		Disagree		Agree		Total	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
1	Punjab	7260	40.88	10500	59.12	17760	100
2	Sindh	3272	49.13	3388	50.87	6660	100
3	Baluchistan	1227	55.27	993	44.73	2220	100
4	Khyber P.K.	7807	50.24	7733	49.76	15540	100
5	Federal area	3945	44.42	4935	55.58	8880	100

The data in table 4.87 expressed the province-region based situation of research & development (R&D) in Pakistan. According to the data analysis 59.12% of the respondents were agreed to the current situation of research & development in the universities at Punjab. The data showed that 50.87% of the respondents were agreed to the current situation of research & development in the universities at Sindh. The data described that 55.27% of the respondents were disagreed to the current situation research & development in Baluchistan. The data showed that 50.24% of the respondents were disagreed to the current situation of research & development in Khybar P.K. The data described that 55.58% of the respondents were agreed to the current situation of research & development in Fedral area. In overall, majority 59.12% of the repondents were satisfied to the situation of research & development centers in the universities at Punjab.

Figure 4.1: *Region / Province wise comparison of R&D*

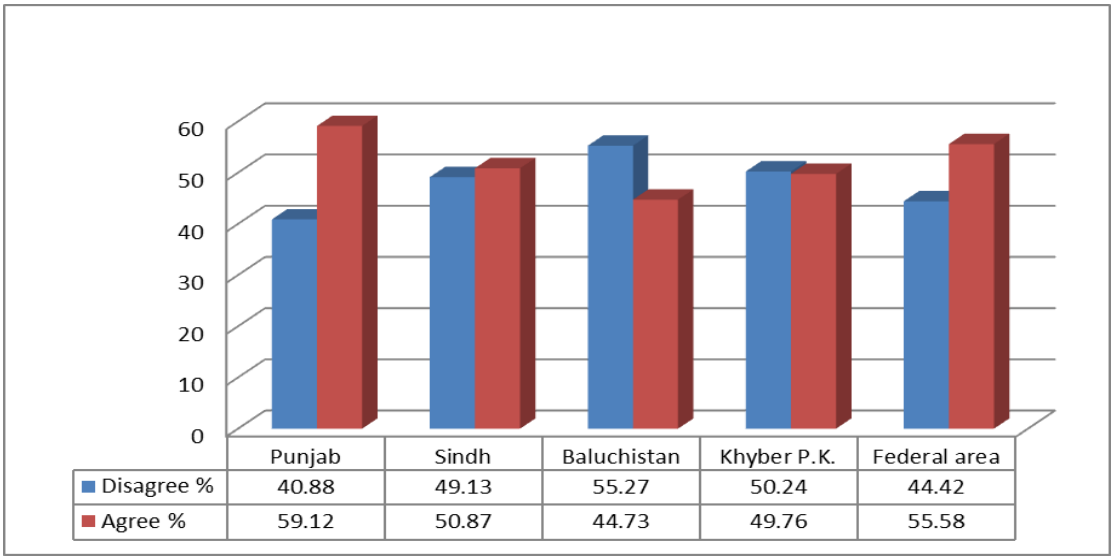


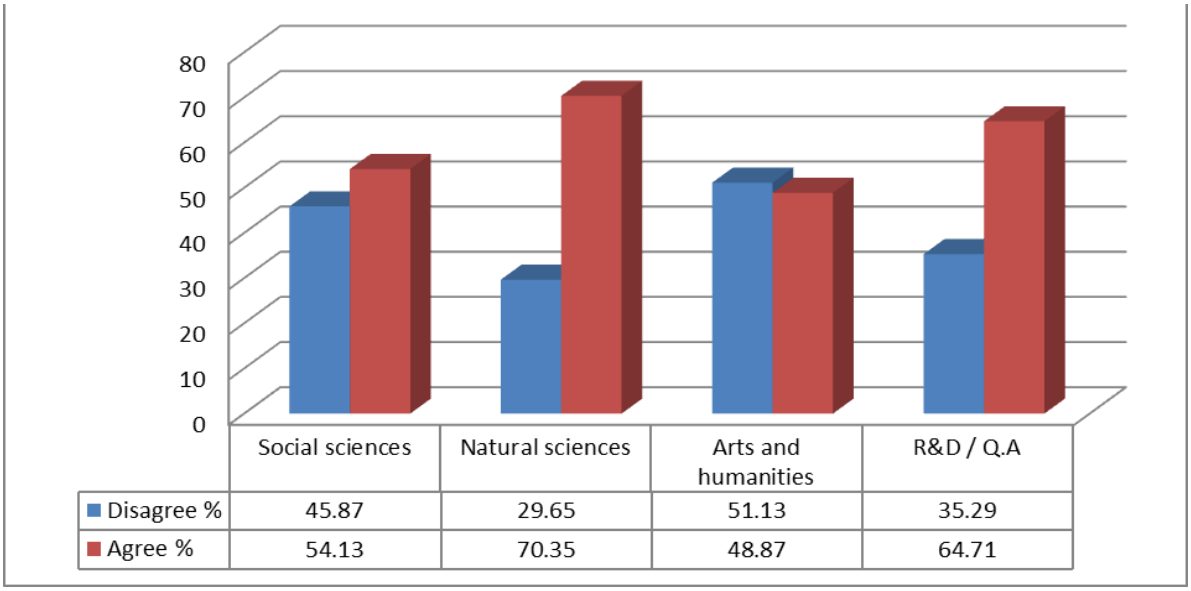
Table 4.88

Comparison of R&D situation at discipline/faculty

Sr. No.	Discipline/Faculty	Responses					
		Disagree		Agree		Total	
		Frequency	Percent	Frequency	Percentage	Frequency	percentage
1	Social sciences	5465	45.87	6449	54.13	11914	100
2	Natural sciences	3532	29.65	8382	70.35	11914	100
3	Arts and humanities	6092	51.13	5822	48.87	11914	100
4	R&D/Q.A	5405	35.29	9913	64.71	15318	100

The data in table 4.88 described the current situation of research & development (R&D) mechanism in different faculties. According to the data analysis 54.13% of the respondents were agreed to the quality of research work in social sciences. The data explored that 70.35% of the respondents were agreed to the quality of research work in natural sciences. The data expressed that 51.13% of the respondents were agreed to the quality of research work. The data described that 64.71% of the respondents were agreed to the quality of research work in research & development centers and quality assurance departments. In overall, majority 70.35% of the respondents were satisfied to the efficiency of research & development mechanisms in natural sciences.

Figure 4.2: *Discipline / Faculty wise comparison of R&D*



	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

4.1 Discussion

The major purpose of this section is to discuss the results of the study. The discussion will start with a critical review of the research methodology and how this approach influences on the results of the study. The second section is more focused discussion on the results of the study which is supported through the arguments of experts and previous researchers.

4.1.1 Discussion on the Methodology

This research study has produced many important results related to the research objectives and research questions. These results focused on the analysis of current research and development (R&D) mechanism at university level in Pakistan. Research and development is backbone of the universities. Higher education occupies a very critical place in education system and plays vital role to promote research and development process in Pakistan. It is an important stage of education for the students to get research based professional education. The study was descriptive in nature and survey approach was considered appropriate to complete it. The multistage sampling consisted on three stages was adopted for study which according to Connolly (2007) serve as the foundation of all statistical tests. Sample has been taken from all the provinces including Gilgit-baltistan and federal areas of Pakistan. The sample includes eight (08) general universities of public sector from the Punjab province, three (03) general

universities of public sector from Sindh province, seven (07) general universities of public sector from Khyber P.K., one (01) general university of public from Baluchistan province, and three (03) general universities of public sector from federal area were selected as a sample. Gay (2005) described that for a smaller population, say N = 100 or fewer, there is little point in sampling, survey the entire population. So hundred percent is considered appropriate sample size for survey studies having the population size of only ten or twenty. The sections-departments of R&D or alternate system in all the general universities of public sector are taken as a sample. Sample will be spread and ideally representative of the population. Best and Khan (2003) suggested that in survey research the sample should be large enough than experimental researches to represent the population. Therefore, all the concerned officials or personnels of R&D such as, directors, deans, chairmen, head of departments, research supervisors, and etc. were included in the sample. Data was collected through the questionnaire as a research tool. The analysis was completed by using relevant statistical formulas. Whole analysis and results were designed item wise and factor wise.

This section focuses and discusses on the item wise and factor wise current situation of research and development mechanism in general universities of public sector.

4.1.2 Discussion on the Analysis of Data

This research study aimed to analyze the existing and prevailing practices of research and development centers in the public sector general universities of Pakistan. The first factor of this research study was the role of research & development (R&D) council. Gay (2005) described that the basic purpose of R&D was to sort out new methods of teaching, learning and research. Majority of the stakeholders of research & development council argued that they encouraged the initiatives of research & development and provided technical and financial help during research process. When the respondents were asked about the monitoring process of research they further described that they monitored research process and ensured quality of research work in the department. During discussion it was cleared that most of the stakeholders of R&D gave roadmap to strengthen the research mechanism and involved actively during research process while almost half of the respondents did not satisfy with the efficiency of BASR. The overall mean score (3.16) showed closer toward agreed which showed that most of the stakeholders of research & development contributed well in the universities.

Product management was the second important factor of research & development (R&D) mechanism in the universities and research institutions of higher education. As discussed by Altbach (2003) the productive research environment is the environment where there were well-defined processes , policies and workflows that were of significant value to make the flow of research smoother. Further, Virk (2005) described that every university was trying its best to flourish R&D departments. Results of this research study elaborated that less than half of the research institutes provided market based information technologies and HRM personnel. Major aim of research and development was to introduce new products on demand of the market/ industry. Most of the respondents were of the view that research institutes did not design market based software and hardware. Stromberg (2000) described that major function of R&D was to develop link between research institutes and industry. More than half of the respondents argued that research institutes organized resources for human resource development while they did not strengthen financial status of the customers. During discussion with the respondents it was cleared that more than half of the research institutes created literature and produced scientists for further research and innovations in the universities. The overall mean score (2.94) showed inclination toward disagreed which described the performance of research & development centers was not satisfactory in introducing new products.

Planning process was the most important factor of research and development (R&D) in the universities and research institutions of higher education. Therefore, available literature suggested to design new policies for better performance of the researchers as Witman & Richlin (2007) supported that the incentives for positive change in behavior. Gibbs (2001) and Gordon (2003) suggested to prepare strategic directions in institutional policy to support for better performance in research. When question were asked about the planning process, more than half of the respondents argued that research and development centers formulated policy matters and research projects in the light of research findings. The major function of R&D was to develop strategic plan and design rules and regulations to enhance the quality of the research work and to facilitate the researchers during research process. Data further elaborated that most of the R&D centers did not plan research projects according to the demand of national and global trends. Main purpose of the research and development was to introduce new research policies. Shackle (2001) described that major function of R&D firms is to make long term research policies. Data further illustrated that most of the research institutes did not launch long term

policies for research and development in the universities. The overall mean score (3.03) showed closer toward agreed side which indicated that almost half of the respondents agreed with the planning process of R&D centers.

Implementation phase of research and development of the rules and regulations, research plans, research policies and research projects was very important assignment in the universities and research institutions of higher education. David (2007) described that implementation of R&D policies was very important factor to ensure the quality of research work. Results of this research study further indicated that more than half of the research institutes conducted research conferences, seminars and symposiums for improving research culture, while more than half of the research institutes did not arrange professional development workshop to develop research expertise among the faculty members. Major aim of research and development is to introduce innovative practices and to provide management information system in the research institutes. Fuether data expressed that more than half of the research institutes introduced innovative practices and provided management information system for the research activities. Most of the research institutes did not sign agreements between national and foreign agencies on the research projects. Main function of research and development was to ensure quality of research institutes. During discussion it was cleared that most of the research institutes did not take specific measures to improve the quality of research institutes. More than half of the research institutes did not sign agreement between private and public sector. Data showed that more than half of the research institutions did not implement research related policies formulated by R&D and further the data clarified that most of the universities did not establish sound organization for research and development. The overall mean score (2.98) showed inclinations toward disagreed which meant that most of the universities did not implement the research policies of R&D.

The results of this research study further elaborated that almost half of respondents did not agree with the R&D mechanism to ensure check and balance on the running research projects. Major aim of research and development was to monitor the quality assurance mechanism. More than half of the research and development centers did not monitor the quality assurance mechanism properly. During discussion half of respondents argued that the research and development centers created competitive environment to develop research culture and to ensure quality assurance for research process. It was cleared from the data that most of the research and development centers did not provide security during research process to its stake

holders. The overall mean score (2.98) showed inclinations toward disagreed which identified that more than half of the respondents did not agree with the monitoring networks of research and development.

More than half of the respondents argued that research and development centers provided technical assistance and facilitated the supervisors through latest instrumentation such as internet, computer labs and science laboratories. Renan & Hall (2000) described that provision of funds for latest technologies was another major function of research and development. Almost half of the respondents felt that R&D centers did not facilitate the research scholars through latest print media. Major function of research and development was to facilitate science labs and libraries through providing latest material. This research study elaborated that R&D centers did not equip science laboratories with modern technologies. During discussion it was cleared that most of the research and development centers did not support libraries through inter library loan projects. Data revealed that more than half of the respondents argued that R&D centers facilitated computer labs through updated material and technologies and data identified that more than half of the research and development centers do not recommend scholarly assistance for research students. The overall mean score (3.06) showed inclinations toward agreed which meant that almost half of the respondents agreed with the technical assistance of research & development centers.

More than half of the respondents argued that R&D centers generated funds through available resources to enhance the quality of research. Major aim of research and development was to generate funds through different sources and to provide financial assistance for research activities. Data further expressed that most of the research and development centers did not support research activities through research grants. Hall (2002) described that funds generating for research activities was the basic task of R&D. It was further indicated that most of the research and development centers did not generate funds from internal university resources. Another function of research and development was to contact with national and international donor for fund raising. Most of the research and development centers did not contact with national and foreign donor agencies for fund raising and human assistance. Data further depicted that more than half of the research and development centers did not launch research projects to

increase funds for university income. The overall mean score (2.96) showed inclinations toward disagreed which meant that R&D centers did not generate funds for the research institutes.

Major function of research and development was to provide feedback to the researchers, supervisors and research institutes in the universities. During discussion most of the respondents were of the view that research and development centers did not provide feedback to the social sector through the research recommendations. More than half of the respondents viewed that research institutes did not improve their performance through feedback of the functional institutions. The overall mean score (2.97) showed inclinations toward disagreed side which meant that R&D centers did not provide feedback to the social sector.

Developing coordination and collaboration among various local, national and international research institutions was an important function of the research & development centers. Audretsch (2010) opined that most of the academic studies on research collaboration focused on formal relationships at the organizational level, such as the occurrence of joint labs, contract research, university spin-off companies etc. These relationships are visible and relatively easy to identify, classify and measure. The results of the study explored that more than half of the respondents argued that research and development centers developed coordination among different local research institutions. Results of the study further affirmed that most of the research and development centers did not collaborate with national and international research institutes for increasing research quality. Most of the respondents were of the view that research & development centers did not develop coordination between research institutions and functional institutions and more than half of the research and development centers did not build interaction between external agencies and research institutes.

Outcomes of the initiatives and efforts of research institutes to develop research culture in the universities was an important factor of research and development (R&D) process. Brostrom (2010) described that R&D initiatives were now for economic reasons increasingly inclined to establish close collaborative relations with the universities and government research institutes wherever they can find the best suitable provider. This was especially true in advanced nations with well-developed research and development systems. Results of the study further revealed that more than half of the respondents argued that research institutes did not design need based assessment for research projects. Major function of the research and development

was to provide trained manpower and human resource management to the local industry and for the good governance of the institutions. Results further showed that most of the research institutes did not prepare experts for labor market. More than half of the respondents viewed that research institutes did not. Another aim of research and development was to develop bridge between research institutions and social sector of the community. This appears to be supported the views of Latona & Brown (2001) that quality research conducted by the teachers contribute to institutional & societal development because research was pivotal to university education in this modern era. Results further clarified that more than half of the research institutes did not facilitate public sector through the results of research activities. More than half of the research institutes provide skilled manpower to the social sectors and data reveals that most of the research institutes provide research experts to the university and research institutes.

The results of this research study further showed that majority of the respondents argued that research and development mechanism was too lengthy. Major function of research and development was to enhance research expertise in the universities. Majority of the respondents argued that efficiency of R&D mechanism affected due to lack of research expertise. Data elaborated that majority of the respondents were of the opinion that university administration gave less priority to the research and development (R&D) mechanism. Majority of the respondents felt that the lack of funds and personal liking and disliking influenced the research & development mechanism. Majority of the respondents felt that unstable policies influenced the the formance of research & development. During discussion majority of the respondents felt that there existed lack of coordination among stakeholders of R&D. Majority of the respondents argued that there was lack of professional competency and support among the HRD personnel.

As a whole the study concluded that most of the stake holders of research & development (R&D) councils were doing their responsibilities properly and contributing well in the research & development process of the universities. It was cleared from the data that more than half of the research institutions did not perform well in the product management of research & development in the universities. The data further expressed that more than half of the research institutes did not show good progress in the planning process of research & development in the universities. The data showed that most of the research institutes did not implement research policies, research plans and research projects formulated by research & development in the universities. The data further clarified that almost half of the research & development centers

did not monitor the running research projects and quality assurance of research activities properly. The data further indicated that more than half of the research and development centers did not provide technical assistance to the researchers, supervisors, and research institutes for the sake of research process. The data further found out that most of the research & development centers did not generate funds to provide financial assistance for the research institutes and universities. The data indicated that most of the research & development centers did not provide proper feedback for the functional institutes and social sector. The data further represented that most of the research & development centers did not develop coordination and collaboration among local, national, international and functional research institutes to increase the quality of research in universities. The data further identified that majority of the respondents admitted that research & development (R&D) mechanism in the universities was facing several challenges.

4.1.3 Discussion on Open Ended Questions

Research & development (R&D) mechanism plays important role to increase the efficiency of research process and to ensure the quality of research work in the universities and research institutes of higher education. The significant majority of respondents responded that lack of funds, shortage of financial resources, lack of latest instrumentations & equipment, inconsistence research policies, no linkage between research institutes & industry were the main issues and challenges of research & development in the universities. They further discussed that many research activities and projects remained uncompleted due to the lack of funds and shortage of financial resources. They mentioned that even some of the research projects did not start because of lack of proper planning and lack of research expertise. Most of the respondents commented that the research & development mechanism faced several problems and mentioned that research & development process was very lengthy and time consuming. They further expressed that lack of expertise and shortage of research experts was another issue of research and development. Another group of respondents mentioned that most of the universities and research institutions gave less priority to R&D process. The respondents further mentioned that that lack of proper funds for research activities, personal liking and disliking of the stakeholders of R&D, inconsistence and unstable research policies, lack of coordination among research institutes and private sector and lack of professional competency to promote research culture were another challenges of research and development.

In the light of suggestions from the respondents' research & development process should be improved through providing special funds for research activities. Majority of the respondents argued that latest instrumentation and equipment for labs should be provided. Most of the respondents mentioned that stable research policies should be designed to improve research mechanism in the universities. They further suggested that linkage between research institutions and industry should be built. New research activities and projects should be started to promote research culture in the universities. Research and development process should be easy to get desired goals. It is cleared that university administration should be given top priority to the research and development process. Research expertise should be managed and provided to assist the research process.

It was cleared from discussion with the respondents that majority of them argued that board of management for research & development should be established in the universities. This board should become an effective arm of the university to implement the research policy. The board should have sections in the major cities, in order to deal with the R&D centers regularly. It should have the capability to analyze the work done by any R&D centers and institute regular performance-evaluation. At the same time, the board should have no authority to interfere in the functioning and decision-making of the R&D centers. Most of the respondents suggested that the executive director of the research & development centers should be introduced. The director should have full authorities of hiring and firing. The overriding goal should be to work orient of the center, so that its research efforts will useful to the relevant industry. The success or failure of the R&D centers should be judged from the usefulness of the services of the centers and its capacity to sell new ideas and technology for product-improvement.

It was further cleared form discussion that most of the respondents told that R&D centers should be expected to meet a percentage of their expenses through internal cash-generation. The revenues should be remained under control of the centers and will not be credited back to the national finance. They suggested that the requirements of working capital for each research & development centers should be worked out. The approved amounts will provide as working capital, so that the centers can have a business-like approach and capability. There should be a marketing wing in the centers, to boost sales of its products, services and technology. They further stated that the cash generated by the R&D centers should be used to enhance its

productivity and to reward its employees, according to an approved proportion. The income from patents will also be retained.

It was further cleared that after strengthening and provision of working capital, research & development centers should be expected to meet some of the expenses, according to an approved schedule. In accordance with this approved schedule, the non-developmental part of the budget will reduce in easy stages. This will put enough pressure on the centers and executive director to handle the resources in a business-like manner and to reach out to prospective customers and clients. They further discussed that if the revenues are less than the (non-developmental) reduction, the executive director should have to reduce staff by lying off. This is admittedly a controversial measure, but many universities have already adopted this method. They further opined that the R&D board of management should establish, there will no need for individual boards of directors. Instead there will be a number of standing committees for intellectual interaction and collective decision-making. The new R&D system envisages a tenure-system for the executive director leading the R&D centers.

4.2 Summary

This chapter presented data analysis and its interpretation. The data analysis was presented into three sections i.e. item analysis, domain analysis and variable analysis. Statistical Package for Social Science (SPSS-17) was used to analyze data by using statistical formulas i.e. percentage, frequency, chi-square, mean score and one way ANOVA. Discussion on the data analysis and results is also included in this chapter.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents summary of the study, results and findings, conclusions and recommendations of the researcher based on findings and conclusions.

5.1 Summary

The study was aimed to analyze the current research and development (R&D) mechanism and preparation of a model for research and development at university level in Pakistan. The main objectives of the study were to; (a) analyze the status of research and development at universities in Pakistan, (b) explore the existing research and development practices at universities in Pakistan, (c) identify the problems faced by research & development for its smooth functioning (d) find out the trends of research & development in Pakistani Universities, and (e) propose a new model of research & development for Pakistani universities. The study was descriptive in nature; therefore survey approach was considered appropriate and adopted for its completion. The population of the study consisted of research supervisors, chairpersons and/ or heads of teaching departments, deans of faculties, concerned authorities of research & development centers and quality assurance cells from twenty three (23) public sector general universities in Pakistan. The multistage sampling consisted on three stages was adopted for study. The sample of the study consisted of thirty (30) respondents from each university including ten (10) research supervisors, five (05) chairpersons and/ or heads of teaching departments, five (05) deans of faculties, one (01) head and five (05) officials of the research & development center, and four (04) officials working in quality assurance cells taken randomly from the population. Five (05) separate questionnaires prepared on five point rating (likert) scale according to the objectives of the study were used as research tools. It was finalized after its pilot testing with the calculated reliability of the research instruments. After finalization of research tools the researcher personally collected data from the respondents. After data collection, it was coded in SPSS version 17 and statistically analyzed through using relevant statistically formulas.

5.1.1 Results of the Research Study

5.1.2 Role of Research and Development (R&D) Council

1. The vice chancellors are executive heads of research and development councils and they play important role to assist the research activities in the universities and research institutions at higher education in Pakistan. It is obvious from the data that 67.3% of the respondents agreed and appreciated the efforts of vice chancellors to take research initiatives through the research and development centers by providing technical and financial assistance. The mean score (3.43) showed closer toward agree. It showed that majority of the vice chancellors encouraged the initiatives to strengthen the research and development mechanism in the universities (Table 4.1).

2. Deans of the faculties are members of research and development councils and they monitor the research process in their faculties at the universities of public sector in Pakistan. All of the data demonstrated that 60.4% respondents agreed to the statement that dean of faculty facilitates and monitors research process of the faculty members. The mean score (3.10) showed closer toward agree. It showed that most of the deans of faculties facilitated and monitored research process in the faculties (Table 4.2).

3. Chairmen of the departments are members of research and development councils and they ensure the quality of research work according to the research policy in their own department at the public sector universities of Pakistan. According to the data, 63.1% respondents agreed that the chairperson ensured research quality of the department. The mean score (3.34) showed closer toward agree. It showed that most of the chairpersons of the departments ensured quality of research in the concerned departments (Table 4.3).

4. Heads of R&D centers-cells are the members of research and development councils and they give important directions in the light of HEC policies to increase the productivity of research at the universities and research institutions of higher education in Pakistan. Whole set of data gestured that 50.1% of the respondents agreed to the statement that head of R&D provides roadmap for research and development in the universities. The mean score (2.99) showed closer toward agree. It showed that almost half of the heads

of R&D centers provided roadmap for research and development in the universities (Table 4.4).

5. HEC approved research supervisors are the members of research and development councils and provide proper guidance-supervision to the researchers during research process/projects at the universities of public sector and research institutions of higher education. It is evident from the data that 65.8% respondents agreed to the statement that research supervisors involve actively during research process. The mean value (3.48) showed closer toward agree. It showed that majority of the research supervisors involved actively during research process in the universities (Table 4.5).
6. Chairman of BASR is the member of research and development council and conduct meetings regularly to approve the research proposals of PhD scholars at the universities of public sector in Pakistan. Data displayed a true picture of findings that 50.3% respondents agreed that chairman of BASR approves research proposals timely. The mean score (3.04) showed closer toward agree. It showed that more than half of the chairmen board of advance studies and research conducted meetings regularly and approved the research proposals timely in the public universities (Table 4.6).

5.1.3 Product management of Research and Development (R&D)

7. Provision of research based knowledge and information technology to the public and private sector is the core function of R&D centers. A complete set of data elaborated that 49.6% of the respondents agreed to the statement that research institutes provided market based knowledge and information technology. The mean score (3.0) showed closer toward agree. It showed that less than half of the research institutes provided market based knowledge and information technology (Table 4.7).
8. Designing of market based software through research for the industry and private sector is the major function of R&D center. Data comprehensively informed that 57.6% of the respondents disagreed that research institutes designed market based software. The mean score (2.80) showed closer toward disagree. It showed that most of the research institutes-departments did not design market based software in the universities (Table 4.8).

9. Designing of market based hardware through research for the public and private sector is an important function of R&D center-cell. Data expounded that 54.6% of the respondents disagreed to the statement that research institutes designed market based hardware. The mean score (2.86) showed closer towards disagree. It showed that most of the research institutes-departments did not design market based hardware in the universities (Table 4.9).

10. Provision of HRM personnel to the public and private sector is main purpose of the universities and institutions of higher education. Data illustrated that 49.6% of the respondents agreed to the statement that research institutes produced human resource management personnel. The mean score (3.03) showed closer toward agree. It showed that less than half of the research institutes-departments produced human resource management (HRM) personnel (Table 4.10).

11. Organizing need based resources for human resource development is an important function of the universities and research institutes. Data elucidated that 51% of the respondents agreed to the statement that research institutes organized need based resources for human resource development. The mean score (3.04) showed closer toward agree. It showed that more than half of the research institutes-departments organized need based resources for human resources (HRD) in the universities (Table 4.11).

12. Strengthening financial status of the customer of public and private sector through generating resources and opportunities is major function of the universities and research institutions of higher education. It is crystal clear from the data that 59.4% of the respondents did not agree to the statement that research institutes strengthened the financial status of the customers. The mean score (2.72) showed closer toward disagree. It showed that most of the research institutes-departments did not strengthen financial status of the customers (Table 4.12).

13. Creating research based literature according to the market demand is an important function of R&D center-cell at the universities. Data identified that 51.1% of the respondents agreed to the statement that research institutes created literature according to the market demand. The mean score (2.99) showed closer toward agreed which meant

that more than half of the research institutes created literature according to the market demand (Table 4.13).

14. Production of research scientists for further research and innovations to bring change and overall progress of the society is major function of the universities and institutions of higher education. Data mentioned that 56.2% of the respondents agreed to the statement that research institutes produced scientists for further research and innovations. The mean score (3.18) showed closer toward agree. It showed that most of the research institutes produced scientists for further research and innovations (Table 4.14).

5.1.4 Planning Process of Research and Development (R&D)

15. Formulation of research policies to strengthen the research and development mechanism-process is major function of the R&D centers in the universities and research institutions at higher education. Data described that 52% of the respondents agreed the statement that research and development centers formulated policy matters for research mechanism in the universities. The mean score (3.05) showed closer toward agree. It showed that more than half of the research and development (R&D) centers formulated policy matters for research mechanism of the university (Table 4.15).

16. Formulation of research projects in the light of research findings is an important function of R&D center at the universities and research institutes of higher education. Data indicated that 51.7% of the respondents agreed to the statement that research and development centers formulated research projects in light of the research findings. The mean score (3.06) showed closer toward agree. It showed that more than half of the research and development centers formulated research projects in the light of research findings (Table 4.16).

17. One the function of research and development is to design rules and regulations for the researchers to facilitate them during research process in the universities. The data further pointed out that 55.6% of the respondents agreed to the statement that research and development centers designed rules and regulations to facilitate the researcher during research process. The mean score (3.19) showed closer toward agree. It showed that most

of the research and development centers designed rules and regulations to facilitate the researchers during research process (Table 4.17).

18. The purpose of research and development is to develop strategic plan to enhance the quality of research work. The data identified that 50.9% of the respondents agreed to the statement that research and development centers developed strategic plan to enhance the quality of research work. The mean score (3.08) showed closer toward agree. It showed that more than half of the research and development centers developed strategic plan to enhance the quality of research work (Table 4.18).
19. Data explained that 56.7% of the respondents disagreed to the statement that the research and development centers planned research projects according to national goals. The mean score (2.87) showed closer toward disagree. It showed that most of the research and development centers did not plan research projects according to national goals (Table 4.19).
20. Data showed that 55.2% of the respondents did not agree to the statement that research and development centers prepared research activities according to the demand of global trends. The mean score (2.88) showed closer toward disagree. It showed that most of the research and development centers did not prepare research activities according to the demand of global trends (Table 4.20).
21. Data found out that 56.1% of the respondents did not agree to the statement that research and development centers designed job description for research technocrats. The mean score (2.87) showed closer toward disagree. It showed that most of the research and development centers did not design job description for research technocrats (Table 4.21).
22. Data specified that 62.7% of the respondents agreed to the statement that research institutes prepared rules and regulations for research and development. The mean score (3.33) showed closer toward agree. It showed that most of the research institutes prepared rules and regulations for research and development in the universities (Table 4.22).
23. Data revealed that 54.9% of the respondents disagreed to the statement that research institutes launched long term policies for research advancement. The mean score (2.92) showed closer toward disagree. It showed that most of the research institutes-

departments did not launch long-term policies for research advancement in the universities (Table 4.23).

24. Data exhibited that 51.4% of the respondents agreed to the statement that research and development institutes launched short term research projects. The mean score (3.04) showed closer toward agree. It showed that more than half of the research and development institutes launched short-term research projects in the universities (Table 4.24).

5.1.5 Implementation Phase of Research and Development (R&D)

25. Data showed that 58.8% of the respondents agreed to the statement that research and development institutes conducted conferences and seminars for improving research culture in the university. The mean score (3.26) showed closer toward agree. It showed that most of the research and development institutes conducted conferences and seminars to promote research culture in the universities (Table 4.25).

26. Data illustrated that 52.9% of the respondents agreed to the statement that research and development institutes arranged professional development workshops to enhance research expertise among faculty members. The mean score (3.09) showed closer toward agree. It showed that more than half of the research and development institutes arranged professional development workshops to enhance research expertise among faculty members in the universities (Table 4.26).

27. Data explicated that 50.7% of the respondents agreed to the statement that research and development institutes introduce innovative practices to improve the research mechanism. The mean score (3.00) showed closer toward agree. It showed that more than half of the research and development centers introduced innovative practices to improve the research mechanism in the universities (Table 4.27).

28. It is observed from data that 50.4% of the respondents agreed to the statement that research and development center provided management information system to the research institution. The mean score (3.04) showed closer toward agree. It showed that more than half of the research and development centers provided management information system to the research institutions (Table 4.28).

29. It is found from data that 51.6% of the respondents did not agree to the statement that research and development center signed agreement between national and foreign agencies in the university. The mean score (2.96) showed closer toward disagree. It showed that more than half of the research and development centers did not sign agreements between national and foreign agencies in the universities (Table 4.29).

30. In accordance with data 50.1% of the respondents agreed to the statement that research and development centers took specific measures to improve the quality of research institutes. The mean score (3.03) showed closer toward agree. It showed that more than half of the research and development centers took specific measures to improve the quality of the research institutes (Table 4.30).

31. According to the data 55.5% of the respondents agreed to the statement that research and development center managed to sign agreement between private and public sector. The mean score (2.90) showed closer toward agree. It showed that most of the research and development centers managed to sign agreement between private and public sectors (Table 4.31).

32. Data declared that 54.2% of the respondents did not agree to the statement that research and development center arranged study tours of researchers and research supervisors for improving research expertise. The mean score (2.96) showed closer toward disagree. It showed that most of the research and development centers did not arrange study tours for the researchers and supervisors to improve the research expertise (Table 4.32).

33. Data affirmed that 50.3% of the respondents did not agree to the statement that research institutes implemented research and development policies. The mean score (3.02) showed closer toward disagree. It showed that more than half of the research institutes-departments did not implement the policies of research and development centers (Table 4.33).

34. Data testified that 53.4% of the respondents did not agree to the statement that research institutes-departments established sound organization for research and development. The mean score (2.92) showed closer toward disagree. It showed that most of the research institutes-departments did not establish sound organization for research and development (Table 4.34).

5.1.6 Monitoring Networks of Research and Development (R&D)

35. Data depicted that 50.8% of the respondents did not agree to the statement that research and development centers ensured the restrictions for the running research projects. The mean score (2.97) showed closer toward disagree. It showed that more than half of the research and development institutes did not ensure the restrictions for the running research projects in the universities (Table 4.35).

36. Data represented that 51.2% of the respondents did not agree to the statement that research and development centers monitored the quality assurance mechanism of the research institutions on regular basis. The mean score (2.99) showed closer toward disagree. It showed that more than half of the research and development centers did not monitor the quality assurance mechanism of the research institutions (Table 4.36).

37. Data showed that 50% of the respondents agreed to the statement that research institutes-department created environment for research and development in the universities. The mean score (3.04) showed closer toward agree. It showed that half of the research institutes-departments created conducive environment for research and development in the universities (Table 4.37).

38. Data indicated that 50.9% of the respondents agreed to the statement that research and development center ensured quality assurance of the research process. The mean score (3.00) showed closer toward agree. It showed that more than half of the research and development center ensured quality assurance of research process in the university (Table 4.38).

39. Data demonstrated that 54.2% of the respondents did not agree to the statement that research institutes-departments provided security during research process to its stakeholders. The mean score (2.91) showed closer toward disagree. It showed that most of the research institutes-departments did not provide security to its stakeholders during research process (Table 4.39).

5.1.7 Technical Assistance for Research and Development (R&D)

40. Data showed that 52.2% of the respondents agreed to the statement that research and development centers provided technical assistance for research activities. The mean

score (3.18) showed closer toward agree. It showed that most of the research and development centers provided technical assistance for research activities (Table 4.40).

41. Data informed that 56.1% of the respondents agreed to the statement that research and development centers assisted the research supervisors through information communication technologies in the universities. The mean score (3.18) showed closer toward agree. It showed that most of the research and development centers assisted the research supervisors through information communication technologies in the universities (Table 4.41).

42. Data elaborated that 49.4% of the respondents did not agree to the statement that research and development centers facilitated the researchers through latest print media. The mean score (3.05%) showed closer toward disagree. It showed that less than half of the research and development centers did not facilitate the researchers through latest print media in the universities (Table 4.42).

43. Data figures out that 51.7% of the respondents did not agree to the statement that research and development centers equipped the science laboratories with modern apparatus for experimentation. The mean score (2.99) showed closer toward agree. It showed that more than half of the research and development centers equipped the science laboratories with modern apparatus for experimentation in the university (Table 4.43).

44. Data clarified that 57.5% of the respondents did not agree to the statement that research and development centers supported libraries through inter library loan projects. The mean score (2.86) showed closer toward disagree. It showed that most of the research and development centers did not support libraries through inter library loan projects (Table 4.44).

45. Data showed that 53.3% of the respondents agreed to the statement that research and development centers up-graded computer labs through latest computer technologies. The mean score (3.14) showed closer toward agree. It showed that most of the research and development centers up-graded computer labs through latest computer technologies in the universities (Table 4.45).

46. Data revealed that 50.5% of the respondents did not agree to the statement that research and development centers recommended scholarly assistance for research students. The mean score (3.03) showed closer toward agree. It showed that more than half of the research and development centers did not recommend scholarly assistance for research students (Table 4.46).

47. Data exposed that 55.5% of the respondents did not agree to the statement that research and development centers generated resources through industrial sector to enhance the quality of research. The mean score (2.87) showed closer toward disagree. It showed that most of the research and development centers did not generate resources through industrial sector to enhance the quality of research in the university (Table 4.47).

5.1.8 Financial Assistance for Research and Development (R&D)

48. Data described that 52.2% of the respondents did not agree to the statement that research and development centers supported research activities through research grants. The mean score (3.12) showed closer toward agree. It showed that most of the research and development centers supported the research activities through research grants in the university (Table 4.48).

49. Data illustrated that 56.2% of the respondents did not agree to the statement that research and development centers generated funds from internal university resources. The mean score (2.89) showed closer toward disagree. It showed that most of the research and development centers did not generate funds from internal university resources (Table 4.49).

50. Data showed that 57.4% of the respondents did not agree to the statement that research and development centers contacted with donor agencies for fund raising. The mean score (2.89) showed closer toward disagree. It showed that most of the research and development centers contacted with donor agencies for fund raising in the universities (Table 4.50).

51. Data indicated that 57% of the respondents did not agree to the statement that research and development centers developed links with foreign donor agencies for capital and human assistance. The mean score (2.91) showed closer toward disagree. It showed that

most of the research and development centers did not link with foreign donor agencies for capital and human assistance in the universities (Table 4.51).

52. Data identified that 52.9% of the respondents did not agree to the statement that research and development centers launched research projects to increase funds for university income. The mean score (2.98) showed closer toward disagree. It showed that most of the research and development centers did not launch research projects to increase funds for university income (Table 4.52).

5.1.9 Feed Back of Research and Development Mechanism (R&D)

53. Data found out that 53.4% of the respondents disagreed to the statement that research recommendations provided feedback to the social sector. The mean score (2.98) showed closer toward disagree. It showed that most of the research recommendations provided feedback to the social sector (Table 4.53).

54. Data described that 52.6% of the respondents did not agree to the statement that research institutions-departments improved their performance through feedback of the functional institutions. The mean score (2.97) showed closer toward agree. It showed that more than half of the research institutions-departments did not improve their performance through feedback of the functional institutions (Table 4.54).

5.1.10 Coordination between Local and International Institutions

55. Data described that 50.7% of the respondents agreed to the statement that research and development centers developed coordination among different universities to exchange research expertise. The mean score (3.06) showed closer toward agree. It showed that half of the research and development centers developed coordination among different universities to exchange research expertise (Table 4.55).

56. Data explored that 51.7% of the respondents did not agree to the statement that research and development centers collaborated with national and international institutions to increase the quality of research work. The mean score (1.26) showed closer toward disagree. It showed that more than half of the research and development centers collaborated with national and international institutions to increase the quality of research work (Table 4.56).

57. Data revealed that 52.8% of the respondents did not agree to the statement that research and development centers developed coordination between research institutions and industry to ensure quality of the research products. The mean score (1.26) showed closer toward disagree. It showed that most of the research and development centers did not develop coordination between research institutions and industry to ensure quality of the research products (Table 4.57).

58. Data expressed that 51.4% of the respondents did not agree to the statement that research and development centers built interaction between external agencies and research institutes. The mean score (2.99) showed closer toward agree. It showed that more than half of the research and development centers did not build interaction between external agencies and research institutes in the universities (Table 4.58).

5.1.11 Outcomes of Research and Development (R&D) Mechanism

59. Data found out that 51.4% of the respondents did not agree to the statement that research and development centers designed need based assessment for research projects. The mean score (2.99) showed closer toward disagree. It showed that more than half of the research and development centers did not design need based assessment for research projects in the universities (Table 4.59).

60. Data described that 52.6% of the respondents did not agree to the statement that research and development centers provided trained manpower to the local industry. The mean score (2.95) showed closer toward agree. It showed that more than half of the research and development centers did not provide trained manpower to the local industries (Table 4.60).

61. Data expressed that 49.9% of the respondents did not agree to the statement that research and development centers provided human resource management for good governance of the institutions. The mean score (3.04) showed closer toward disagree. It showed that less than half of the research and development centers did not provide human resource management for good governance of the institutions-departments in the universities (Table 4.61).

62. Data demonstrated that 56.8% of the respondents did not agree to the statement that research and development centers prepared expert artisans to strengthen the labor market. The mean score (2.83) showed closer toward disagree. It showed that most of the research and development centers did not prepare expert artisans to strengthen the labor market (Table 4.62).

63. Data indicated that 50.3% of the respondents did not agree to the statement that research and development centers developed bridge between research institutions and social sector of the community. The mean score (2.99) showed closer toward disagree. It showed that more than half of the research and development centers did not develop bridge between research institutions and the community (Table 4.63).

64. Data expressed that 50.9% of the respondents did not agree to the statement that research and development centers facilitated public sector through results of the research activities. The mean score (2.99) showed closer toward disagree. It showed that more than half of the research and development centers facilitated the public sector through results of the research activities (Table 4.64).

65. Data found out that 51% of the respondents agreed to the statement that research and development centers provided skilled manpower for development of the society. The mean score (3.07) showed closer toward agree. It showed that more than half of the research and development centers provided skilled manpower for development of the society (Table 4.65).

66. Data explored that 57.4% of the respondents agreed to the statement that research and development centers provided research experts to the university and research institutes. The mean score (3.23) showed closer toward agree. It showed that most of the research and development centers provided research experts to the universities (Table 4.66).

5.1.12 Challenges of Research and Development (R&D) Mechanism in the University

67. Data described that 78.9% of the respondents agreed to the statement that research and development mechanism was too lengthy. The mean score (3.75) showed closer toward agree. It showed that majority of the respondents opined that research and development mechanism was too much lengthy (Table 4.67).

68. Data explored that 74.8% of the respondents agreed to the statement that research and development centers lack research expertise in the university. The mean score (3.63) showed closer toward agree. It showed that research and development centers lack research expertise in the universities (Table 4.68).
69. Data described that 72.1% of the respondents agreed to the statement that academia gives less priority to the research and development process. The mean score (3.59) showed closer toward agree. It showed that academia gave less priority to the research and development process in the universities (Table 4.69).
70. Data depicted that 72.9% of the respondents agreed to the statement that research and development centers suffered from the lack of funds. The mean score (3.65) showed closer toward agree. It showed that majority of the research and development centers suffered from lack of funds (Table 4.70).
71. Data indicated that 75.8% of the respondents agreed to the statement that personal liking and disliking influenced the research and development process. The mean score (3.70) showed closer toward agree. It showed that personal liking and disliking influenced the research and development process in the universities (Table 4.71).
72. Data showed that 77.2% of the respondents agreed to the statement that unstable policies influenced the performance of the research and development mechanism. The mean score (3.74) showed closer toward agree. It showed that unstable policies influenced the performance of the research and development mechanism in the universities (Table 4.72).
73. Data described that 77.1% of the respondents agreed to the statement that lack of coordination among stakeholders of the research and development mechanism. The mean score (3.71) showed closer toward agree. It showed that there was lack of coordination among stakeholders of the research and development mechanism in the universities (Table 4.73).
74. Data expressed that 75.1% of the respondents agreed to the statement that there is lack of professional competency of HRD personnel affected the research and development mechanism. The mean score (3.71) showed closer toward agree. It showed that lack of

professional competency of HRD personnel affected the research and development mechanism in the universities (Table 4.74).

5.1.13 Results Based on Factors

75. Data expressed that 56.77% of the respondents agreed to the research and development council played active role to promote research activities. The mean score 3.16 showed closer toward agree. It showed that most of the stakeholders of research and development (R&D) councils played active role in promoting research activities (Table 4.75).

76. Data expressed that 50.01% of the respondents did not agree to the research and development council played efficient role in the product management. The mean score 2.94 showed closer toward disagree. It showed that more than half of the research and development centers did not play efficient role in the product management (Table 4.76).

77. Data expressed that 49.78% of the respondents agree to the research & development centers planned the research policies and projects to ensure the quality of research. The mean score 3.32 showed closer toward agree. It showed that less than half of the research and development (R&D) centers planned the research policies and projects regularly to ensure the quality of research in the universities (Table 4.77).

78. Data expressed that 52.06% of the respondents did not agree to research institutes implement the tasks of research and development. The mean score 2.98 showed closer toward disagree. It showed that most of the research institutes did not implement the tasks of research and development (Table 4.78).

79. Data expressed that 50.06% of the respondents did not agree to the efficiency of monitoring networks of the research and development centers. The mean score 2.98 showed closer toward disagree. It showed that more than half of the respondents did not agree with the monitoring networks of research and development (R&D) centers worked properly (Table 4.79).

80. Data expressed that (49.6%) of the respondents agreed to the research and development centers provided technical assistance to the research institutes. The mean score 3.06 showed closer toward agree. It showed that less than half of the research and development centers provided technical assistance to the research institutes (Table 4.80).

81. Data expressed that 54% of the respondents did not agree to the research and development centers provided financial assistance for research institutes. The mean score 2.96 showed closer toward disagree. It showed that most of the research and development centers did not provide financial assistance for research institutes in the universities (Table 4.81).

82. Data expressed that 52.95% did not agree to the research and development centers gave feedback to the social sector. The mean score 2.97 showed closer toward disagree. It showed that research and development center did not give feedback to the social sector (Table 4.82).

83. Data expressed that 51.13% of the respondents did not agree to the statement that research and development (R&D) centers developed coordination among local research institutions and international institutions. The mean score 2.99 showed closer toward disagree. It showed that most of the research and development (R&D) centers did not develop coordination among local research institution and international institutions (Table 4.83).

84. Data expressed that 50.14% of the respondents did not agree to the outcomes of research and development in the university. The mean score 2.98 showed closer toward disagree. It showed that more than half of the respondents did not agree with the outcomes of the research and development centers (Table 4.84).

85. Data expressed that 75.48% of the respondents agreed to the research and development centers faced many challenges in the universities. The mean score 3.68 showed closer toward agree. It showed that research and development (R&D) centers faced many challenges in the universities (Table 4.85).

5.1.14 Overall Results

86. Data expressed that 51.01 % of the respondents agreed to the issues and challenges of research and development while 47.93% of the respondents disagreed to the current situation of research and development. The mean score 3.10 showed closer toward agree. It showed that more than half of the respondents agreed to the current situation of research and development (Table 4.86).

87. Data expressed comparative analysis of the province-region based current situation of research & development (R&D) in the universities. Data showed that 59.12% of the respondents agreed to the current situation of research and development in the universities of Punjab province. Data described that 50.87% of the respondents agreed to the current situation of research & development in the universities of Sindh province. Data showed that 55.27% of the respondents did not agree to the current situation research & development in the universities of Baluchistan province. Data expressed that 50.24% of the respondents did not agree to the current situation of research & development in the universities of Khyber P.K. Data indicated that 55.58% of the respondents agreed to the current situation of research & development in the universities of the federal area (Table 4.87).

88. Data expressed that 54.13% of the respondents agreed to the current situation of research & development in social sciences. Data described that 70.35% of the respondents agreed to the situation of research & development in natural sciences. Data explored that 51.13% of the respondents disagreed to the situation of research & development in arts and humanities. Data showed that 64.71% of the respondents agreed to the situation of research & development in R&D and Q.A departments (Table 4.88).

5.2 Findings and Conclusions of the Study

This research study aimed at to analyze the current research and development mechanism at university level in Pakistan. The main findings and conclusions of the study were caterorized according to its objectives and research questions.

5.2.1 Status of Research and Development of Public Sector General Universities

The major focus of this study was on analyzing the status of research & development (R&D) practices in the public sector general universities of Pakistan. Its relevant question was how to analyze the status of research & development at universities in Pakistan? Findings of the study revealed that research & development council play a significant role in functioning of a university and promotion of research culture aomong academia. Results of the study explored that a significant majority of the vice chancellors encouraged and supported the initiatives of R&D centers through providing essential technical and financial help. The data further showed

that most of the deans of faculties played significant role to facilitate and to monitor research process of the faculty members. It was clear from the data that most of the chairmen of departments ensured the quality of research work through proper monitoring in their departments. It was found out from the data that more than half of the chairmen/directors of R&D centers gave right direction to strengthen the research and development mechanism. It was revealed that more than half of the research supervisors get involved actively during research process and less than half of the chairmen of BASR conducted meetings according to the schedule and approved the research proposals at right time. Overall it was concluded that most of the respondents seemed agreed that the stake holders of R&D councils like as; vice chancellors, deans, and chairmen were doing their responsibilities properly and contributing very well to strengthen the R&D mechanism in the universities. On the other hand, almost half of the respondents did not agree to the monitoring and involvement of the research process by the chairmen of R&D centers and research supervisors. While less than half of the respondents expressed that the chairmen of BASR conducted meetings and approved research proposals timely. The lack of board of management of R&D was the cause of ignorance and inefficiency of research and development mechanism in the universities. The lack of interest and coordination between the stakeholders of R&D council was another reason of the passive role of research and development mechanism.

5.2.2 Exisiting Prctices of Research and Development of Public Sector General Universities

Product management was an important factor of research and development (R&D) mechanism in the universities and research institutions of higher education. The second question explored the existing research & development practices at universities in Pakistan? The related findings indicated that less than half of the research institutes provided market based knowledge and information technologies to the educational institutions and industry. It was found out from the data that most of the research institutes did not design market based software for the public and private institutions. The data further expressed that more than half of the research institutes did not design market based hardware for private firms and industry. It was explored from the data that less than half of the research institutes produced human resource management personnel to fulfill the needs of admin and technical sections of public and private institutions.

It was cleared from the data that more than half of the research institutes organized need based resources for human resource development to provide necessary trainings. The data further showed that most of the research institutes did not strengthen financial status of the customers. Further it was indicated that more than half of the research institutes created literature according to the market demand. The data also revealed that most of the research institutes produced scientists for further research and innovations in the universities. Overall it was concluded that, more than half of the respondents seemed disagreed regarding product management of R&D. The study further concluded that lack of productivity and efficiency was found in the product management of R&D mechanism in the public universities of Pakistan. It was also concluded that no industrial set up and lack of modern research centers was reason behind the poor condition of product management of R&D.

Planning process was the most important factor of research and development (R&D) mechanism in the universities and research institutions of higher education. The results of the study showed that more than half of the R&D centers formulated policy matters for research institutions of higher education. It was indicated from the data that more than half of the R&D centers formulated research projects in the light of the research findings. It was explored from the data that most of the R&D centers facilitated the researchers during research process. It was found out from the study that R&D centers designed rules and regulations to facilitate the supervisors and researchers. It was pointed out from the data that half of the R&D centers developed strategic plan to enhance quality of the research work in the university and institutions of higher education. The data further revealed that most of the R&D centers did not plan research projects according to the national goals. It was noted from the data that most of the R&D centers did not prepare and manage the research activities for the students in the universities according to the global trends. It was cleared from the data that most of the R&D centers did not design job description for the research technocrats and experienced people to utilize their expertise in the research projects. The data further elaborated that majority of the research institutes prepared rules and regulations for research and development mechanism. The data affirmed that most of the research institutes did not launch long term policies of R&D in the universities. The data further illustrated that more than half of the R&D institutes launched short term research projects in the universities. Overall it was concluded that more than half of the respondents seemed

disagreed regarding the planning process of R&D in the public universities of Pakistan. The lack of proper planning and shortage of expertise were the main causes of low quality research.

Implementation of rules & regulations, research plans, research policies and research projects is an important phase of R&D mechanism in the universities and research institutions of higher education. The findings of the study indicated that more than half of the research institutes conducted conferences, seminars and symposiums to promote the research culture in university. It was found out from the data that more than half of the research institutes did not arrange professional development workshop to enhance research expertise among the faculty members. It was clear from the results that more than half of the research institutes introduced innovative practices to improve the research mechanism. The data further informed that most of the research institutes did not provide management information system for the research activities. The results of the study showed that most of the research institutes did not sign agreements between national and foreign agencies on the research projects. It was explored from analysis of the study that most of the research institutes did not take specific measures to improve the quality of research in the universities and institutes of higher education. It was further exposed from the data that more than half of the research institutes did not sign agreement between public and private sector. It was described that most of the research institutes did not arrange study tours for the researchers and research supervisors to improve research expertise. It was expressed from the data that more than half of the research institutions did not implement the research related policies formulated by R&D. It was clarified from the data that most of the research institutes did not establish sound organization for research development. Overall it was concluded that most of the respondents seemed disagreed to the implementation of research policies, research plans and research projects formulated by R&D in the universities. The study further concluded that there was lack of agreements signed between public and private sector. The reason behind the poor situation of implementation phase was the non-availability of particular implementation mechanism.

Monitoring process of the research practices in the universities and higher education institutions is the major function of research and development mechanism. Monitoring networks of R&D council was an important factor of this research study. The results of the study indicated that almost half of the R&D centers did not ensure the feedback on the running research projects. It was depicted from the data that more than half of the R&D centers did not monitor the quality

assurance mechanism properly in the research institutions of higher education. It was revealed from the research data that half of the R&D centers created competitive environment to produce research publications. Further the data explored that more than half of the R&D centers ensured to maintain the quality of research process. It was cleared from the data that most of the R&D centers did not provide security during research process to the working people. Overall, it was concluded that almost half of the respondents seemed disagreed regarding R&D centers for monitoring the running research projects and the quality assurance of research activities properly. The reason behind this was the lack of proper monitoring networks of the R&D mechanism in the universities. The study further concluded that there was no particular monitoring wing in the R&D centers of the universities and institutions of higher education.

Technical assistance in the research projects for the researchers, supervisors and research institutes is the main purpose of research and development mechanism. Provision of technical assistance was important factor of this research study. The results of the study further indicated that more than half of the R&D centers provided essential technical assistance in the research projects. It was illustrated from the data that most of the R&D centers assisted the supervisors through internet facility. It was showed from the data that almost half of the R&D centers did not facilitate the researchers through latest print media. It was revealed from the data that more than half of the R&D centers did not equip science laboratories with modern technologies. The data affirmed that most of the R&D centers did not support libraries through inter library loan projects to upgrade the library by providing updated books and materials. It was showed that more than half of the R&D centers facilitated computer labs through updated material and technologies. Further it was identified that more than half of the R&D centers did not provide scholarly assistance for research students. Overall, it was concluded that simple majority of the respondents seemed disagreed regarding R&D centers in providing technical assistance to the researchers, supervisors, and research institutes in the research process. The lack of technical expertise and shortage of latest technologies was the reason behind the situation.

Provision of financial assistance to the research institutes is an important function of research and development (R&D) mechanism in the universities. The results of this research study further showed that more than half of the R&D centers generate resources through industrial sector to increase the quality of research. It was further identified from the data that most of the R&D centers did not support the research activities through research grants. The

study further illustrated that R&D centers did not generate funds from internal university resources. The reason was that they did not contact with national donor agencies for fund raising to promote research activities. It was further depicted from the data that most of the R&D centers did not develop links with foreign donor agencies for capital and human assistance. Further it was found out that more than half of the R&D centers did not launch research projects to increase the funds for university income. Overall, it was concluded that majority of the respondents seemed disagreed regarding R&D centers for generating funds to get financial assistance for the universities in Pakistan. The lack of linkages with national and international agencies was the reason behind the poor situation.

The provision of feedback to the researchers, supervisors and research institutes is the main purpose of the research and development centers (R&D) in the universities. In the light of results of the study it was further indicated that most of the R&D centers did not provide feedback to the social sector through the research recommendations. It was further identified from the data that more than half of the research institutes did not improve their performance through feedback of the functional institutions and industry. In the light of overall results of the study it was concluded that most of the R&D centers did not provide proper feedback to the functional institutions and industry. The study further concluded that simple majority of the respondents seemed disagreed regarding the R&D centers to improve their performance through feedback.

To develop coordination and collaboration among different universities, national and international research institutions and industries are important functions of the research and development (R&D) centers. It was indicated by the results of the study that more than half of the R&D centers developed coordination among different local research institutions. It was further affirmed that most of the R&D centers did not collaborate with different universities, national and international research institutions and industries to increase the quality of research work. The data further explored that the R&D centers did not build interaction between external agencies and research institutes. Overall, it was concluded that most of the respondents seemed disagreed regarding R&D centers to develop coordination and collaboration among different universities, national and international research institutions and industries for increasing the quality of research work. The lack of expertise and professional competency was the major

causes of lack of interaction, lack of coordination and lack of collaboration between the national and international universities.

Outcomes of the initiatives and efforts of research institutes to develop research culture in the universities is an important factor of research and development (R&D) mechanism. The results of the study showed that more than half of the research institutes did not design need based assessment for the research projects. It was identified from the data that most of the research institutes did not provide trained manpower to the local industry. The data further indicated that almost half of the research institutes did not provide human resource management for good governance of the institutions. It was revealed from the data that most of the research institutes did not prepare experts for labor market. The study further depicted that more than half of the research institutes did not develop bridge between research institutions and social sector of the community. It was further showed that more than half of the research institutes did not facilitate public sector through the results of research activities. The data depicted that more than half of the research institutes provided skilled manpower to the social sectors. The data further expressed that most of the research institutes provided research experts to the universities and research institutes. In the light of research findings it was concluded that most of the respondents seemed disagreed regarding research institutes to achieve the desired goals of the efforts of R&D centers in the universities.

5.2.3 Problems Faced by Research and Development for its Smooth Functioning

The challenges/problems of R&D are an important issue that influences the process of research and development in the universities. The third question investigated into the problems faced by research & development council for its smooth functioning in university? The results of this research study showed that majority of the respondents opined that R&D mechanism was very lengthy as well as there were lack of expertise in R&D mechanism. Data elaborated that majority of the respondents were of the opinion that university administration give less priority to the research and development which suffers from lack of funds personal liking and disliking unstable policies and lack of coordination among R&D stakeholders. Data further illustrated that majority of the respondents opine that there is lack of professional competency and support among the HRD personnel. In the light of findings of this research study it was concluded that

majority of the respondents felt that research and development mechanism in the universities was facing various challenges.

5.2.4 The Trends of Research and Development in Public Sector General Universities

The fourth question examined the trends of research & development in Pakistani universities? It was affirmed by the oipinion of the respondents that university administration should be given a top priority to the research and development process. Research expertise should be managed and provided to assist the research process. Majority of the respondents argued that R&D board of management should be established in the universities. This board should become an effective arm of the university to implement the research policies. The board should have sections in the major cities, in order to deal with the R&D centers regularly. It should have the capability to analyze the work done by any R&D centers and institute regular performance-evaluation. At the same time, the board should have no authority to interfere in the functioning and decision-making of the R&D centers. Most of the respondents suggested that the executive director of the R&D centers should be introduced. The director should have full authorities of hiring and firing. The overriding goal should be to orient work of the center, so that its research efforts will useful to the relevant industry. The success or failure of the R&D centers should be judged from the usefulness of the services of the centers and its capacity to sell new ideas and technology for product-improvement.

This research study concluded that R&D centers should be expected to meet a percentage of their expenses through internal cash-generation. The revenues should be remained under control of the centers and would not be credited back to the national exchequer. Most of the respondents felt that the requirements of working capital for each R&D centers should be worked out. The approved amounts will provide as working capital, so that the centers can have a business-like approach and capability. The results further concluded that there should be a marketing wing in the centers, to boost sales of its products, services and technology. Most of the respondents argued that the cash generated by the R&D centers should be used to enhance its productivity and to reward its employees, according to an approved proportion. The income from patents will also be retained.

It was concluded that R&D centers, after strengthening and provision of working capital, should be expected to meet some of the expenses, according to an approved schedule. In

accordance with this approved schedule, the non-developmental part of the budget would be reduced in easy stages. This would be put enough pressure on the centers and executive director to handle the resources in a business-like manner and to reach out to prospective customers and clients. If the revenues were less than the (non-developmental) reduction, the executive director should have to reduce staff by lying off. This was admittedly a controversial measure, but many universities had already adopted this method. Most of the respondents described that the R&D board of management should be established, there would be no need for individual boards of directors. Instead there would be a number of standing committees for intellectual interaction and collective decision-making. The new R&D system envisages a tenure-system for the executive director leading the R&D centers.

As a whole the study concluded that most of the stake holders of research and development (R&D) councils were meeting their responsibilities properly and contributing well in the R&D process of the universities. It was cleared from the data that more than half of the research institutions did not perform well in the product management of R&D in the universities. It was concluded that simple majority of the respondents seemed disagreed regarding research institutes to show good progress in the planning process of R&D in the universities. The study further concluded that the research institutes did not implement research policies, research plans and research projects formulated by R&D in the universities. Almost half of the R&D centers did not monitor the running research projects and quality assurance of research activities properly. Data further described that more than half of the R&D centers did not provide technical assistance to the researchers, supervisors, and research institutes for the sake of research process. Most of the R&D centers did not generate funds to provide financial assistance for the research institutes and universities. Majority of R&D centers did not provide proper feedback for the functional institutions and social sector and also did not develop coordination and collaboration among local, national, international and functional research institutions to increase research quality in the universities. Majority of the respondents opined that R&D mechanism in the university was facing various challenges. In the light of findings of this research study it was concluded that R&D mechanism in the universities was facing various challenges.

Research and development capabilities exist within the country in a variety of disciplines. The link-up with industry will be beneficial to the R&D sector in a big way. The link-up can be achieved only through a variety of reforms within the science sector, as it requires

a sea-change in the attitude of the heads of R&D centers. The institution of performance-evaluation, peer-review and creation of incentives, through funding streams allocated on the basis of performance, can do the job.

5.3 The R&D Model Proposed

In the light of last objective of the study and on the basis of its findings and conclusions; a R&D model was proposed keeping in view the opinons of R&D/ORIC directors, QEC directors, faculty members and senior research scholars. This R&D model proposed was named as Saeed & Nizam model of Research & Development and it was output of the study. The R&D model given below:

Proposed

Universal R&D Model

This R&D model has been proposed in the light of findings of the study going through the existing R &D models at national and international universities given in literature review.

1. Introduction

Research and development is the backbone of university and institutions of higher learning where knowledge is not only transferred but consistently generated, ideas are evolved, hypotheses are developed and proved, their applications are demonstrated and prototypes are built for fabrication through the industry for the benefits of the community. This necessitates the need to establish the directorate of research and development with the aim to facilitate and co-ordinate research activities in university departments, set up consultancy service and technology incubation center/ Technology Park, create linkage with other national as well as international academic institutions, R&D and industrial organizations.

In line with the policy of HEC and in pursuance of Vice Chancellor's directives for streamlining the management of research initiatives and programs, there was a need to re-enforce the existing research centers already working at university for not only sustaining but also improving the trends of the research activities having an impact for the improvement of areas concerning economic, industrial, social and academic development and their accelerated advancements for achieving the national objectives.

Research in the creative and performing arts, architecture, design, media, science and the humanities is at the forefront of a successful research culture at the Universities. Faculties systematically pursue clear strategy of disciplinary and interdisciplinary research, inter-relating critical theory, current practices and their histories. This generates fresh fields of interdisciplinary enquiry stimulating insights that question modern practices and foster new understandings.

2. Vision & Mission Statement

The mission of R&D is to develop, expand, enhance and manage the university's research programs and to link research activities directly to the educational, social and economic priorities of the university and its broader community. R&D will be responsible for assuring that the quality of research reflects the highest international standards and advances the stature of the

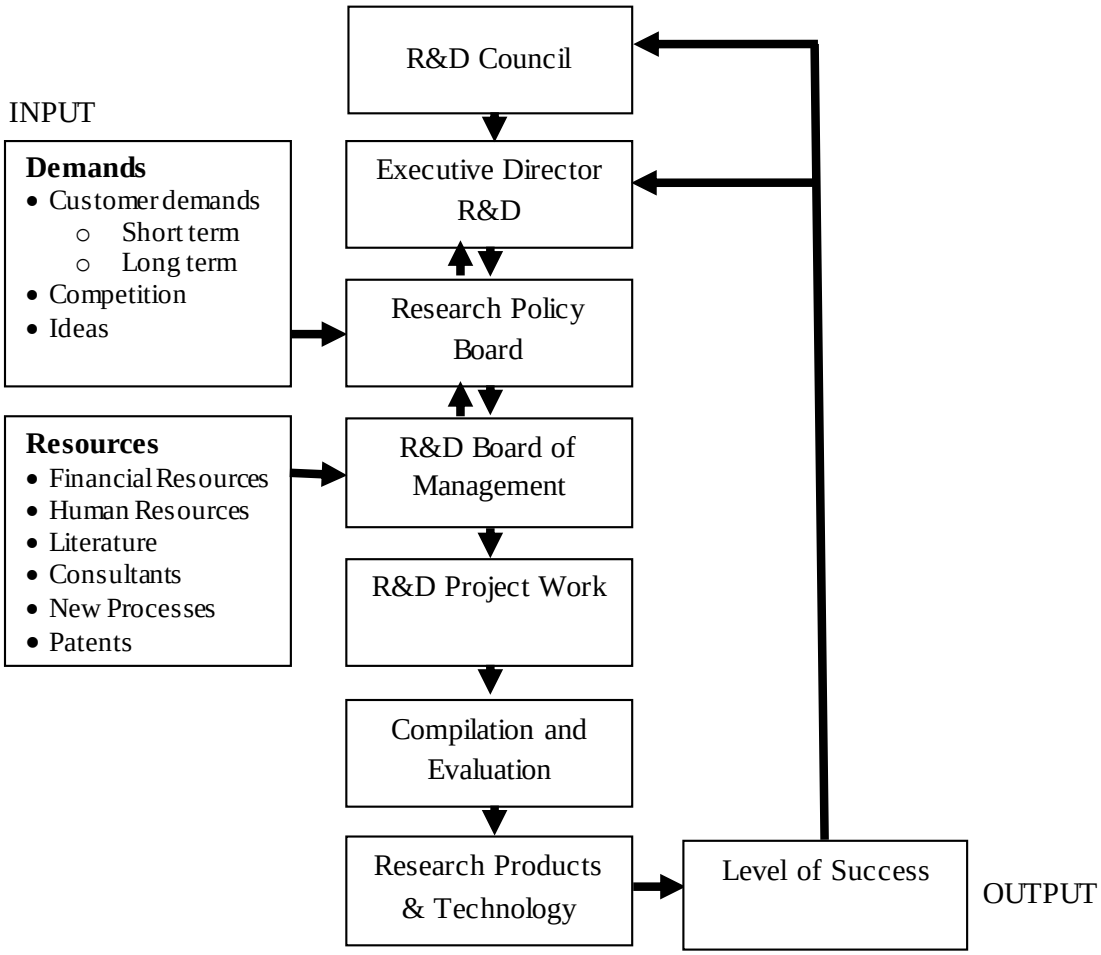
university among the world's best research institutions. The R&D will be committed to being the synergy and moving force of research in the university. Research and development will strengthen the research capacity of the university community by encouraging and promoting research that will meet focus of the country through internationally recognized research outcomes and in line with the on-going policy of national research program of the universities for building the national economy. In view of the significant increase in number of post graduate students involved in research, enhancement in research projects, increase in publications and enhanced possibility of commercialization of research; it is equally important to build-up the capacity of the academic institutions at university level to manage all research related activities. R&D will positively set the pace to match up to the challenges in the field of research.

3. Aims and Objectives

1. To ensure that high quality research of direct relevance to our country's needs, pertaining to both public and private sectors.
2. To establish linkages between departments/institutes/centers and industry both in the public and private sectors and to facilitate contract research benefit to the university and public/private sectors.
3. To assist in obtaining research grants from the public/private sector and foreign agencies.
4. To generate R&D funds through sponsored projects and consultancy services for further up-gradation of libraries, computing facilities, laboratories and research facilities at the universities.
5. To co-ordinate placement of students at different stages of their education with relevant organizations for practical training and subsequent employment.
6. To encourage and activate research activities in order to upgrade the overall quality of teaching and learning within the university.
7. To keep the university faculty abreast of the latest developments in their respective areas of specialization.
8. To disseminate research findings through conferences/seminars and workshops etc.
9. To develop the university's strategic research directions and policies.
10. To enhance multi-disciplinary research initiatives while working out incentives and awards' schemes for world class research and publications.

4. R&D Mechanism

R&D council will play supervisory role. Executive Director R&D will manage and organize all activities with the collaboration of Research Policy Board and Board of Management. Research policy board will formulate policies in the light of demands. R&D board of management will manage the resources according to the demands. Project work will start and compile in a specific way. After evaluation R&D council will be informed with the research products and technology.



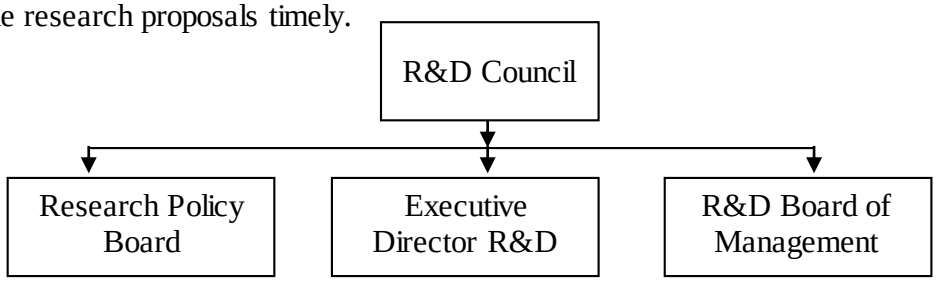
5. Future Research and Training Plan

The R&D Center`s agenda for promoting quality based research culture in future should be included current key issues such as; new mechanism for support to research projects, training programs and workshops, linkage and international cooperation, promotion of annual research fair, collaboration with local industries and their involvement in the university activities, special lectures series, research productivity of the center, linkages between departments/institutes/ centers and industry, obtaining research grants from public/private sector and foreign agencies. These initiatives will provide an opportunity to students as well as teachers to improve their research skills and dredge up their knowledge of empirical studies with expertise in data analysis. The R&D Center should be developed a substantive database by conducting various surveys, which will be used by faculty, staff and students for further analysis, preparation of theses and dissertations, classroom instruction, and for planning of programs or development of policies. Although the database should be useful for those in social sciences such as; population sciences, economics, sociology, psychology, as well as medicine, public health, education and information science, and public policy. The R&D Center should be planned to start short courses in the fields of gender studies, reproductive health, criminology, and demography, quantitative and qualitative techniques of data analysis. Training workshops will also be conducted in data analysis techniques, presentation of data, communication skills, teaching methodology and human resource management.

6. Tasks and Functions of the R&D

6.1 Role of R&D Council

Role of research and development council is important to create research atmosphere in the universities. Vice chancellor, Deans, Chairmen and Supervisors should involve actively during research process and they should encourage, facilitate, monitor and supervise all the functions of R&D. Chairman of BASR should conduct meetings according to the schedule and approve the research proposals timely.



6.2 Product Management

Product management is very important task of R&D process in the universities to ensure the market based productivity of knowledge and information technology. Research institutions introduce need based products for local and foreign market, up-dated, knowledge based, and on demand of local industry. Research institutes produce latest technologies and HRM personnel.

6.3 Planning Process

R&D experts formulate future based and comprehensive policies and research projects for the higher institutions such as universities according to the demands of national and international scenario. There should be designed rules and regulations and strategic plans to facilitate the researchers and enhance the quality of research work.

6.4 Implementation Phase

Implementation of HEC policies is the most important task of R&D mechanism in the universities. R&D centers should implement the research policies and conduct conferences, seminars, workshops and symposium for improving research culture. R&D centers should sign agreement between private and public sectors. R&D centers should implement research related policies to establish sound organizations of public and private sectors.

6.5 Monitoring Networks

Monitoring networks for research and development process is an important function of R&D in the universities. BASR and R&D council will monitor all the research activities and ensure quality assurance mechanism in the universities. R&D centers should provide proper guidance to the Stakeholders of R&D during research process.

6.6 Technical Assistance

Provision of technical assistance to the researchers and supervisors is an important factor of R&D mechanism. R&D centers will facilitate the scholars and supervisors through latest instrumentation such as internet, computer lab and science laboratory. So that they will be able to perform better and achieve the desired goals.

6.7 Financial Assistance

Financial assistance for promotion of research and development culture in the universities is an important function of R&D. R&D centers will generate funds and research grants from available resources and will develop links with local and foreign donor agencies for capital and human assistance to increase university income.

6.8 Proper Feedback

Provision of proper feedback to the social sector during research projects is an important function of R&D process. Feedback through the research recommendations should be provided to the public and private sectors. Research institutes should improve their performance through feedback of the functional institutions.

6.9 Coordination with Industrial Sector

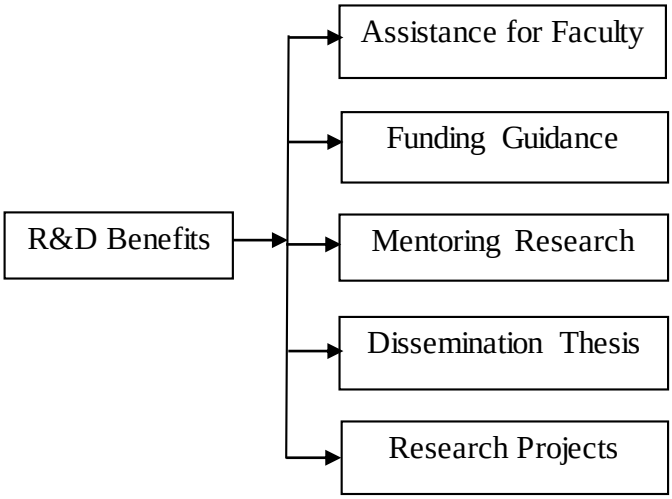
Coordination among different research institutions with industrial sector during research and development process is the most important function. R&D center should develop coordination among different local research institutions and industrial sector. R&D should collaborate with national and international research institutes and build interaction between local and external research agencies for improving research quality.

6.10 Research Outcomes

R&D is a cyclic process and assessment is an important element of this process. R&D centers will design need based assessment to know about the level of successes of research activities. R&D center should provide research experts and skilled manpower to the local industry. R&D center should develop bridge between research institutions and social sector of the community.

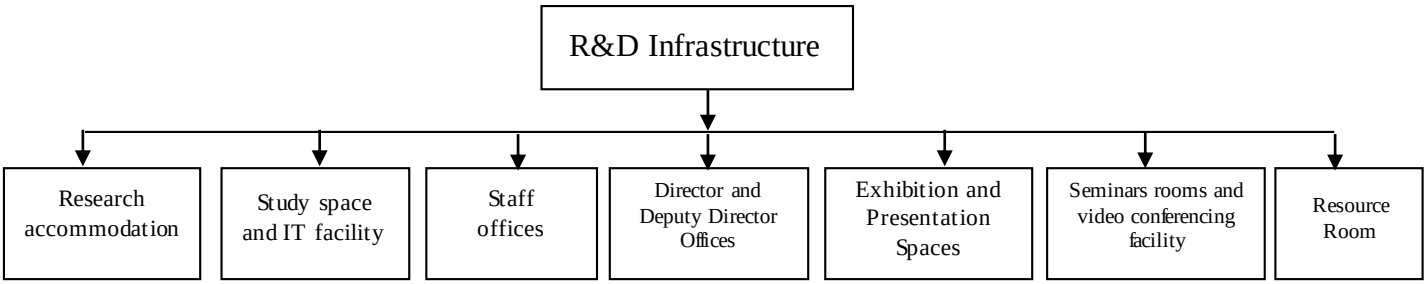
7. Benefits of R&D

The R&D provides a supportive research infrastructure for the faculty's community offering assistance, funding guidance, mentoring and dissemination for the development and delivery of research projects.



8. R&D Infrastructure

The R&D infrastructure consists of the space including dedicated research accommodation and study space, staff offices, exhibition and presentation spaces; seminar rooms and video-conferencing facilities.



9. Development & Promotion of Research Activities

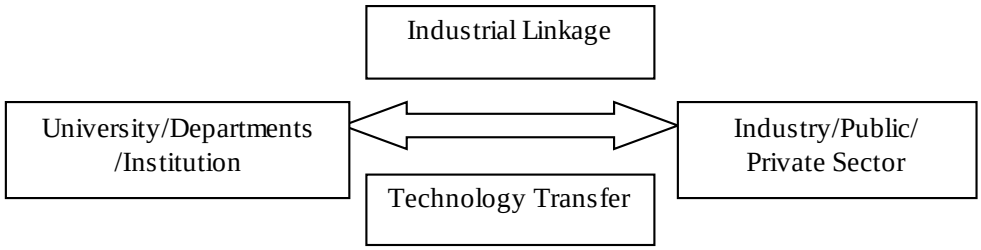
R&D will develop programs and activities that will:-

- Increase funding for research from all public and private sources.
- Establish and maintain excellent relationships with donors and stakeholders.
- Oversee research proposal development and submission.
- Support commercialization, licensing, etc, of university research products.

10. University – Industrial Linkages & Technology Transfer

R&D will promote the development of public-private partnerships:-

- In support of university research initiatives.
- Link the university's research community with the needs and priorities of the corporate sector.
- Develop opportunities for applied research and explore opportunities for technology transfer.
- Commercialization of university research.
- To follow-up of commercialization process of research products.

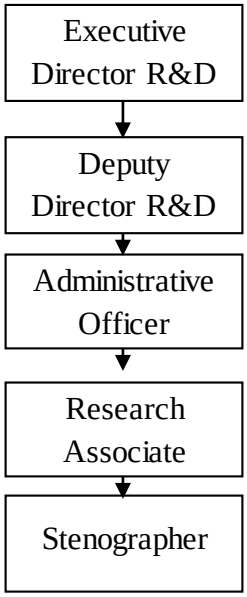


11. The Doctoral Center of R&D

The Doctoral Centre is a key unit within the R&D center and provides a key role in leading the faculty's postgraduate research and doctoral provision and building a lively and stimulating community and research training for students and supervisors (internal and external). The administrative team of doctoral center should be responsible for organizing research days and specialist seminars. R&D Center oversees the registration, supervision, progression, quality assurance and examination of doctoral students and manages the university's accreditation of research degree provision at University.

12. Management and Administration

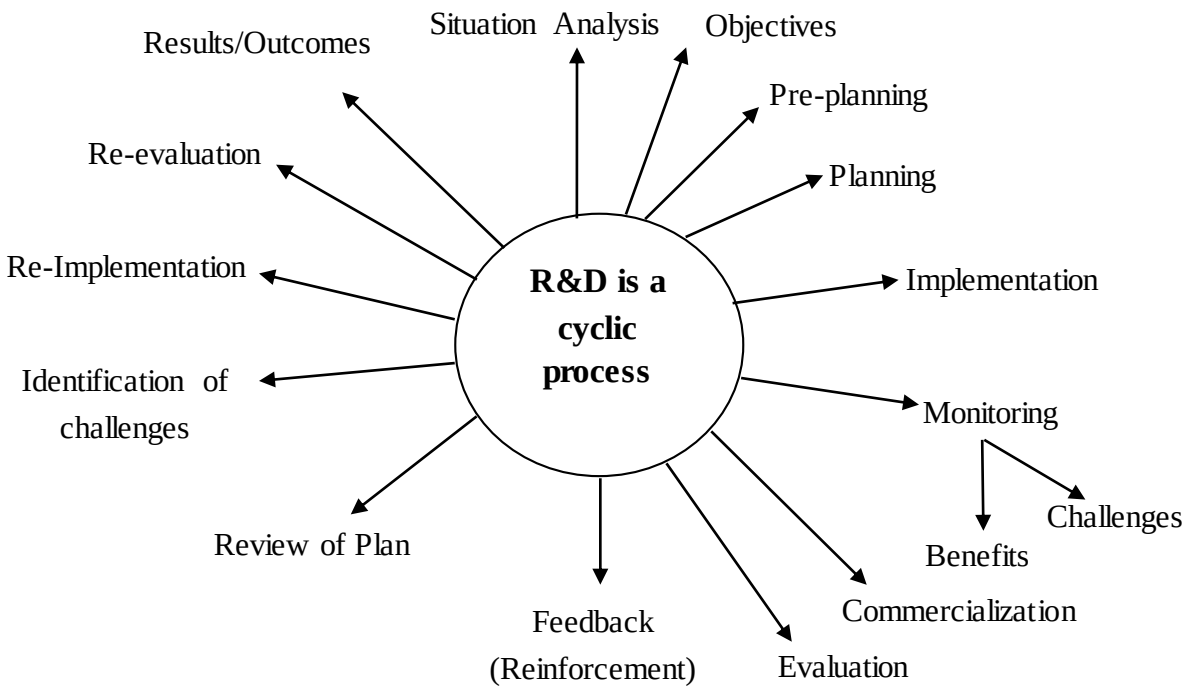
A separate structure and establishment for R&D will be made functional at the university level. The office of R&D should be headed by the Executive Director supported by deputy director, administrative officer, a research associate and a stenographer. Proper building will be constructed for R&D Center.



13. Practice in a Cyclic Manner

Research and development (R&D) model practices in a cyclic manner. This cyclic process is very effective to enhance productivity at higher education. R&D cycle comprises of following phases.

Framework of R&D Cycle



1. **Situation analysis:** This R&D model practices in a cyclic process which starts from situation analysis of concerned project. At this stage the current status of related issues are discussed.
2. **Obectives:** The process of above R&D cycle basis on specific objectives. The objectives are formulated in light of situation analysis to get desired results.
3. **Pre-planning:** The above R&D cycle focuses on initial steps/ agenda for proper planning.
4. **Planning:** The executive council of this R&D model make decisions for necessary actions during planning process.
5. **Implementation:** The concerned personnel of this R&D model make an effort to implement on decisions of the executive council during cyclic process.

6. **Monitoring:** This R&D model establishes monitoring networks to ensures efficiency and transparency of works/ practices during its cyclic process.
7. **Commercialization:** This R&D model commercializes research based products to facilitate customers/ clients dring its cyclic process. ‘
8. **Evaluation:** This R&D model evaluates the whole phases to identify problems/ challenges faced during its cyclic process.
9. **Feedback:** This R&D model provides feedback during its cyclic process to improve/ modify its functions.
10. **Review of Plan:** This R&D model make a review on policies and planning through feedback during its cyclic process to achieve the desired objectives.
11. **Identification of challenges:** This R&D model identifies the challenges during its cycles process.
12. **Re-Implementation:** This R&D model revises its instructions during its cyclic process to re-implement policies to get better results.
13. **Re-evaluation:** This R&D model re-evaluates the functions during its cyclic process.
14. **Results/Outcomes:** This R&D model get better results/ outcomes during its cyclic process for corporations and clients.

5.4 General Recommendations

Further recommendations are as under:

1. One of the new approaches is to form the R&D board of management. This board will become an effective arm of the university management to implement the research policy. The board will have sections or branches in the major cities, in order to deal with the R&D centers on a regular basis. It will have the capability to analyze the work done by any R&D centers and institute regular performance-evaluation. At the same time, the board will have no power to interfere in the day-to-day functioning and decision-making of the R&D centers.
2. The concept of the Executive Director of the R&D centers has been introduced. The director will have full powers of hiring and firing. The overriding goal will be to orient the work of the center, so that its research efforts are useful to the relevant industry. The success or failure of the R&D centers will be judged from the usefulness of the services of the centers and its capacity to sell new ideas and technology for product-improvement.
3. The R&D centers will be expected to meet a percentage of their expenses through internal cash-generation. The revenues earned will remain under the control of the centers and will not be credited back to the national exchequer.
4. The requirements of working capital for each R&D centers will be worked out. The approved amounts will be provided as working capital, so that the centers can have a business-like approach and capability. There will be a marketing wing in the centers, to boost sales of its products, services and technology.
5. The cash generated by the R&D centers will be used to enhance its productivity and to reward its employees, according to an approved proportion. The income from patents will also be retained.
6. The R&D centers, after strengthening and provision of working capital, will be expected to meet some of the expenses, according to an approved schedule. In accordance with this approved schedule, the non-developmental part of the budget will be reduced in easy stages. This will put enough pressure on the centers and Executive Director to

handle the resources in a business-like manner and to reach out to prospective customers and clients. If the revenues are less than the (non-developmental) reduction, the Executive Director will have to reduce staff by lying off. This is admittedly a controversial measure, but many universities have already adopted this method.

7. In case the R&D board of management is established, there will be no need for individual boards of directors. Instead there will be a number of standing committees for intellectual interaction and collective decision-making.
8. The new R&D system envisages a tenure-system for the Executive Director leading the R&D centers.

5.4.1 Recommendation Related to the Results

1. Role of research and development council is most important in creating research atmosphere basis on quality criteria. This research study strongly recommends that establishment of R&D centers should be mandatory in all of the universities of public sector and already established R&D centers should be up-graded through providing necessary technical and financial assistance for the sake of creating competitive research atmosphere in all the public sector universities of Pakistan. Performance of stakeholders of R&D centers should be more effective and efficient to achieve the predetermined goals of research efforts and to increase the quality of research work. Responsibilities of all the personnel of R&D council should be pre-specified for their better contribution in promoting research oriented approach in the universities. Vice chancellors, deans, chairmen and research supervisors should be involved more actively during research process and they should encourage, facilitate, monitor and supervise all the efforts of research and development. Chairman of BASR should conduct meetings according to schedule and approve the research proposals timely.
2. Product management is the most important aspect and specific task of R&D mechanism in the institutes of higher education. In academic institutions, its role has become very significant to ensure the market based productivity of knowledge and information technology. Ignorance of product management in the research institutions makes it impossible to attain the desired goals of R&D. This research study strongly recommends that there must be a developed link between research institutes and industrial sector.

Research institutions must introduce need based products that would be beneficial for local and foreign market. Research production must be up-dated, knowledge based, and on demand of local industry. Software and hardware must be designed for the progress of industries and business sector. Research institutes must produce HRM personnel and manage need based resources for human resource development.

3. Tasks and targets of research and development mechanism in the institutions of higher education can only be achieved through planning process of R&D. This research study strongly recommends that policies must be designed to do research and development in the research institutions to launch long term and short term research projects. R&D council should formulate future based and comprehensive policies and research projects for the higher institutions such as universities according to the demands of national and international scenario. There must be designed rules and regulations and strategic plans to facilitate the researchers and enhance the quality of research work.
4. Implementation of R&D policies is the most important phase of research and development mechanism in the universities. This research study strongly recommends that R&D centers must implement the policies and conducted conferences, seminars or symposium for improving research culture. Professional development workshops must be organized as well as innovative practices for the faculty to develop research expertise and to improve the research mechanism must be introduced. R&D centers must sign agreement between private and public sectors. Research and development centers should arrange study tours for researchers and supervisors for improving the research expertise. R&D centers must implement research related policies to establish sound organizations of public and private sectors for research and development.
5. Monitoring networks for research and development process is an important function of R&D in the universities. This research study strongly recommends that there must be proper check and balance on the running research projects in the universities. BASR, R&D council and stakeholders should monitor all the research activities and ensure quality assurance mechanism in the universities. Proper security to the stakeholders of R&D during research process must be provided.

6. Provision of technical assistance to the researchers and supervisors is very important factor of R&D mechanism. This research study strongly recommends that research and development centers must facilitate the researchers and supervisors through latest instrumentation such as internet, computer lab and science laboratory. So that they would be able to perform better and achieve the desired goals.
7. Financial assistance for promotion of research and development culture in the universities is an important function of R&D. This research study strongly recommends that R&D centers should generate funds and research grants from available resources to promote research activities. There must be developed links with local and foreign donor agencies for capital and human assistance to increase university income.
8. Provision of proper feedback to the social sector during research projects is an important function of research and development process. This research study suggests that feedback through the research recommendations should be provided to the social and private sectors. Research institutes must improve their performance through feedback of the functional institutions.
9. Coordination among different research institutions with industrial sector during research and development process is the most important function of R&D center. This research study strongly recommended that R&D center should develop coordination among different local research institutions and industrial sector. R&D should collaborate national and international research institutes and build interaction between local and external research agencies for developing research quality.
10. Outcomes of research and development process are very important tasks of R&D center. This research study focuses on outcomes of research activities conducted in the academic institutions of higher education. R&D is a cyclic process and assessment is an important element of this process. To know about the level of successes of R&D activities, need based assessment for research projects must be designed. R&D center should provide trained and skilled manpower to the local industry. R&D center should develop bridge between research institutions and social sector of the community. R&D center should provide research experts for the local industry and academic institutions of higher education.

11. Challenges of research and development process are very important issue of R&D centers. R&D mechanism requires a lot of time, money and expertise because it is too much lengthy and costly. This research study strongly recommends that research and development process should be easy, simple and flexible. It should be considered a top priority in the universities and proper funds should be provided for R&D activities.

5.4.2 Recommendation for Future Research

12. In future research studies can be conducted, on the various aspects and functions of R&D in the universities and institutions of higher education, as well as why most of the universities of public sector do not have specific role of research and development. Further research studies can be conducted on research and development in private sector universities and other universities for women, medical, engineering universities in Paksitan.

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APPENDICES

Appendix – A

Authority Letter

TO WHOM IT MAY CONCERN

It is certified that Mr. Jam Muhamamd Zafar, PhD scholar, Department of Education, The Islamia University of Bahawalpur, intends to collect data from your prestigious institute for research purpose. His topic of research is: Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan. Kindly allow him to collect data from your department / institution.

Prof. Dr. Irshad Hussain
Supervisor
Department of Education
The Islamia University of Bahawalpur

Appendix –B

ANALYSIS OF CURRENT RESEARCH AND DEVELOPMENT (R&D) MECHANISM AND PREPARATION OF A MODEL FOR RESEARCH AND DEVELOPMENT AT UNIVERSITY LEVEL IN PAKISTAN

(Questionnaire for Deans)

This questionnaire is designed to **"Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at UniversityLevel in Pakistan"** your cooperation and contribution is highly appreciated. The provided information will be treated as confidential and used only for research purpose.

Name (Optional):

Name of University: **Department:**

Designation: Supervisor ☐ Head of Department ☐ Chairman ☐ Dean ☐

R&D Head ☐ R&D Officials ☐ Quality Assurance Personnel ☐

Qualification: M.A/M.Sc ☐ M.Phil ☐ PhD ☐ Post PhD ☐ Others ☐

Discipline: Physical Sciences ☐ Social Sciences ☐ Arts ☐ Others ☐

No. of Publications: _____ National _____ International **_____**

Number of Supervise: M.A /M.Sc _____ M.Phil _____ PhD_____

Term: R&D Stands for R&D centers / institutions / section.

Note: Please tick (3) the relevant box.

Responses: SA = Strongly Agree A = Agree, UD = Undecided

DA = Disagree SDA = Strongly Disagree

Sincerely

Jam Muhammad Zafar
PhD Scholar
Department of Education
The Islamia University of Bahawalpur

Sr. No.	Statement	SDA	DA	UD	A	SA
1.	Vice chancellor encourages and supports the initiatives of research institutes.					
2.	Dean of faculty facilitates and monitors the research process of the faculty members.					
3.	Chairman ensures the research quality of the department.					
4.	Head of R&D gives roadmap for research development.					
5.	Supervisor involves actively during research process.					
6.	Chairman BASR approves the research proposals timely.					
7.	Research institutes provide market based knowledge and information technology					
8.	Research institutes design market based software.					
9.	Research institutes design market based hardware.					
10.	Research institutes produce human resource management (HRM) personnel's.					
11.	Research institutes organize need based resources for human resource development (HRD)					
12.	Research institutes strengthen the financial status of customers.					
13.	Research institutes create literature according to market demand.					
14.	Research institutes produce scientists for further research and inventions.					
15.	R&D formulates policy matters for research institutions.					
16.	R&D formulates research projects in the light of research findings.					
17.	R&D designs rules and regulations to facilitate the researcher about research activities.					

18.	R&D develops strategic plan to enhance the quality of research work.					
19.	R&D plans research projects according to national goals.					
20.	R&D prepares research activities according to the demands of global trends.					
21.	R&D designs job description for research technocrats.					
22.	Research institutes prepare rules and regulations for research development.					
23.	Research institutes launch long-term policies for research advancement.					
24.	Research institutes launch short term research projects.					
25.	R&D conducts conferences / seminars or symposiums for improving research culture.					
26.	R&D arranges professional development workshop to enhance research expertise among the faculty members.					
27.	R&D introduces innovative practices to improve the research mechanism.					
28.	R&D provides management information system to the research institution.					
29.	R&D signs agreements between national and foreign agencies on the research projects.					
30.	R&D takes specific measures for improving the quality of research institutes.					
31.	R&D signs charter between private and public sector.					
32.	R&D arranges study tours of researcher and research supervisors for improving research expertise.					
33.	Research institutes implement research related policies.					
34.	Research institutes establish sound organization for research development.					
35.	R&D ensures the restrictions for the running research projects.					

36.	R&D monitors the quality assurance mechanism of the research institutions on regular basis					
37.	Research institutes create competitive environment for research development.					
38.	R&D keeps maintain the quality assurance of research process.					
39.	Research institutes provide security during research process to its stakeholders.					
40.	R&D provides technical assistance for research activities.					
41.	R&D assists the supervisor through information communication technologies.					
42.	R&D facilitates the researcher through latest print media.					
43.	R&D equips the science laborites with necessary apparatus for experimentation.					
44.	R&D upgrades the libraries through inter library loan projects.					
45.	R&D upgrades the computer labs through latest computer technologies.					
46.	R&D recommends scholarly assistance for research students.					
47.	R&D generates funds through industrial sector to increase research productivity.					
48.	R&D supports research activities through research grants.					
49.	R&D generates funds from internal university resources.					
50.	R&D contacts with donor agencies for donating funds to promote research activities.					
51.	R&D develops links with foreign donor agencies for capital and human assistance.					
52.	R&D launches research projects for increasing funds for university income.					

53.	Research recommendations provide feed back to the social sector.					
54.	Research institutes improve their performance through feedback of the functional institutions.					
55.	R&D develops co-ordination among different universities to exchange research expertise.					
56.	R&D collaborates with national and international research institutes to increase quality of research.					
57.	R&D develops co-ordination between research institutions and industry to ensure quality of products.					
58.	R&D builds interaction between external agencies and research institutes.					
59.	R&D designs need based assessment for research projects.					
60.	R&D provides trained manpower to the local industry.					
61.	R&D provides HRM for good governance of institutions.					
62.	R&D prepares expert artisans to strengthen the labor market.					
63.	R&D develops bridge between research institutions and the community.					
64.	R&D facilitates public sector through the results of research activities.					
65.	R&D provides skilled manpower for development of the society.					
66.	R&D provides research experts to the university and research institutes.					
67.	R&D mechanism is too much lengthy.					
68.	R&D lacks research expertise.					
69.	University give less priority to R&D.					
70.	R&D suffers lack of funds.					

71.	Personal liking and disliking influence R&D mechanisms.					
72.	Unstable policies influence R&D performance.					
73.	Lack of co-ordination exists among R&D stakeholders.					
74.	There is lack of professional competency and support among the HRD personnel.					

75. Please write down three challenges that R&D faces in this university?
    1.
    2.
    3.

76. Write down three suggestions to improve R&D mechanism in this university?
    1.
    2.
    3.

Appendix –C

ANALYSIS OF CURRENT RESEARCH AND DEVELOPMENT (R&D) MECHANISM AND PREPARATION OF A MODEL FOR RESEARCH AND DEVELOPMENT AT UNIVERSITY LEVEL IN PAKISTAN

(Questionnaire for Chairpersons / Heads of Departments)

This questionnaire is designed to **"Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan"** your cooperation and contribution is highly appreciated. The provided information will be treated as confidential and used only for research purpose.

Name (Optional):

Name of University: **Department:**

Designation: Supervisor ☐ Head of Department ☐ Chairman ☐ Dean ☐

R&D Head ☐ R&D Officials ☐ Quality Assurance Personnel ☐

Qualification: M.A/M.Sc ☐ M.Phil ☐ PhD ☐ Post PhD ☐ Others ☐

Discipline: Physical Sciences ☐ Social Sciences ☐ Arts ☐ Others ☐

No. of Publications: _____ National _____ International **_____**

Number of Supervise: M.A /M.Sc _____ M.Phil _____ PhD_____

Term: R&D Stands for R&D centers / institutions / section.

Note: Please tick (3) the relevant box.

Responses: SA = Strongly Agree A = Agree, UD = Undecided

DA = Disagree SDA = Strongly Disagree

Sincerely

Jam Muhammad Zafar
PhD Scholar
Department of Education
The Islamia University of Bahawalpur

Sr. No.	Statement	SDA	DA	UD	A	SA
1.	Vice chancellor encourages and supports the initiatives of research institutes.					
2.	Dean of faculty facilitates and monitors the research process of the faculty members.					
3.	Chairman ensures the research quality of the department.					
4.	Head of R&D gives roadmap for research development.					
5.	Supervisor involves actively during research process.					
6.	Chairman BASR approves the research proposals timely.					
7.	Research institutes provide market based knowledge and information technology					
8.	Research institutes design market based software.					
9.	Research institutes design market based hardware.					
10.	Research institutes produce human resource management (HRM) personnel's.					
11.	Research institutes organize need based resources for human resource development (HRD)					
12.	Research institutes strengthen the financial status of customers.					
13.	Research institutes create literature according to market demand.					
14.	Research institutes produce scientists for further research and inventions.					
15.	R&D formulates policy matters for research institutions.					
16.	R&D formulates research projects in the light of research findings.					
17.	R&D designs rules and regulations to facilitate the researcher about research activities.					
18.	R&D develops strategic plan to enhance the quality of research work.					

19.	R&D plans research projects according to national goals.					
20.	R&D prepares research activities according to the demands of global trends.					
21.	R&D designs job description for research technocrats.					
22.	Research institutes prepare rules and regulations for research development.					
23.	Research institutes launch long-term policies for research advancement.					
24.	Research institutes launch short term research projects.					
25.	R&D conducts conferences / seminars or symposiums for improving research culture.					
26.	R&D arranges professional development workshop to enhance research expertise among the faculty members.					
27.	R&D introduces innovative practices to improve the research mechanism.					
28.	R&D provides management information system to the research institution.					
29.	R&D signs agreements between national and foreign agencies on the research projects.					
30.	R&D takes specific measures for improving the quality of research institutes.					
31.	R&D signs charter between private and public sector.					
32.	R&D arranges study tours of researcher and research supervisors for improving research expertise.					
33.	Research institutes implement research related policies.					
34.	Research institutes establish sound organization for research development.					
35.	R&D ensures the restrictions for the running research projects.					
36.	R&D monitors the quality assurance mechanism of the research institutions on regular basis					

37.	Research institutes create competitive environment for research development.					
38.	R&D keeps maintain the quality assurance of research process.					
39.	Research institutes provide security during research process to its stakeholders.					
40.	R&D provides technical assistance for research activities.					
41.	R&D assists the supervisor through information communication technologies.					
42.	R&D facilitates the researcher through latest print media.					
43.	R&D equips the science laborites with necessary apparatus for experimentation.					
44.	R&D upgrades the libraries through inter library loan projects.					
45.	R&D upgrades the computer labs through latest computer technologies.					
46.	R&D recommends scholarly assistance for research students.					
47.	R&D generates funds through industrial sector to increase research productivity.					
48.	R&D supports research activities through research grants.					
49.	R&D generates funds from internal university resources.					
50.	R&D contacts with donor agencies for donating funds to promote research activities.					
51.	R&D develops links with foreign donor agencies for capital and human assistance.					
52.	R&D launches research projects for increasing funds for university income.					
53.	Research recommendations provide feed back to the social sector.					

54.	Research institutes improve their performance through feedback of the functional institutions.					
55.	R&D develops co-ordination among different universities to exchange research expertise.					
56.	R&D collaborates with national and international research institutes to increase quality of research.					
57.	R&D develops co-ordination between research institutions and industry to ensure quality of products.					
58.	R&D builds interaction between external agencies and research institutes.					
59.	R&D designs need based assessment for research projects.					
60.	R&D provides trained manpower to the local industry.					
61.	R&D provides HRM for good governance of institutions.					
62.	R&D prepares expert artisans to strengthen the labor market.					
63.	R&D develops bridge between research institutions and the community.					
64.	R&D facilitates public sector through the results of research activities.					
65.	R&D provides skilled manpower for development of the society.					
66.	R&D provides research experts to the university and research institutes.					
67.	R&D mechanism is too much lengthy.					
68.	R&D lacks research expertise.					
69.	University give less priority to R&D.					
70.	R&D suffers lack of funds.					
71.	Personal liking and disliking influence R&D mechanisms.					
72.	Unstable policies influence R&D performance.					

73.	Lack of co-ordination exists among R&D stakeholders.					
74.	There is lack of professional competency and support among the HRD personnel.					

75. Please write down three challenges that R&D faces in this university?
    1.

    2.

    3.

76. Write down three suggestions to improve R&D mechanism in this university?
    1.

    2.

Appendix –D

ANALYSIS OF CURRENT RESEARCH AND DEVELOPMENT (R&D) MECHANISM AND PREPARATION OF A MODEL FOR RESEARCH AND DEVELOPMENT AT UNIVERSITY LEVEL IN PAKISTAN

(Questionnaire for Research Supervisors)

This questionnaire is designed to **"Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan"** your cooperation and contribution is highly appreciated. The provided information will be treated as confidential and used only for research purpose.

Name (Optional):

Name of University: **Department:**

Designation: Supervisor ☐ Head of Department ☐ Chairman ☐ Dean ☐

R&D Head ☐ R&D Officials ☐ Quality Assurance Personnel ☐

Qualification: M.A/M.Sc ☐ M.Phil ☐ PhD ☐ Post PhD ☐ Others ☐

Discipline: Physical Sciences ☐ Social Sciences ☐ Arts ☐ Others ☐

No. of Publications: _____ National _____ International **_____**

Number of Supervise: M.A /M.Sc _____ M.Phil _____ PhD_____

Term: R&D Stands for R&D centers / institutions / section.

Note: Please tick (3) the relevant box.

Responses: SA = Strongly Agree A = Agree, UD = Undecided

DA = Disagree SDA = Strongly Disagree

Sincerely

Jam Muhammad Zafar
PhD Scholar
Department of Education
The Islamia University of Bahawalpur

Sr. No.	Statement	SDA	DA	UD	A	SA
1.	Vice chancellor encourages and supports the initiatives of research institutes.					
2.	Dean of faculty facilitates and monitors the research process of the faculty members.					
3.	Chairman ensures the research quality of the department.					
4.	Head of R&D gives roadmap for research development.					
5.	Supervisor involves actively during research process.					
6.	Chairman BASR approves the research proposals timely.					
7.	Research institutes provide market based knowledge and information technology					
8.	Research institutes design market based software.					
9.	Research institutes design market based hardware.					
10.	Research institutes produce human resource management (HRM) personnel's.					
11.	Research institutes organize need based resources for human resource development (HRD)					
12.	Research institutes strengthen the financial status of customers.					
13.	Research institutes create literature according to market demand.					
14.	Research institutes produce scientists for further research and inventions.					
15.	R&D formulates policy matters for research institutions.					
16.	R&D formulates research projects in the light of research findings.					
17.	R&D designs rules and regulations to facilitate the researcher about research activities.					
18.	R&D develops strategic plan to enhance the quality of research work.					

19.	R&D plans research projects according to national goals.					
20.	R&D prepares research activities according to the demands of global trends.					
21.	R&D designs job description for research technocrats.					
22.	Research institutes prepare rules and regulations for research development.					
23.	Research institutes launch long-term policies for research advancement.					
24.	Research institutes launch short term research projects.					
25.	R&D conducts conferences / seminars or symposiums for improving research culture.					
26.	R&D arranges professional development workshop to enhance research expertise among the faculty members.					
27.	R&D introduces innovative practices to improve the research mechanism.					
28.	R&D provides management information system to the research institution.					
29.	R&D signs agreements between national and foreign agencies on the research projects.					
30.	R&D takes specific measures for improving the quality of research institutes.					
31.	R&D signs charter between private and public sector.					
32.	R&D arranges study tours of researcher and research supervisors for improving research expertise.					
33.	Research institutes implement research related policies.					
34.	Research institutes establish sound organization for research development.					
35.	R&D ensures the restrictions for the running research projects.					
36.	R&D monitors the quality assurance mechanism of the research institutions on regular basis					

37.	Research institutes create competitive environment for research development.					
38.	R&D keeps maintain the quality assurance of research process.					
39.	Research institutes provide security during research process to its stakeholders.					
40.	R&D provides technical assistance for research activities.					
41.	R&D assists the supervisor through information communication technologies.					
42.	R&D facilitates the researcher through latest print media.					
43.	R&D equips the science laborites with necessary apparatus for experimentation.					
44.	R&D upgrades the libraries through inter library loan projects.					
45.	R&D upgrades the computer labs through latest computer technologies.					
46.	R&D recommends scholarly assistance for research students.					
47.	R&D generates funds through industrial sector to increase research productivity.					
48.	R&D supports research activities through research grants.					
49.	R&D generates funds from internal university resources.					
50.	R&D contacts with donor agencies for donating funds to promote research activities.					
51.	R&D develops links with foreign donor agencies for capital and human assistance.					
52.	R&D launches research projects for increasing funds for university income.					
53.	Research recommendations provide feed back to the social sector.					

54.	Research institutes improve their performance through feedback of the functional institutions.					
55.	R&D develops co-ordination among different universities to exchange research expertise.					
56.	R&D collaborates with national and international research institutes to increase quality of research.					
57.	R&D develops co-ordination between research institutions and industry to ensure quality of products.					
58.	R&D builds interaction between external agencies and research institutes.					
59.	R&D designs need based assessment for research projects.					
60.	R&D provides trained manpower to the local industry.					
61.	R&D provides HRM for good governance of institutions.					
62.	R&D prepares expert artisans to strengthen the labor market.					
63.	R&D develops bridge between research institutions and the community.					
64.	R&D facilitates public sector through the results of research activities.					
65.	R&D provides skilled manpower for development of the society.					
66.	R&D provides research experts to the university and research institutes.					
67.	R&D mechanism is too much lengthy.					
68.	R&D lacks research expertise.					
69.	University give less priority to R&D.					
70.	R&D suffers lack of funds.					
71.	Personal liking and disliking influence R&D mechanisms.					
72.	Unstable policies influence R&D performance.					

73.	Lack of co-ordination exists among R&D stakeholders.					
74.	There is lack of professional competency and support among the HRD personnel.					

75. Please write down three challenges that R&D faces in this university?
    1.

    2.

    3.

76. Write down three suggestions to improve R&D mechanism in this university?
    1.

    2.

Appendix –E

ANALYSIS OF CURRENT RESEARCH AND DEVELOPMENT (R&D) MECHANISM AND PREPARATION OF A MODEL FOR RESEARCH AND DEVELOPMENT AT UNIVERSITY LEVEL IN PAKISTAN

(Questionnaire for Directors of R&D/BASR/ORIC)

This questionnaire is designed to **"Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at University Level in Pakistan"** your cooperation and contribution is highly appreciated. The provided information will be treated as confidential and used only for research purpose.

Name (Optional):

Name of University: **Department:**

Designation: Supervisor ☐ Head of Department ☐ Chairman ☐ Dean ☐

R&D Head ☐ R&D Officials ☐ Quality Assurance Personnel ☐

Qualification: M.A/M.Sc ☐ M.Phil ☐ PhD ☐ Post PhD ☐ Others ☐

Discipline: Physical Sciences ☐ Social Sciences ☐ Arts ☐ Others ☐

No. of Publications: _____ National _____ International **_____**

Number of Supervise: M.A /M.Sc _____ M.Phil _____ PhD_____

Term: R&D Stands for R&D centers / institutions / section.

Note: Please tick (3) the relevant box.

Responses: SA = Strongly Agree A = Agree, UD = Undecided

DA = Disagree SDA = Strongly Disagree

Sincerely

Jam Muhammad Zafar
PhD Scholar
Department of Education
The Islamia University of Bahawalpur

Sr. No.	Statement	SDA	DA	UD	A	SA

1.	Vice chancellor encourages and supports the initiatives of research institutes.					
2.	Dean of faculty facilitates and monitors the research process of the faculty members.					
3.	Chairman ensures the research quality of the department.					
4.	Head of R&D gives roadmap for research development.					
5.	Supervisor involves actively during research process.					
6.	Chairman BASR approves the research proposals timely.					
7.	Research institutes provide market based knowledge and information technology					
8.	Research institutes design market based software.					
9.	Research institutes design market based hardware.					
10.	Research institutes produce human resource management (HRM) personnel's.					
11.	Research institutes organize need based resources for human resource development (HRD)					
12.	Research institutes strengthen the financial status of customers.					
13.	Research institutes create literature according to market demand.					
14.	Research institutes produce scientists for further research and inventions.					
15.	R&D formulates policy matters for research institutions.					
16.	R&D formulates research projects in the light of research findings.					
17.	R&D designs rules and regulations to facilitate the researcher about research activities.					
18.	R&D develops strategic plan to enhance the quality of research work.					

19.	R&D plans research projects according to national goals.					
20.	R&D prepares research activities according to the demands of global trends.					
21.	R&D designs job description for research technocrats.					
22.	Research institutes prepare rules and regulations for research development.					
23.	Research institutes launch long-term policies for research advancement.					
24.	Research institutes launch short term research projects.					
25.	R&D conducts conferences / seminars or symposiums for improving research culture.					
26.	R&D arranges professional development workshop to enhance research expertise among the faculty members.					
27.	R&D introduces innovative practices to improve the research mechanism.					
28.	R&D provides management information system to the research institution.					
29.	R&D signs agreements between national and foreign agencies on the research projects.					
30.	R&D takes specific measures for improving the quality of research institutes.					
31.	R&D signs charter between private and public sector.					
32.	R&D arranges study tours of researcher and research supervisors for improving research expertise.					
33.	Research institutes implement research related policies.					
34.	Research institutes establish sound organization for research development.					
35.	R&D ensures the restrictions for the running research projects.					
36.	R&D monitors the quality assurance mechanism of the research institutions on regular basis					

37.	Research institutes create competitive environment for research development.					
38.	R&D keeps maintain the quality assurance of research process.					
39.	Research institutes provide security during research process to its stakeholders.					
40.	R&D provides technical assistance for research activities.					
41.	R&D assists the supervisor through information communication technologies.					
42.	R&D facilitates the researcher through latest print media.					
43.	R&D equips the science laborites with necessary apparatus for experimentation.					
44.	R&D upgrades the libraries through inter library loan projects.					
45.	R&D upgrades the computer labs through latest computer technologies.					
46.	R&D recommends scholarly assistance for research students.					
47.	R&D generates funds through industrial sector to increase research productivity.					
48.	R&D supports research activities through research grants.					
49.	R&D generates funds from internal university resources.					
50.	R&D contacts with donor agencies for donating funds to promote research activities.					
51.	R&D develops links with foreign donor agencies for capital and human assistance.					
52.	R&D launches research projects for increasing funds for university income.					
53.	Research recommendations provide feed back to the social sector.					

54.	Research institutes improve their performance through feedback of the functional institutions.					
55.	R&D develops co-ordination among different universities to exchange research expertise.					
56.	R&D collaborates with national and international research institutes to increase quality of research.					
57.	R&D develops co-ordination between research institutions and industry to ensure quality of products.					
58.	R&D builds interaction between external agencies and research institutes.					
59.	R&D designs need based assessment for research projects.					
60.	R&D provides trained manpower to the local industry.					
61.	R&D provides HRM for good governance of institutions.					
62.	R&D prepares expert artisans to strengthen the labor market.					
63.	R&D develops bridge between research institutions and the community.					
64.	R&D facilitates public sector through the results of research activities.					
65.	R&D provides skilled manpower for development of the society.					
66.	R&D provides research experts to the university and research institutes.					
67.	R&D mechanism is too much lengthy.					
68.	R&D lacks research expertise.					
69.	University give less priority to R&D.					
70.	R&D suffers lack of funds.					
71.	Personal liking and disliking influence R&D mechanisms.					
72.	Unstable policies influence R&D performance.					

73.	Lack of co-ordination exists among R&D stakeholders.					
74.	There is lack of professional competency and support among the HRD personnel.					

75. Please write down three challenges that R&D faces in this university?
    1.

    2.

    3.

76. Write down three suggestions to improve R&D mechanism in this university?
    1.

    2.

Appendix –F

ANALYSIS OF CURRENT RESEARCH AND DEVELOPMENT (R&D) MECHANISM AND PREPARATION OF A MODEL FOR RESEARCH AND DEVELOPMENT AT UNIVERSITY LEVEL IN PAKISTAN

(Questionnaire for Directors of Quality Assurance Cells)

This questionnaire is designed to **"Analysis of Current Research and Development (R&D) Mechanism and Preparation of a Model for Research and Development at UniversityLevel in Pakistan"** your cooperation and contribution is highly appreciated. The provided information will be treated as confidential and used only for research purpose.

Name (Optional):

Name of University: **Department:**

Designation: Supervisor ☐ Head of Department ☐ Chairman ☐ Dean ☐

R&D Head ☐ R&D Officials ☐ Quality Assurance Personnel ☐

Qualification: M.A/M.Sc ☐ M.Phil ☐ PhD ☐ Post PhD ☐ Others ☐

Discipline: Physical Sciences ☐ Social Sciences ☐ Arts ☐ Others ☐

No. of Publications: _____ National _____ International **_____**

Number of Supervise: M.A /M.Sc _____ M.Phil _____ PhD_____

Term: R&D Stands for R&D centers / institutions / section.

Note: Please tick (3) the relevant box.

Responses: SA = Strongly Agree A = Agree, UD = Undecided

DA = Disagree SDA = Strongly Disagree

Sincerely

Jam Muhammad Zafar
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Sr. No.	Statement	SDA	DA	UD	A	SA
1.	Vice chancellor encourages and supports the initiatives of research institutes.					
2.	Dean of faculty facilitates and monitors the research process of the faculty members.					
3.	Chairman ensures the research quality of the department.					
4.	Head of R&D gives roadmap for research development.					
5.	Supervisor involves actively during research process.					
6.	Chairman BASR approves the research proposals timely.					
7.	Research institutes provide market based knowledge and information technology					
8.	Research institutes design market based software.					
9.	Research institutes design market based hardware.					
10.	Research institutes produce human resource management (HRM) personnel's.					
11.	Research institutes organize need based resources for human resource development (HRD)					
12.	Research institutes strengthen the financial status of customers.					
13.	Research institutes create literature according to market demand.					
14.	Research institutes produce scientists for further research and inventions.					
15.	R&D formulates policy matters for research institutions.					
16.	R&D formulates research projects in the light of research findings.					
17.	R&D designs rules and regulations to facilitate the researcher about research activities.					
18.	R&D develops strategic plan to enhance the quality of research work.					

19.	R&D plans research projects according to national goals.					
20.	R&D prepares research activities according to the demands of global trends.					
21.	R&D designs job description for research technocrats.					
22.	Research institutes prepare rules and regulations for research development.					
23.	Research institutes launch long-term policies for research advancement.					
24.	Research institutes launch short term research projects.					
25.	R&D conducts conferences / seminars or symposiums for improving research culture.					
26.	R&D arranges professional development workshop to enhance research expertise among the faculty members.					
27.	R&D introduces innovative practices to improve the research mechanism.					
28.	R&D provides management information system to the research institution.					
29.	R&D signs agreements between national and foreign agencies on the research projects.					
30.	R&D takes specific measures for improving the quality of research institutes.					
31.	R&D signs charter between private and public sector.					
32.	R&D arranges study tours of researcher and research supervisors for improving research expertise.					
33.	Research institutes implement research related policies.					
34.	Research institutes establish sound organization for research development.					
35.	R&D ensures the restrictions for the running research projects.					
36.	R&D monitors the quality assurance mechanism of the research institutions on regular basis					

37.	Research institutes create competitive environment for research development.					
38.	R&D keeps maintain the quality assurance of research process.					
39.	Research institutes provide security during research process to its stakeholders.					
40.	R&D provides technical assistance for research activities.					
41.	R&D assists the supervisor through information communication technologies.					
42.	R&D facilitates the researcher through latest print media.					
43.	R&D equips the science laborites with necessary apparatus for experimentation.					
44.	R&D upgrades the libraries through inter library loan projects.					
45.	R&D upgrades the computer labs through latest computer technologies.					
46.	R&D recommends scholarly assistance for research students.					
47.	R&D generates funds through industrial sector to increase research productivity.					
48.	R&D supports research activities through research grants.					
49.	R&D generates funds from internal university resources.					
50.	R&D contacts with donor agencies for donating funds to promote research activities.					
51.	R&D develops links with foreign donor agencies for capital and human assistance.					
52.	R&D launches research projects for increasing funds for university income.					
53.	Research recommendations provide feed back to the social sector.					

54.	Research institutes improve their performance through feedback of the functional institutions.					
55.	R&D develops co-ordination among different universities to exchange research expertise.					
56.	R&D collaborates with national and international research institutes to increase quality of research.					
57.	R&D develops co-ordination between research institutions and industry to ensure quality of products.					
58.	R&D builds interaction between external agencies and research institutes.					
59.	R&D designs need based assessment for research projects.					
60.	R&D provides trained manpower to the local industry.					
61.	R&D provides HRM for good governance of institutions.					
62.	R&D prepares expert artisans to strengthen the labor market.					
63.	R&D develops bridge between research institutions and the community.					
64.	R&D facilitates public sector through the results of research activities.					
65.	R&D provides skilled manpower for development of the society.					
66.	R&D provides research experts to the university and research institutes.					
67.	R&D mechanism is too much lengthy.					
68.	R&D lacks research expertise.					
69.	University give less priority to R&D.					
70.	R&D suffers lack of funds.					
71.	Personal liking and disliking influence R&D mechanisms.					
72.	Unstable policies influence R&D performance.					

73.	Lack of co-ordination exists among R&D stakeholders.					
74.	There is lack of professional competency and support among the HRD personnel.					

75. Please write down three challenges that R&D faces in this university?
    1.

    2.

    3.

76. Write down three suggestions to improve R&D mechanism in this university?
    1.

    2.

Appendix – G

List of General Universities in Public Sector of Pakistan

Punjab Province

1. Punjab University Lahore
2. GC University Lahore
3. University of Education Lahore
4. BZU Multan
5. IUB Bahawalpur
6. GCU Faisalabad
7. University of Sargodha (UOS)
8. University of Gujjrat

Sindh Province

9. Karachi University
10. Sindh University Jamshors
11. Shah Latif University Khairpur

Blochistan Province

12. Balochistan University Quetta

Khyber Pakhtunkhwa (KPK) Province

13. Peshawar University, Peshawar
14. Islamia College University Peshawar
15. Gomal University D.I Khan
16. Hazra Univeristy (KPK)
17. Bannu University (KPK)
18. Abdul Wali Khan University
19. Northern University, Noshehra

Federal Area

20. Quaid-e-Azam University Islamabad
21. Islamic International University Islamabad
22. Azad Kashmir University
23. Karakaram International University Gilgat Baltistan

Appendix – H

List of Departments in Public Sector Universities of Pakistan

Total Numbers of Department

Social Sciences

1. Education
2. Psychology
3. Political Sciences
4. Social Work
5. Management Science

Natural Sciences

6. Physics
7. Chemistry
8. Mathematics
9. Statistics
10. Live Sciences

Arts and Humanities

11. Urdu
12. English
13. Islamic Studies
14. History and Pakistan Studies
15. Pharmacy

R & D Department

16. Department of Research and Development / Research and Innovation

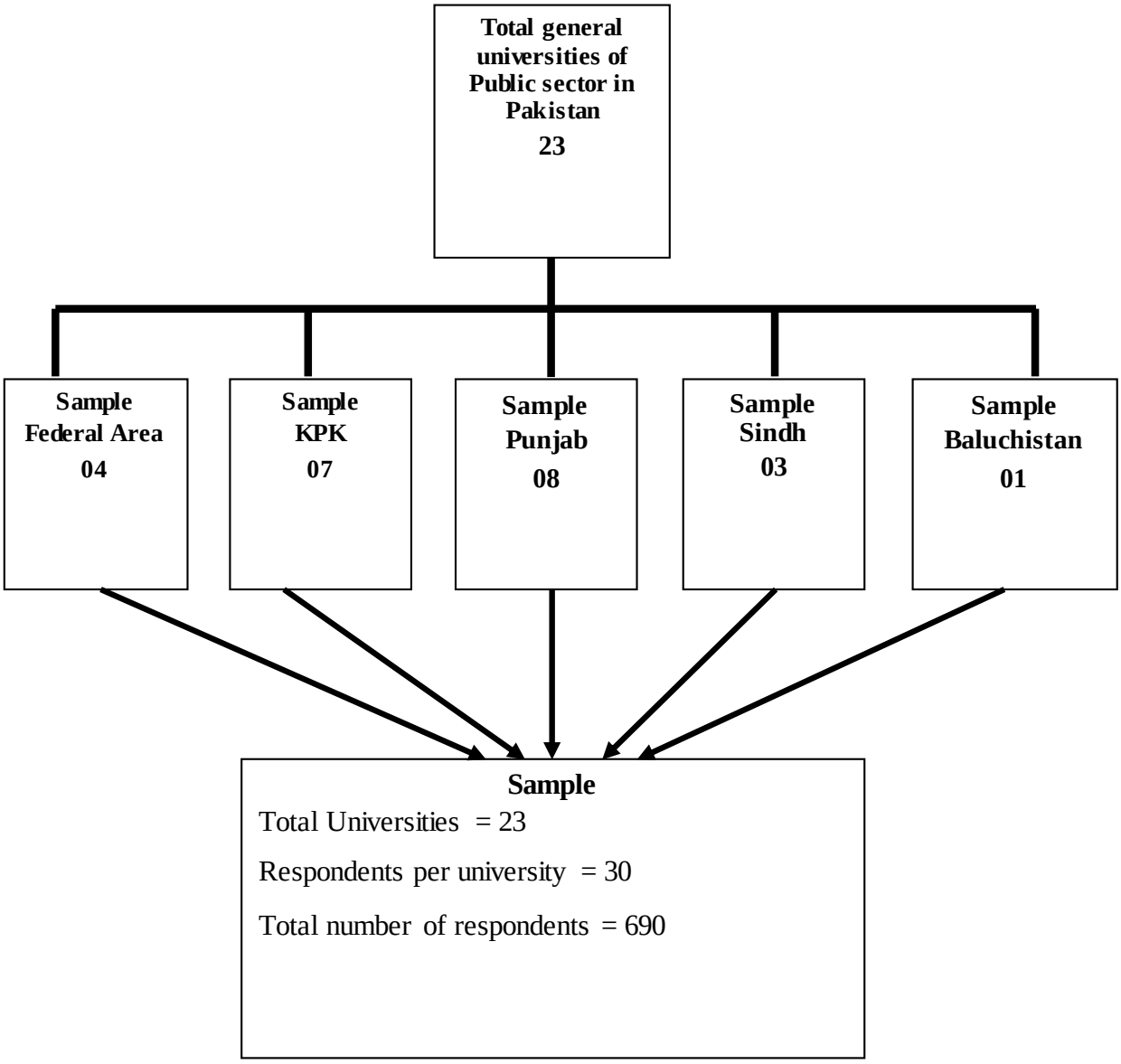
Quality Assurance

17. Department of Quality Assurance

Appendix- I

Multistage Sample Distribution Chart –A

Higher Education Commission, Islamabad (HEC)



Appendix – J

Multistage Sample Distribution Chart –B

Higher Education Commission (HEC) Islamabad, Pakistan