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**THE MEDIATING ROLE OF INNOVATION IN  
THE RELATIONSHIP BETWEEN  
MARKET ORIENTATION AND UNIVERSITY PERFORMANCE  
IN PAKISTAN**

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## ABSTRACT

Universities globally are going through a paradigm shift with a need to become more innovatively market-oriented to handle the issue of growing competition for funding, as well as attracting/retaining the international/local competent students and academicians. However, there appears to be a dearth of research on how such state of affairs could be addressed, particularly in the emerging economies like Pakistan. In the light of resource-based theory (RBT), as well as organizational-learning theory (OLT), literature suggests that market-orientation (MO) and innovation are to be the desirable unique resources, as well as the guiding philosophies, to enable universities for a more competitive performance. Hence, this study investigated how resources like market-orientation (MO), and innovation, can influence university performance (UP). The study also tested empirically the potential mediating effect of innovation on the MO-UP relationship. In addition, how the dimensions of MO influenced the innovation and university performance (UP) were also tested empirically in the universities of Pakistan. Results of the PLS path modelling (with 369 respondents from the target public-sector universities) firstly confirmed significant effect of the “universal construct of MO” and two of its dimensions “the advising and mentoring, as well as the intelligence-generation and response” on UP. However, one dimension of MO, which is the administration-leadership, was not significantly supported to directly influence the UP. Secondly, the study confirmed that there were significant direct effects of the “universal construct of MO”, as well as all of its dimensions, on innovation. Thirdly, the study also found that there was a significant effect of innovation on UP. Furthermore, the bootstrapping results found significant mediation of innovation between the MO-UP relationship. Hence, the results show that UP can be directly enhanced through MO and innovation. Even the use of innovation as a mediator can further strengthen the MO-UP relationship. Based on the findings, the study offers theoretical and practical implications, followed by its limitations and directions, for future research.

**Key words:** Resource based view, Organizational learning theory, Innovation, Market orientation, University performance, Higher education

## ABSTRAK

Universiti di seluruh dunia sedang melalui peralihan paradigma dengan keperluan untuk menjadi lebih berorientasikan pasaran secara inovasi bagi menangani isu persaingan yang semakin meningkat untuk mendapatkan pelaburan, serta menarik/mengekalkan pelajar/ahli akademik antarabangsa dan tempatan. Walau bagaimanapun, terdapat kelemahan dalam penyelidikan tentang cara hal ehwal tersebut ditangani, terutamanya dalam negara ekonomi baharu seperti Pakistan. Berdasarkan teori berasaskan sumber (RBT), serta teori pembelajaran organisasi (OLT), literatur menunjukkan bahawa orientasi pasaran (MO) dan inovasi merupakan sumber unik yang dikehendaki, begitu juga panduan falsafah untuk membolehkan universiti mencapai prestasi yang lebih kompetitif. Oleh itu, kajian semasa menyelidik bagaimana sumber seperti orientasi pasaran (MO) dan inovasi boleh mempengaruhi prestasi universiti (UP). Kajian ini juga menguji secara empirikal potensi kesan pengantaraan inovasi terhadap hubungan MO-UP. Di samping itu, dimensi bagaimana MO mempengaruhi inovasi dan prestasi universiti (UP) juga diuji secara empirikal. Hasil pemodelan jalur PLS (dengan 369 responden dari universiti sektor awam sasaran) yang pertama mengesahkan hubungan langsung yang signifikan dari "pembinaan universal MO" dan dua dimensinya iaitu "nasihat dan bimbingan, serta generasi bijak pandai dan tindak balas" dengan UP. Walau bagaimanapun, satu daripada dimensi MO iaitu kepimpinan pentadbiran, tidak disokong secara signifikan untuk mempengaruhi UP secara langsung. Kedua, kajian ini mengesahkan bahawa terdapat hubungan langsung yang signifikan dari "pembinaan universal MO", serta hubungan kesemua dimensinya dengan inovasi. Ketiga, kajian itu juga mendapati terdapat hubungan langsung yang signifikan antara inovasi dan UP. Tambahan pula, hasil pengikatan but (*bootstrapping*) menemui pengantaraan inovasi yang signifikan dalam hubungan MO-UP. Oleh itu, keputusan menunjukkan bahawa UP boleh terus ditingkatkan menerusi MO dan inovasi. Malah penggunaan inovasi sebagai pengantara dapat mengukuhkan hubungan MO-UP. Berdasarkan penemuan tersebut, kajian ini menawarkan implikasi teori dan praktikal, diikuti dengan batasan dan arah tuju untuk penyelidikan pada masa hadapan.

**Katakunci:** Teori Berasaskan Sumber, Teori Pembelajaran Organisasi, Inovasi, Orientasi Pasaran, Prestasi universiti, Pengajian Tinggi

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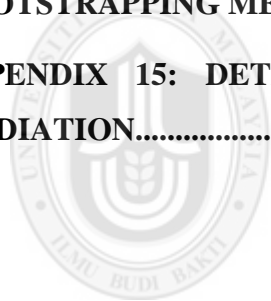


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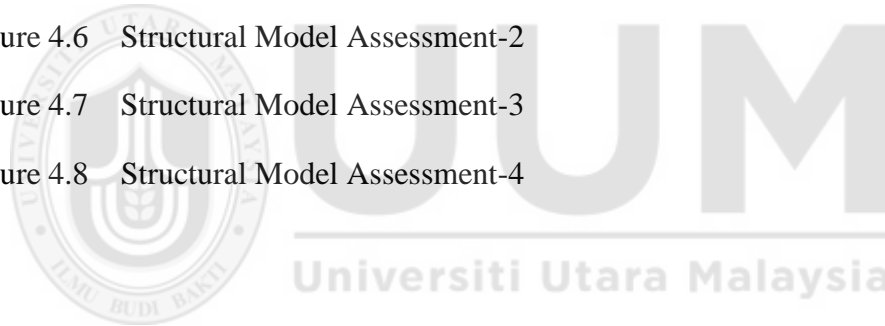
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## LIST OF ABBREVIATIONS

A&M	Advising and Mentoring
AACSB	Association to Advance Collegiate Schools of Business
ACT	American College Testing
ADML	Administration Leadership
AKU	Agha Khan University
AVE	Average Variance Extracted
BISE	Boards of Intermediate and Secondary Education
BNQP	Baldrige National Quality Program
CB-SEM	Covariance based structural equation modeling
CIA	Central Intelligence Agency
CIHE	Council of industry and higher education'
CLA	Collegiate Learning Assessment
CMV	Common method variance
CR	Composite reliability
DAIs	Degree Awarding Institutions
EBSR	Eduniversal Business School Ranking
ECPE	Education Criteria for Performance Excellence
EFA	Education for All
FFRM	Future Faculty/Research scientist Mentoring
GDP	Gross Domestic Product
GOP	Government of Pakistan
HE	Higher Education
HEC	Higher Education commission
HEFCE	Higher Education Finance commission in England
HEIs	Higher Education Institutions
HILT	Harvard Initiative on Learning and Teaching
IBA	Institute of Business Administration
IG&R	Intelligence-Generation and Responsiveness

LUMS	Lahore University of Management Sciences
M.Phil	Master of Philosophy
M.Sc	Master of Science
ME	Master of Engineering
MO	Market-orientation
NACADA	National Academic Advising Association
NCRC	National Curriculum Revision Committees
NEP	National Education Policy
OECD	Organization for economic cooperation and development
OL	Organizational learning
OLT	Organizational learning Theory
PHECV	Pakistan Higher Education Commission Vision
PBL	Problem Based Learning
Ph.D	Doctor of Philosophy
PKR	Pakistani Rupee
PLS	Partial least square
PLS-SEM	Partial least square- Structural Equation Modeling
R&D	Research and Development
RBT	Resource Based Theory
TBG	The Boston Group
TQM	Total Quality Management
UDL	Universal Design for Learning
UGC	University Grants Commission
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
VC	Vice Chancellor
VRIN	Valuable, Rare, Inimitable, Non-substitutable



## **CHAPTER ONE**

### **RESEARCH OVERVIEW**

#### **1.0 Introduction**

This chapter presents an overall background of the study through a comprehensive contextual review of the general circumstances regarding higher education institutions with a focus on higher education in Pakistan. The subsequent section of the problem statement then highlights the key issues in higher education of Pakistan, requiring further investigation for application of market-orientation and innovation in higher education of Pakistan. Next segment of the chapter enlists the basic research questions as well as the corresponding research objectives of this study. In the later section of this chapter, the significance of the study is demonstrated by highlighting the major contributions of and research gaps for this study. The later section of this chapter covers the scope of this study that determines the areas and the possibilities of research coverage by this study. Then the chapter defines the key terms/variables of this study. While the last section of the chapter summarizes the overall chapter.

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## Appendix 1: The Questionnaire



### SURVEY OF HIGHER EDUCATION INSTITUTIONS (HEIs) IN PAKISTAN

Please take 15-20 minutes for your valuable contribution to fill this PhD Survey Study form (with anticipatory Thanks). **Your honest responses** are highly desirable and appreciated. All responses will be surely kept confidential.

  
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#### SECTION A: Some necessary demographic information of the respondents.

Please fill in or put a tick mark (✓) in the appropriate boxes

##### I. Job title

- Teacher
- Teacher and Administrator

##### II. Gender

- Male
- Female

##### III. Age groups

- 30 years and below
- 31-40
- 41-50
- 51-60
- Above 60

##### IV. Academic qualification

- Bachelors
- Masters
- PhD

##### V. Work experience in higher education

- 10 years and below
- 11-20
- 21-30
- 31-40
- 41-50
- Above 50

##### VI. Age of your institution

- 10 years and below
- 11-20
- 21-30
- 31-40
- 41-50
- Above 50

## SECTION B: MARKET ORIENTATION

**NOTE:** This Section is **related to student services** at your university. Using the 1 to 5 point scale below [1= strongly disagree to 5=strongly agree], please indicate your agreement with each item by pointing out the appropriate number that reflects how you feel.

S.N	Statement	Str. Agree	Agree	Neutral	Disagree	Str. Disagree
<b>Factor B1: Students' Advising and Mentoring</b>						
1.	In my interaction with students, I always try to determine their academic needs.	5	4	3	2	1
2.	I try to help students get an accurate expectation of what our programs will do for them.	5	4	3	2	1
3.	I am open to disagree with students' arguments if necessary, in order to help them make a better decision.	5	4	3	2	1
4.	I try to match student's educational needs with given course contents that best suit them.	5	4	3	2	1
5.	I always try to answer students' questions about our courses /services as correct as I can.	5	4	3	2	1
6.	I suggest a program composed of the courses that best suit the students' needs.	5	4	3	2	1
<b>Factor B2: Administration-leadership</b>						
7.	My department head asks for, and considers, my ideas about improving the quality of our services for students.	5	4	3	2	1
8.	My department head frequently gives me honest and direct feedback about how well I am serving students.	5	4	3	2	1
9.	My department head seeks opportunities to try new ways of doing things to serve students better.	5	4	3	2	1
10.	I know what my department head expects of me in serving students.	5	4	3	2	1
11.	My boss makes efforts to remove obstacles that hinder serving students well.	5	4	3	2	1
12.	My department head helps me learn from experiences with students (both good or bad).	5	4	3	2	1
<b>Factor B 3: Intelligence-Generation and Responsiveness</b>						
13.	We regularly ask our students about their needs, wants, and expectations.	5	4	3	2	1
14.	We survey our students regularly to assess their academic needs.	5	4	3	2	1
15.	Information from student surveys are regularly used to improve our services.	5	4	3	2	1
16.	We meet with employers of our students at least once a year to find out what courses or services they think students will need in future.	5	4	3	2	1
17.	We survey industry at least once a year to assess quality of our courses and services.	5	4	3	2	1
18.	Data on student satisfaction are regularly disseminated at all levels in this university.	5	4	3	2	1
19.	Data on industry satisfaction with our graduates are disseminated at all levels in this university on a regular basis.	5	4	3	2	1
20.	We periodically review our course development phenomenon to ensure that the courses are in line with what the industry wants.	5	4	3	2	1
21.	Our university actively searches for the information on potential fundraising opportunities for the consistent and sustainable delivery of quality services.	5	4	3	2	1
22.	Our university seeks a regular feedback to gauge and improve funders' satisfaction level	5	4	3	2	1

## SECTION C: INNOVATION

**INSTRUCTIONS:** In this section, we want you to gauge “how innovative your university is in serving its clients”, by pointing out the appropriate number in the given scale below [1= strongly disagree to 5=strongly agree] that reflects exactly how you feel.

S.N	Statement	Str. Agree	Agree	Neutral	Disagre	Str. Disagree
1.	Our university has adequate means for gaining access to the new/updated technologies in order to facilitate the teaching/learning process	5	4	3	2	1
2.	Our university has an adequate capacity to bring in new knowledge (through faculty training and development), for offering new programs and improved services.	5	4	3	2	1
3.	Our university has made major changes to courses/programs offered in last few years	5	4	3	2	1
4.	Our university has made major changes to the overall curriculum in last few years	5	4	3	2	1
5.	Our university has a high capability to identify the innovative strategy of competitors	5	4	3	2	1
6.	Our university has an adequate capability to identify students’ needs/wants and to respond them accordingly (with popular courses/programs and facilities offered).	5	4	3	2	1
7.	Our university has an adequate capability to identify industry/employers’ needs and to respond them accordingly (with real-time, case based education services).	5	4	3	2	1
8.	Our university has an adequate capability to identify funders’ needs/wants and to respond them accordingly (through more desirable courses/programs and projects).	5	4	3	2	1
9.	Our university has a tendency to engage in strategic planning activities.	5	4	3	2	1
10.	Our university/Department has an adequate capability to make our vision a reality.	5	4	3	2	1
11.	Our university has an adequate capability to identify new opportunities.	5	4	3	2	1
12.	Our university has an adequate level of overall innovation.	5	4	3	2	1

## SECTION D: UNIVERSITY PERFORMANCE

**INSTRUCTIONS:** In this section, we want you to gauge the performance of your university/Department on the given scale of 1 to 5 points [1=very poor to 5=very good] in the last five years. We appreciate your honest answers.

S. N	Statements	Very good	Good	Neutral	Poor	Very poor
<b>Factor D1: Overall Performance</b>						
1.	The overall performance of this university in the last five years has been:	5	4	3	2	1
2.	Performance of this university in creating student satisfaction in last five years has been:	5	4	3	2	1
3.	The level of student services provided by this university in the last five years has been:	5	4	3	2	1
4.	Progress of this university regarding resource commitment, in the last five years has been:	5	4	3	2	1
5.	The level of cost effectiveness achieved by this university in the last five years has been:	5	4	3	2	1
<b>Factor D 2: Funding</b>						
1.	The overall ability of this university to raise funds in last five years has been:	5	4	3	2	1
2.	The overall ability of this university to obtain research grants in last five years has been:	5	4	3	2	1
3	The overall ability of this university to obtain development grants in last five years has been:	5	4	3	2	1
4	Overall ability of this university to obtain grants for poor students in last five years has been:	5	4	3	2	1
5	The overall ability of this university to obtain community development grants in last five years has been:	5	4	3	2	1
<b>Factor D 3: Retention and recruitment</b>						
1.	The performance of this university to retain students as majors over last five years has been:	5	4	3	2	1
2.	The performance of this university to recruit students as majors in last five years has been:	5	4	3	2	1
3.	The ability of this university to increase graduation rates in last five years has been:	5	4	3	2	1

**Thank you very much for your valuable contribution .....**



## Appendix 2: HEC Recognized Universities/Degree Awarding Institutions in Pakistan

### A) PUBLIC SECTOR UNIVERSITIES/DEGREE AWARDING INSTITUTIONS

#### i) Universities/DAIs chartered by the Central Government of Pakistan

S. No	University/DAI Name	Main Campus Location	Website Address
1	Air University, Islamabad	Islamabad	www.au.edu.pk
2	Allama Iqbal Open University, Islamabad (AIOU)	Islamabad	www.aiou.edu.pk
3	Bahria University, Islamabad	Islamabad	www.bahria.edu.pk
4	COMSATS Institute of Information Technology, Islamabad	Islamabad	www.ciit.edu.pk
5	Dawood University of Engineering & Technology, Karachi	Karachi	www.dcet.edu.pk
6	Federal Urdu University of Arts, Sciences & Technology, Islamabad	Islamabad	www.fuuast.edu.pk
7	Institute of Space Technology, Islamabad (IST)	Islamabad	www.ist.edu.pk
8	International Islamic University, Islamabad	Islamabad	www.iiu.edu.pk
9	Karakorum International University, Gilgit, Gilgit Baltistan	Gilgit	www.kiu.edu.pk
10	National College of Arts, Lahore (NCA)	Lahore	www.nca.edu.pk
11	National Defense University, Islamabad (NDU)	Islamabad	www.ndu.edu.pk
12	National Textile University, Faisalabad	Faisalabad	www.ntu.edu.pk
13	National University of Modern Languages, Islamabad (NUML)	Islamabad	www.numl.edu.pk
14	National University of Sciences & Tech, Rawalpindi/ Islamabad (NUST)	Islamabad	www.nust.edu.pk
15	NFC Institute of Engineering & Technology, Multan	Multan	www.nfciet.edu.pk
16	Pakistan Institute of Development Economics (PIDE), Islamabad	Islamabad	www.pide.org.pk
17	Pakistan Institute of Engineering & Applied Sciences, Islamabad (PIEAS)	Islamabad	www.pieas.edu.pk
18	Pakistan Institute of Fashion and Design, Lahore	Lahore	www.pifd.edu.pk
19	Pakistan Military Academy, Abbottabad	Abbottabad	Not Available
20	Pakistan Naval Academy, Karachi	Karachi	www.paknavy.gov.pk
21	Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad	Islamabad	www.szabmu.edu.pk
22	Quaid-i-Azam University, Islamabad	Islamabad	www.qau.edu.pk
23	University of FATA, Kohat	Kohat	under construction
24	Virtual University of Pakistan, Lahore	Lahore	www.vu.edu.pk

**ii) Universities/DAIs chartered by Government of the Punjab**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Bahauddin Zakariya University, Multan	Multan	www.bzu.edu.pk
2	Fatima Jinnah Women University, Rawalpindi	Rawalpindi	www.fjwu.edu.pk
3	Government College University, Faisalabad	Faisalabad	www.gcuf.edu.pk
4	Government College University, Lahore	Lahore	www.gcu.edu.pk
5	Government College for Women University, Faisalabad	Faisalabad	www.gcuf.edu.pk
6	Government College Women University, Sialkot	Sialkot	www.gcwus.edu.pk
7	Ghazi University, Dera Ghazi Khan	Dera Ghazi Khan	www.ghaziuniversity.edu.pk
8	Government Sadiq College Women University, Bahawalpur	Bahawalpur	www.gscwu.edu.pk
9	Islamia University, Bahawalpur	Bahawalpur	www.iub.edu.pk
10	Information Technology University of the Punjab, Lahore	Lahore	www.itu.edu.pk
11	King Edward Medical University, Lahore	Lahore	www.kemu.edu.pk
12	Kinnaird College for Women, Lahore	Lahore	www.kinnaird.edu.pk
13	Lahore College for Women University, Lahore	Lahore	www.lcwu.edu.pk
14	Muhammad Nawaz Shareef University of Agriculture, Multan	Multan	www.mnsuam.edu.pk
15	Pir Mehr Ali Shah Arid Agriculture, University Rawalpindi	Rawalpindi	www.uaar.edu.pk
16	University of Agriculture, Faisalabad	Faisalabad	www.uaf.edu.pk
17	University of Education, Lahore	Lahore	www.ue.edu.pk
18	University of Engineering & Technology, Lahore	Lahore	www.uet.edu.pk
19	University of Engineering & Technology, Taxila	Taxila	www.uettaxila.edu.pk
20	University of Gujrat, Gujrat	Gujrat	www.uog.edu.pk
21	University of Health Sciences, Lahore	Lahore	www.uhs.edu.pk
22	University of Sargodha, Sargodha	Sargodha	www.uos.edu.pk
23	University of the Punjab, Lahore	Lahore	www.pu.edu.pk
24	University of Veterinary & Animal Sciences, Lahore	Lahore	www.uvas.edu.pk
25	The Women University, Multan	Multan	www.wum.edu.pk

**iii) Universities/DAIs chartered by Government of Sindh**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Benazir Bhutto Shaheed University Lyari, Karachi	Karachi	www.bbsul.edu.pk
2	DOW University of Health Sciences, Karachi	Karachi	www.duhs.edu.pk

3	Gambat Institute of Medical Sciences, Khairpur	Khairpur	under construction
4	Institute of Business Administration, Karachi	Karachi	www.iba.edu.pk
5	Jinnah Sindh Medical University	Karachi	www.jsmu.edu.pk
6	Liaquat University of Medical and Health Sciences, Jamshoro Sindh.	Jamshoro	www.lumhs.edu.pk
7	Mehran University of Engineering & Technology, Jamshoro	Jamshoro	www.muett.edu.pk
8	NED University of Engineering & Technology, Karachi	Karachi	www.neduet.edu.pk
9	Peoples University of Medical and Health Sciences for Women, Nawabshah (Shaheed Benazirabad)	Nawabshah	www.pumhs.edu.pk
10	Quaid-e-Awam University of Engineering, Sciences & Technology, Nawabshah	Nawabshah	www.quest.edu.pk
11	Shah Abdul Latif University, Khairpur	Khairpur	www.salu.edu.pk
12	Shahaeed Mohtarma Benazir Bhutto Medical University, Larkana	Larkana	www.smbbmue.edu.pk
13	Sindh Agriculture University, Tandojam	Tandojam	www.sau.edu.pk
14	Sukkur Institute of Business Administration, Sukkur	Sukkur	www.iba-suk.edu.pk
15	Sindh Madresatul Islam University, Karachi	Karachi	www.smiu.edu.pk
16	Shaheed Benazir Bhutto University Shaheed Benazirabad	Nawabshah	www.sbbusba.edu.pk
17	Shaheed Zulfiqar Ali Bhutto University of Law, Karachi	Karachi	www.szabl.edu.pk
18	University of Karachi, Karachi	Karachi	www.uok.edu.pk
19	University of Sindh, Jamshoro	Jamshoro	www.usindh.edu.pk
20	Pakistan Naval Academy, Karachi	Karachi	www.paknavy.gov.pk
21	Dawood University of Engineering & Technology, Karachi	Karachi	www.dcet.edu.pk

#### iv) Universities/DAIs chartered by Government of Khyber Pakhtoonkhwa

S. No	University/DAI Name	Main Campus Location	Website Address
1	Abdul Wali Khan University, Mardan	Mardan	www.awkum.edu.pk
2	Bacha Khan University, Charsadda	Charsadda	www.bkuc.edu.pk/
3	Shaheed Benazir Bhutto Women University, Peshawar	Peshawar	www.fwu.edu.pk
4	Gomal University, D.I. Khan	D.I.Khan	www.gu.edu.pk/
5	Hazara University, Dodhial, Mansehra	Manshera	www.hu.edu.pk/
6	Institute of Management Science, Peshawar (IMS)	Peshawar	www.imsciences.edu.pk
7	Islamia College, Peshawar	Peshawar	www.icp.edu.pk
8	Khyber Medical University, Peshawar	Peshawar	www.kmu.edu.pk

9	Kohat University of Science and Technology, Kohat	Kohat	www.kust.edu.pk
10	Khushal Khan Khattak University, Karak	Karak	Under construction
11	Khyber Pakhtunkhwa Agricultural University, Peshawar	Peshawar	www.aup.edu.pk
12	University of Engineering & Technology, Peshawar	Peshawar	www.uetpeshawar.edu.pk
13	Shaheed Benazir Bhutto University, Sheringal, Dir	Dir	www.sbbu.edu.pk
14	University of Malakand, Chakdara, Dir, Malakand	Malakand	www.uom.edu.pk
15	University of Peshawar, Peshawar	Peshawar	www.upesh.edu.pk
16	University of Science & Technology, Bannu	Bannu	www.ustb.edu.pk
17	University of Swat, Swat	Swat	www.swatuniversity.edu.pk
18	University of Haripur, Haripur	Haripur	www.uoh.edu.pk
19	University of Swabi	Swabi	www.uoswabi.edu.pk/

#### v) Universities/DAIs chartered by Government of Balochistan

S. No	University/DAI Name	Main Campus Location	Website Address
1	Balochistan University of Engineering & Technology, Khuzdar	Khuzdar	buetk.edu.pk
2	Balochistan University of Information Technology & Management Sciences, Quetta	Quetta	www.buitms.edu.pk
3	Lasbela University of Agriculture, Water and Marine Sciences	Lasbela	www.luawms.edu.pk
4	Sardar Bahadur Khan Women University, Quetta	Quetta	www.sbkwu.edu.pk
5	University of Balochistan, Quetta	Quetta	www.uob.edu.pk
6	University of Turbat, Turbat	Turbat	www.uot.edu.pk

#### vi) Universities/DAIs chartered by Government of Azad Jammu & Kashmir

S. No	University/DAI Name	Main Campus Location	Website Address
1	Mirpur University of Science and Technology (MUST), AJ&K	Mirpur	www.must.edu.pk
2	University of Azad Jammu & Kashmir, Muzaffarabad, Azad Kashmir, Muzaffarabad	Muzaffarabad	www.ajku.edu.pk
3	University of Poonch, Rawalakot	Rawalakot	www.upr.edu.pk
4	Women University of Azad Jammu and Kashmir Bagh	Bagh	under construction
5	University of Management Sciences and Information Technology, Kotli	Kotli	under construction

**B) PRIVATE SECTOR UNIVERSITIES/DEGREE AWARDING INSTITUTIONS****i) Universities/DAIs chartered by the Central Government of Pakistan**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Aga Khan University, Karachi	Karachi	www.aku.edu
2	Foundation University, Islamabad	Islamabad	www.fui.edu.pk
3	Lahore University of Management Sciences (LUMS), Lahore	Lahore	www.lums.edu.pk
4	National University of Computer and Emerging Sciences, Islamabad	Islamabad	www.nu.edu.pk
5	Riphah International University, Islamabad	Islamabad	www.riphah.edu.pk
6	Shifa Tameer-e-Millat University, Islamabad	Islamabad	www.stmu.edu.pk

**ii) Universities/DAIs chartered by Government of the Punjab**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Ali Institute of Education	Lahore	www.aie.edu.pk
2	Beaconhouse National University, Lahore	Lahore	www.bnu.edu.pk
3	Forman Christian College, Lahore (university status)	Lahore	www.fccollege.edu.pk
4	Global Institute, Lahore	Lahore	www.global.edu.pk
5	Hajvery University, Lahore	Lahore	www.hajvery.edu.pk
6	HITEC University, Taxila	Taxila	www.hitecuni.edu.pk
7	Imperial College of Business Studies, Lahore	Lahore	www.imperial.edu.pk
8	Institute of Management Sciences, Lahore	Lahore	www.pakaims.edu.pk
9	Institute of Southern Punjab, Multan	Multan	www.usp.edu.pk
10	Lahore Leads University, Lahore	Lahore	www.leads.edu.pk
11	Lahore School of Economics, Lahore	Lahore	www.lahoreschoolofeconomics.edu.pk
12	Lahore Garrison University, Lahore	Lahore	www.lgu.edu.pk
13	Minhaj University, Lahore	Lahore	www.mul.edu.pk
14	National College of Business Administration & Economics, Lahore	Lahore	www.ncbae.edu.pk
15	Nur International University, Lahore	Lahore	Under construction
16	Qarshi University	Lahore	www.qu.edu.pk
17	The GIFT University, Gujranwala	Gujranwala	www.gift.edu.pk
18	The Superior College, Lahore	Lahore	www.superior.edu.pk
19	The University of Faisalabad, Faisalabad	Faisalabad	www.tuf.edu.pk
20	University of Central Punjab, Lahore	Lahore	www.ucp.edu.pk
21	University of Lahore, Lahore	Lahore	www.uol.edu.pk
22	University of Management & Technology, Lahore	Lahore	www.umt.edu.pk
23	University of South Asia, Lahore	Lahore	www.usa.edu.pk
24	University of Wah, Wah	Wah	www.uw.edu.pk

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**iii) Universities/DAIs chartered by Government of Sindh**

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S. No	University/DAI Name	Main Campus Location	Website Address
1	Baqai Medical University, Karachi	Karachi	<a href="http://www.baqai.edu.pk">www.baqai.edu.pk</a>
2	Commecs Institute of Business & Emerging Sciences, Karachi	Karachi	<a href="http://www.commeccsinstitute.edu.pk">www.commeccsinstitute.edu.pk</a>
3	Dadabhoy Institute of Higher Education, Karachi	Karachi	<a href="http://www.dadabhoy.edu.pk">www.dadabhoy.edu.pk</a>
4	DHA Suffa University, Karachi	Karachi	<a href="http://www.dsu.edu.pk">www.dsu.edu.pk</a>
5	Greenwich University, Karachi	Karachi	<a href="http://www.greenwichuniversity.edu.pk">www.greenwichuniversity.edu.pk</a>
6	Hamdard University, Karachi	Karachi	<a href="http://www.hamdard.edu.pk">www.hamdard.edu.pk</a>
7	Habib University, Karachi	Karachi	<a href="http://www.habib.edu.pk">www.habib.edu.pk</a>
8	Indus University, Karachi	Karachi	<a href="http://www.indus.edu.pk">www.indus.edu.pk</a>
9	Indus Valley School of Art and Architecture, Karachi	Karachi	<a href="http://www.indusvalley.edu.pk">www.indusvalley.edu.pk</a>
10	Institute of Business Management, Karachi	Karachi	<a href="http://www.iobm.edu.pk">www.iobm.edu.pk</a>
11	Institute of Business and Technology, Karachi	Karachi	<a href="http://www.biztek.edu.pk">www.biztek.edu.pk</a>
12	Iqra University, Karachi	Karachi	<a href="http://www.iqra.edu.pk">www.iqra.edu.pk</a>
13	Isra University, Hyderabad	Hyderabad	<a href="http://www.isra.edu.pk">www.isra.edu.pk</a>
14	Jinnah University for Women, Karachi	Karachi	<a href="http://www.juw.edu.pk">www.juw.edu.pk</a>
15	Karachi Institute of Economics & Technology, Karachi	Karachi	<a href="http://www.pafkiet.edu.pk">www.pafkiet.edu.pk</a>
16	KASB Institute of Technology, Karachi	Karachi	<a href="http://www.kasbit.edu.pk">www.kasbit.edu.pk</a>
17	Karachi School for Business & Leadership	Karachi	<a href="http://www.ksbl.edu.pk">www.ksbl.edu.pk</a>
18	Muhammad Ali Jinnah University, Karachi	Karachi	<a href="http://www.jinnah.edu">www.jinnah.edu</a>
19	Newport Institute of Communications & Economics, Karachi	Karachi	<a href="http://www.newports.edu.pk">www.newports.edu.pk</a>
20	Preston Institute of Management, Science and Technology, Karachi	Karachi	<a href="http://pimsat-khi.edu.pk">pimsat-khi.edu.pk</a>
21	Preston University, Karachi	Karachi	<a href="http://www.preston.edu.pk">www.preston.edu.pk</a>
22	Shaheed Zulfikar Ali Bhutto Institute of Sc. & Technology (SZABIST), Karachi	Karachi	<a href="http://www.szabist.edu.pk">www.szabist.edu.pk</a>
23	Shaheed Benazir Bhutto City University, Karachi	Karachi	<a href="http://www.sbbcu.edu.pk">www.sbbcu.edu.pk</a>
24	Sir Syed University of Engg. & Technology, Karachi	Karachi	<a href="http://www.ssuet.edu.pk">www.ssuet.edu.pk</a>
25	Sindh Institute of Medical Sciences, Karachi	Karachi	<a href="http://www.siut.org">www.siut.org</a>
26	Textile Institute of Pakistan, Karachi	Karachi	<a href="http://www.tip.edu.pk">www.tip.edu.pk</a>
27	Nazeer Hussain University, Karachi	Karachi	<a href="http://www.nhu.edu.pk">www.nhu.edu.pk</a>
28	Zia-ud-Din University, Karachi	Karachi	<a href="http://www.zu.edu.pk">www.zu.edu.pk</a>
29	Shaheed Benazir Bhutto Dewan University, Karachi	Karachi	

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**iv) Universities/DAIs chartered by Government of Khyber Pakhtoonkhwa**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Abasyn University, Peshawar	Peshawar	www.abasyn.edu.pk
2	CECOS University of Information Technology and Emerging Sciences, Peshawar	Peshawar	www.cecos.edu.pk
3	City University of Science and Information Technology, Peshawar	Peshawar	www.cityuniversity.edu.pk
4	Gandhara University, Peshawar	Peshawar	www.gandhara.edu.pk
5	Ghulam Ishaq Khan Institute of Engineering Sciences & Technology, Topi	Topi	www.giki.edu.pk
6	Iqra National University, Peshawar	Peshawar	www.iqrapsh.edu.pk
7	Northern University, Nowshera	Nowshera	www.northern.edu.pk
8	Preston University, Kohat	Kohat	www.preston.edu.pk
9	Qurtaba University of Science and Information Technology, D.I. Khan	D.I.Khan	www.qurtaba.edu.pk
10	Sarhad University of Science and Information Technology, Peshawar	Peshawar	www.suit.edu.pk

**v) Universities/DAIs chartered by Government of Baluchistan**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Al-Hamd Islamic University, Quetta	Quetta	http://www.aiu.edu.pk

**vi) Universities/DAIs chartered by Government of Azad Jammu & Kashmir**

S. No	University/DAI Name	Main Campus Location	Website Address
1	Al-Khair University, AJ&K	Bhimber	www.alkhair.edu.pk
2	Mohi-ud-Din Islamic University, AJK	Nerain Sharif	http://www.miu.edu.pk

### Appendix 3: Missing Value Detection

Items	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
MO_aM1	369	0	4.27	.753	1	5
MO_aM2	367	2	4.25	.779	1	5
MO_aM3	363	6	4.00	.813	1	5
MO_aM4	368	1	4.19	.777	1	5
MO_aM5	368	1	4.40	.760	1	5
MO_aM6	362	7	4.13	.822	1	5
MO_adL1	367	2	4.00	.899	1	5
MO_adL2	369	0	3.88	.912	1	5
MO_adL3	369	0	3.91	.931	1	5
MO_adL4	368	1	4.07	.866	1	5
MO_adL5	365	4	3.97	.916	1	5
MO_adL6	364	5	3.94	.874	1	5
MO_inR1	368	1	3.84	.882	1	5
MO_inR2	367	2	3.55	.996	1	5
MO_inR3	361	8	3.49	.952	1	5
MO_inR4	366	3	3.36	1.123	1	12
MO_inR5	368	1	3.22	1.063	1	5
MO_inR6	363	6	3.34	.971	1	5
MO_inR7	367	2	3.16	.957	1	5
MO_inR8	368	1	3.63	.934	1	5
MO_inR9	366	3	3.56	.962	1	5
MO_inR10	368	1	3.47	1.012	1	5
Inn1	369	0	3.73	1.005	1	5
Inn2	368	1	3.77	.913	1	5
Inn3	365	4	3.66	.975	1	5
Inn4	359	10	3.55	1.020	1	5
Inn5	363	6	3.61	.955	1	5
Inn6	363	6	3.60	.942	1	5
Inn7	368	1	3.49	.942	1	5
Inn8	367	2	3.50	.905	1	5
Inn9	364	5	3.66	.941	1	5
Inn10	361	8	3.70	.968	1	5
Inn11	367	2	3.67	.993	1	5
Inn12	365	4	3.61	.950	1	5
UP_op1	369	0	3.90	.905	1	5
UP_op2	368	1	3.73	.847	1	5
UP_op3	362	7	3.75	.846	1	5
UP_op4	367	2	3.60	.871	1	5
UP_op5	364	5	3.59	.942	1	5
UP_F1	368	1	3.48	1.023	1	5
UP_F2	367	2	3.58	.971	1	5
UP_F3	366	3	3.51	.959	1	5
UP_F4	368	1	3.64	.985	1	5
UP_F5	366	3	3.39	.961	1	5
UP_RR1	366	3	3.67	.835	1	5
UP_RR2	366	3	3.59	.815	1	5
UP_RR3	366	3	3.83	.795	1	5

**Note:** INN denotes Innovation; MO\_adL denotes Administration-leadership; MO\_aM denotes Advising and mentoring; MO\_inR denotes Intelligence-generation and responsiveness; UP\_F denotes Funding; UP\_RR denotes Recruitment and Retention; UP\_op denotes Overall Performance.





**Appendix 5: Univariate outlier detection, with Standard Z score of  $> \pm 4$**

S No	idNo	ZMO_aM1	ZMO_aM2	ZMO_aM3	ZMO_aM4	ZMO_aM5	ZMO_aM6	ZMO_ad1	ZUP_PR1	ZUP_PR2	ZUP_PR3
1	423	-0.581	-0.460	-0.015	-3.174	-0.663	-2.806	-2.406	-1.305	-1.193	-0.111
2	395	1.073	1.038	1.285	1.097	0.828	1.092	1.135	0.057	0.211	-0.111
3	410	-2.234	-0.460	1.285	-0.327	-0.663	1.092	-2.406	0.057	0.211	-0.111
4	7	1.073	1.038	-0.015	1.097	0.828	-0.207	-1.226	-1.305	1.615	-1.510
5	222	1.073	-0.460	-1.316	1.097	0.828	-0.207	-0.046	0.057	0.211	-0.111
6	806	-0.581	1.038	-0.015	-0.327	0.828	-0.207	1.135	-1.305	-1.193	-1.510
7	766	-0.581	1.038	1.285	1.097	-2.154	-0.207	-0.046	0.057	0.211	-0.111
8	488	1.073	1.038	1.285	-0.327	0.828	1.092	1.135	-1.305	-1.193	-1.510
9	625	1.073	-0.460	-0.015	-0.327	-0.663	-2.806	-2.406	0.057	-1.193	1.289
10	836	-0.581	-0.460	-0.015	-1.751	-0.663	-1.507	-1.226	-1.305	-1.193	1.289
11	24	-0.581	-0.460	-1.316	-0.327	-2.154	-0.207	-1.226	1.418	0.211	1.289
12	805	1.073	-0.460	-0.015	1.097	-0.663	-2.806	-1.226	0.057	-1.193	1.289
13	264	1.073	1.038	-1.316	1.097	-0.663	-0.035	-3.586	0.057	0.211	-0.111
14	772	-0.581	-0.460	1.285	1.097	-0.663	1.092	-1.226	1.418	1.615	1.289
15	506	-0.581	1.038	1.285	-0.327	0.828	1.092	-1.226	0.057	-1.193	-1.510
16	619	1.073	-0.093	-2.617	1.097	-0.663	-0.207	-1.226	0.057	-1.193	-0.111
17	718	-0.581	-3.456	-1.316	-0.327	-0.663	-0.207	-3.586	-1.305	-1.193	-0.111
18	177	-0.581	-0.460	-1.316	1.097	-0.663	-0.207	1.135	0.057	0.211	-0.111
19	90	-0.581	1.038	-0.015	-0.327	0.828	1.092	-1.226	0.057	0.211	-0.111
20	572	<b>-5.540</b>	-1.958	-1.316	-1.751	-3.644	-2.806	-1.226	-1.305	1.615	-1.510
21	626	1.073	-0.460	1.285	1.097	0.828	1.092	1.135	0.057	0.211	-0.111
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
41	252	1.073	-0.460	-0.015	-1.751	0.828	-1.507	-0.046	<b>-4.027</b>	-1.193	1.289
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
50	57	-0.581	-0.460	-0.015	-0.327	0.828	-0.207	-0.046	0.057	<b>-4.001</b>	-0.111
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
66	260	-0.581	-0.460	-0.019	-0.327	0.828	-0.207	-1.226	-2.666	-2.597	<b>-4.310</b>
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.
332	762	1.0726	1.0375	-0.0154	1.09653	0.8279	1.0915	1.1345	1.41838	0.21141	1.28898
333	138	-0.5806	-0.4602	-0.0154	-0.32705	-0.6628	-0.2074	1.1345	0.05694	0.21141	-0.11071
334	312	-0.5806	-0.4602	-0.0154	1.09653	0.8279	1.0915	-0.0456	0.05694	0.21141	-0.11071
335	100	-0.5806	-0.4602	-0.0154	-0.32705	-0.6628	-0.2074	-0.0456	1.41838	0.21141	1.28898
336	124	1.0726	1.0375	-0.015	1.09653	0.8279	1.0915	1.1345	1.41838	0.21141	1.28898

**Appendix 6: Total outliers detected (Multivariate and Univariate)**

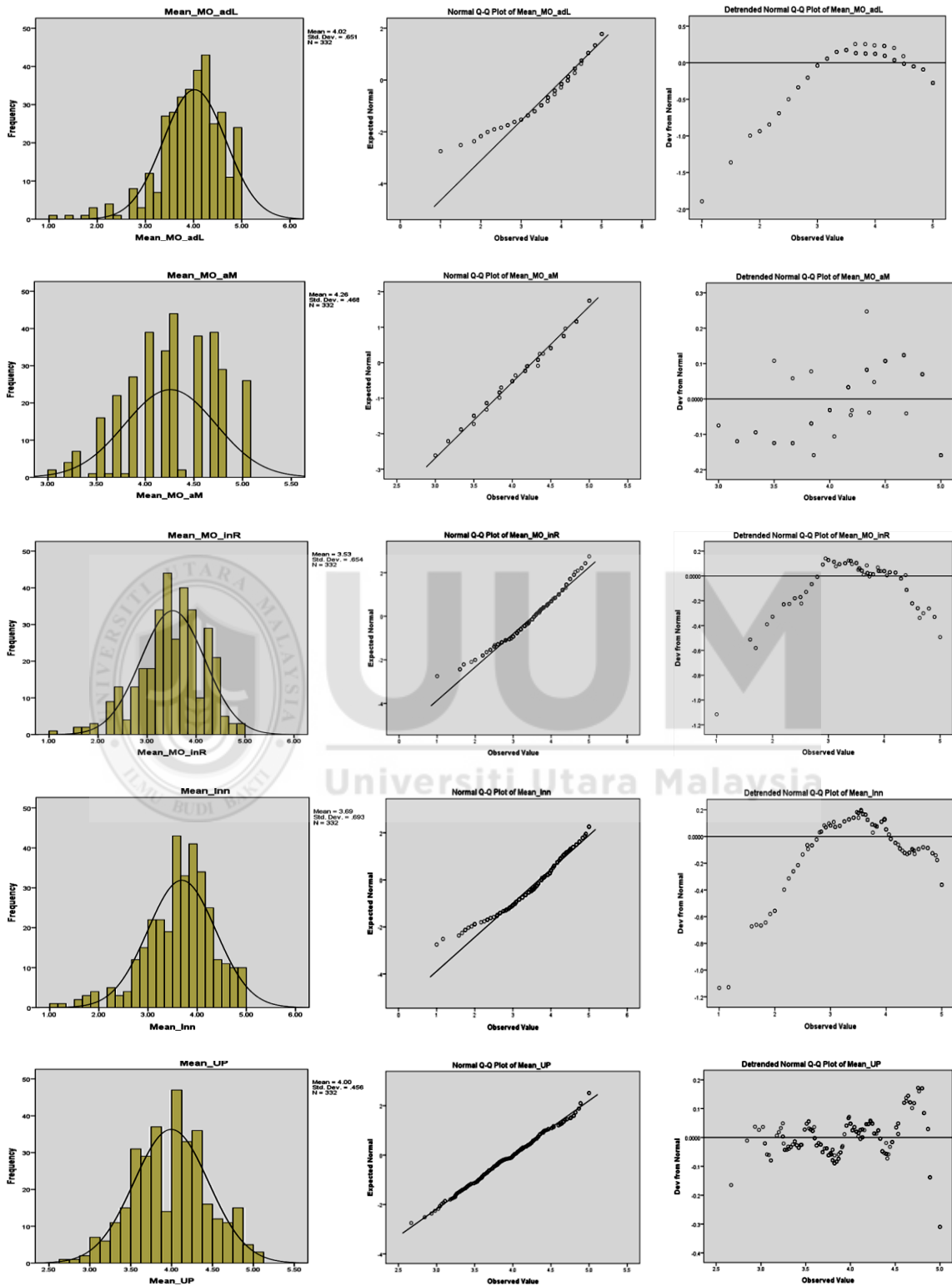
S. No	Multivariate outlier idNo	Univariate outliers		Grand total
		idNo	Frequency (No of times, > standard z-value)	
1	824	572	1	
2	461	252	1	
3	131	57	1	
4	9	260	1	
5	129			
6	265			
7	160			
8	5			
9	638			
10	476			
11	109			
12	406			
13	161			
14	93			
15	497			
16	664			
17	436			
18	575			
19	592			
20	340			
21	82			
22	559			
23	383			
24	69			
25	11			
26	771			
27	825			
28	266			
29	267			
30	797			
31	467			
32	83			
33	86			
<b>Total</b>	<b>33</b>	<b>4</b>		<b>37</b>

**Appendix 7: Normality test results by means of Skewness and Kurtosis**

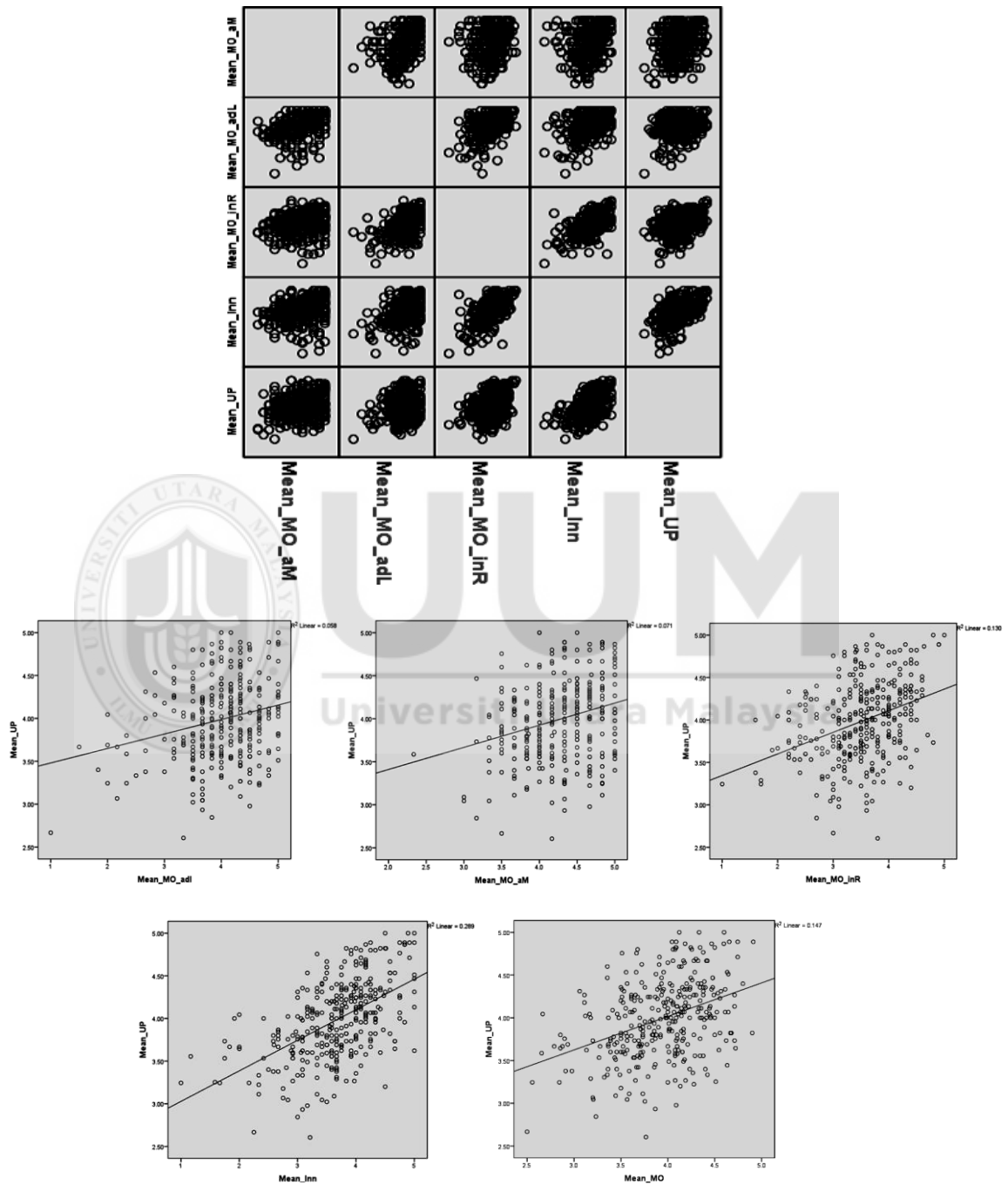
Items	N	Min	Max	Mean	S.Dev.	Skewness >±1	Kurtosis >±3
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
MO_aM1	332	2	5	4.36	.578	-.340	.134
MO_aM2	332	2	5	4.31	.667	-.584	.134
MO_aM3	332	1	5	4.02	.771	-.701	.134
MO_aM4	332	2	5	4.24	.700	-.581	.134
MO_aM5	332	3	5	4.45	.659	-.790	.134
MO_aM6	332	2	5	4.17	.762	-.550	.134
MO_adL1	332	1	5	4.05	.849	-.922	.134
MO_adL2	332	1	5	3.93	.841	-.628	.134
MO_adL3	332	1	5	3.98	.871	-.816	.134
MO_adL4	332	1	5	4.14	.787	-.843	.134
MO_adL5	332	1	5	4.06	.833	-.863	.134
MO_adL6	332	1	5	3.98	.810	-.553	.134
MO_inR1	332	1	5	3.89	.814	-.614	.134
MO_inR2	332	1	5	3.63	.931	-.340	.134
MO_inR3	332	1	5	3.56	.873	-.331	.134
MO_inR4	332	1	5	3.39	.971	-.251	.134
MO_inR5	332	1	5	3.30	.995	-.284	.134
MO_inR6	332	1	5	3.40	.924	-.304	.134
MO_inR7	332	1	5	3.21	.920	-.326	.134
MO_inR8	332	1	5	3.70	.858	-.682	.134
MO_inR9	332	1	5	3.62	.916	-.337	.134
MO_inR10	332	1	5	3.56	.949	-.422	.134
Inn1	332	1	5	3.79	.927	-.627	.134
Inn2	332	1	5	3.80	.871	-.955	.134
Inn3	332	1	5	3.72	.931	-.623	.134
Inn4	332	1	5	3.61	.939	-.473	.134
Inn5	332	1	5	3.67	.900	-.490	.134
Inn6	332	1	5	3.68	.850	-.518	.134
Inn7	332	1	5	3.55	.910	-.428	.134
Inn8	332	1	5	3.55	.879	-.502	.134
Inn9	332	1	5	3.71	.883	-.525	.134
Inn10	332	1	5	3.75	.895	-.491	.134
Inn11	332	1	5	3.75	.910	-.594	.134
Inn12	332	1	5	3.68	.897	-.650	.134
UP_op1	332	1	5	3.92	.846	-.819	.134
UP_op2	332	2	5	4.07	.677	-.434	.134
UP_op3	332	2	5	4.08	.646	-.403	.134
UP_op4	332	2	5	3.98	.691	-.298	.134
UP_op5	332	1	5	4.02	.800	-.526	.134
UP_F1	332	3	5	4.12	.727	-.178	.134
UP_F2	332	2	5	4.02	.758	-.413	.134
UP_F3	332	2	5	4.00	.714	-.184	.134
UP_F4	332	1	5	4.03	.862	-.795	.134
UP_F5	332	1	5	3.81	.886	-.325	.134
UP_RR1	332	2	5	3.97	.712	-.410	.134
UP_RR2	332	2	5	3.87	.690	-.138	.134
UP_RR3	332	2	5	4.09	.694	-.281	.134

**Note:** INN denotes Innovation; MO\_adL denotes Administration-leadership; MO\_aM denotes Advising and mentoring; MO\_inR denotes Intelligence-generation and responsiveness; UP\_F denotes Funding; UP\_RR denotes Recruitment and Retention; UP\_op denotes Overall Performance.

## Appendix 8: Individual graphs for normality, for testing the model



**Appendix 9: Comprehensive view of linearity (Matrix view & Simple view)**



**Note:** INN denotes Innovation; MO\_adL denotes Administration-leadership; MO\_aM denotes Advising and mentoring; MO\_inR denotes Intelligence-generation and responsiveness; UP\_F denotes Funding; UP\_RR denotes Recruitment and Retention; UP\_op denotes Overall Performance.

## Appendix 10: Pearson Correlation for linearity

		Correlations				
		MO_aM	MO_adL	MO_inR	Inn	UP
MO_aM	Pearson Correlation	1				
	Sig. (1-tailed)					
	N	332				
MO_adL	Pearson Correlation	.407**	1			
	Sig. (1-tailed)	.000				
	N	332	332			
MO_inR	Pearson Correlation	.218**	.415**	1		
	Sig. (1-tailed)	.000	.000			
	N	332	332	332		
Inn	Pearson Correlation	.242**	.377**	.623**	1	
	Sig. (1-tailed)	.000	.000	.000		
	N	332	332	332	332	
UP	Pearson Correlation	.264**	.230**	.370**	.537**	1
	Sig. (1-tailed)	.000	.000	.000	.000	
	N	332	332	332	332	332

**\*\*.** Correlation is significant at the 0.01 level (1-tailed).

**Note:** INN denotes Innovation; MO\_adL denotes Administration-leadership; MO\_aM denotes Advising and mentoring; MO\_inR denotes Intelligence-generation and responsiveness; UP\_F denotes Funding; UP\_RR denotes Recruitment and Retention; UP\_op denotes Overall Performance.

## Appendix 11: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Sq. Loadings		
	Total	% Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.507	28.739	28.739	13.507	28.739	28.739
2	3.772	8.025	36.764	3.772	8.025	36.764
3	3.481	7.407	44.171	3.481	7.407	44.171
4	2.286	4.863	49.034	2.286	4.863	49.034
5	2.005	4.266	53.300	2.005	4.266	53.300
6	1.448	3.081	56.381	1.448	3.081	56.381
7	1.314	2.796	59.177	1.314	2.796	59.177
8	1.247	2.652	61.829	1.247	2.652	61.829
9	.999	2.125	63.954			
10	.974	2.072	66.026			
11	.923	1.964	67.989			
12	.816	1.737	69.726			
13	.776	1.652	71.378			
14	.751	1.597	72.975			
15	.701	1.492	74.468			
16	.678	1.443	75.910			
17	.614	1.305	77.216			
18	.602	1.281	78.497			
19	.585	1.245	79.742			
20	.560	1.191	80.933			
21	.542	1.153	82.086			
22	.514	1.094	83.180			
23	.493	1.049	84.228			
24	.471	1.002	85.230			
25	.448	.953	86.183			
26	.441	.939	87.123			
27	.425	.904	88.026			
28	.397	.845	88.871			
29	.394	.838	89.710			
30	.372	.792	90.502			
31	.362	.770	91.272			
32	.352	.749	92.021			
33	.336	.715	92.736			
34	.318	.676	93.412			
35	.308	.655	94.066			
36	.299	.635	94.702			
37	.286	.609	95.310			
38	.273	.581	95.892			
39	.270	.574	96.466			
40	.259	.551	97.016			
41	.234	.497	97.513			
42	.223	.474	97.988			
43	.214	.454	98.442			
44	.200	.426	98.868			
45	.192	.408	99.276			
46	.176	.375	99.651			
47	.164	.349	100.000			

Extraction Method: Principal Component Analysis.



## Appendix 12: Cross loadings

	<b>Inn</b>	<b>MO_aM</b>	<b>MO_adL</b>	<b>MO_inR</b>	<b>UP_F</b>	<b>UP_RR</b>	<b>UP_op</b>
<b>Inn1</b>	<b>0.74165</b>	0.23157	0.27134	0.55380	0.40120	0.22992	0.28998
<b>Inn2</b>	<b>0.78089</b>	0.25758	0.26722	0.47338	0.41849	0.24184	0.34496
<b>Inn3</b>	<b>0.72554</b>	0.14735	0.28680	0.42624	0.37137	0.20002	0.27522
<b>Inn4</b>	<b>0.68220</b>	0.20493	0.22875	0.36932	0.31824	0.18086	0.22441
<b>Inn5</b>	<b>0.79719</b>	0.19888	0.32697	0.53787	0.34384	0.24874	0.27553
<b>Inn6</b>	<b>0.74857</b>	0.12265	0.30666	0.48951	0.29867	0.20393	0.19304
<b>Inn7</b>	<b>0.77910</b>	0.15628	0.23786	0.51242	0.33934	0.14508	0.27702
<b>Inn8</b>	<b>0.79202</b>	0.18586	0.24158	0.51421	0.38634	0.24806	0.32616
<b>Inn9</b>	<b>0.79340</b>	0.22698	0.25996	0.46697	0.37428	0.19843	0.35336
<b>Inn10</b>	<b>0.77938</b>	0.25863	0.41803	0.48012	0.35205	0.22324	0.30478
<b>Inn11</b>	<b>0.79929</b>	0.29228	0.32295	0.45437	0.40508	0.30349	0.32140
<b>Inn12</b>	<b>0.82280</b>	0.27393	0.34001	0.51028	0.40773	0.29374	0.35880
<b>MO_aM1</b>	0.23587	<b>0.69657</b>	0.28742	0.17231	0.14475	0.12812	0.21419
<b>MO_aM2</b>	0.25246	<b>0.79857</b>	0.39257	0.26851	0.16766	0.25125	0.26819
<b>MO_aM4</b>	0.24499	<b>0.76460</b>	0.30330	0.25914	0.12646	0.17729	0.23232
<b>MO_aM5</b>	0.11216	<b>0.68768</b>	0.28167	0.06937	0.06141	0.11630	0.16225
<b>MO_aM6</b>	0.14785	<b>0.70729</b>	0.23292	0.19738	0.03733	0.13273	0.22646
<b>MO_adL1</b>	0.22631	0.27494	<b>0.73612</b>	0.29574	0.07089	0.12738	0.11116
<b>MO_adL2</b>	0.28213	0.32446	<b>0.76057</b>	0.33884	0.17548	0.14117	0.09123
<b>MO_adL3</b>	0.35118	0.32199	<b>0.83357</b>	0.38916	0.14080	0.11440	0.13392
<b>MO_adL4</b>	0.29966	0.39900	<b>0.72542</b>	0.29469	0.11123	0.11426	0.14941
<b>MO_adL5</b>	0.29228	0.30148	<b>0.83154</b>	0.30853	0.12278	0.15016	0.11754
<b>MO_adL6</b>	0.33047	0.32878	<b>0.80380</b>	0.35846	0.14353	0.11610	0.16868
<b>MO_inR1</b>	0.37737	0.38419	0.32687	<b>0.65284</b>	0.14295	0.09784	0.18804
<b>MO_inR2</b>	0.42495	0.28745	0.30971	<b>0.72540</b>	0.21802	0.09962	0.19572
<b>MO_inR3</b>	0.37286	0.18532	0.20970	<b>0.72294</b>	0.15480	0.00406	0.13801
<b>MO_inR4</b>	0.41477	0.15245	0.25703	<b>0.70000</b>	0.11291	0.10257	0.15726
<b>MO_inR5</b>	0.39211	0.16608	0.21577	<b>0.71318</b>	0.15141	0.11397	0.21371
<b>MO_inR6</b>	0.44613	0.06111	0.23443	<b>0.73808</b>	0.19878	0.12485	0.19489
<b>MO_inR7</b>	0.46087	0.10673	0.27348	<b>0.77194</b>	0.26132	0.17153	0.28992
<b>MO_inR8</b>	0.45364	0.23836	0.42326	<b>0.68934</b>	0.22261	0.19559	0.25188
<b>MO_inR9</b>	0.54625	0.23833	0.36851	<b>0.69125</b>	0.40140	0.25915	0.28605
<b>MO_inR10</b>	0.56717	0.12640	0.37094	<b>0.72834</b>	0.39170	0.19426	0.26360
<b>UP_F1</b>	0.54523	0.10195	0.17599	0.39929	<b>0.72105</b>	0.23409	0.28571
<b>UP_F2</b>	0.30308	0.08292	0.08730	0.24449	<b>0.76846</b>	0.29097	0.32621
<b>UP_F3</b>	0.35848	0.14729	0.14693	0.26000	<b>0.77882</b>	0.33982	0.34552
<b>UP_F4</b>	0.28034	0.09709	0.08455	0.16383	<b>0.77859</b>	0.35175	0.43321
<b>UP_F5</b>	0.39055	0.15898	0.14513	0.20475	<b>0.81281</b>	0.33977	0.51553
<b>UP_RR1</b>	0.27759	0.18807	0.16803	0.21261	0.31345	<b>0.81655</b>	0.37440
<b>UP_RR2</b>	0.22999	0.21984	0.13691	0.14385	0.35008	<b>0.82406</b>	0.37843
<b>UP_RR3</b>	0.19545	0.12998	0.07525	0.10179	0.30044	<b>0.73288</b>	0.320724
<b>UP_op2</b>	0.24678	0.26377	0.07134	0.14702	0.36072	0.36138	<b>0.776106</b>
<b>UP_op3</b>	0.27923	0.21273	0.16323	0.24705	0.39077	0.33826	<b>0.80709</b>
<b>UP_op4</b>	0.33714	0.22529	0.10431	0.25913	0.44616	0.37721	<b>0.839392</b>
<b>UP_op5</b>	0.36123	0.27345	0.18598	0.32258	0.38922	0.35978	<b>0.747172</b>

**Note:** INN denotes Innovation; MO\_adL denotes Administration-leadership; MO\_aM denotes Advising and mentoring; MO\_inR denotes Intelligence-generation and responsiveness; UP\_F denotes Funding; UP\_RR denotes Recruitment and Retention; UP\_op denotes Overall Performance.

### Appendix 13: Testing Mediation Hypothesis using Sobel Test.

	<b>H4c</b>	<b>H4</b>	<b>H4a</b>	<b>H4b</b>
<b>Inputs</b>				
<i>N</i> (Sample size)		332	332	332
<i>a</i> (Path coefficient calculated by Warp-PLS)		0.6176	0.0996	0.0896
<i>b</i> (Path coefficient calculated by Warp-PLS)		0.4382	0.4275	0.4275
<i>Sa</i> (Standard error calculated by Warp-PLS)		0.0469	0.0549	0.0461
<i>Sb</i> (Standard error calculated by Warp-PLS)		0.0504	0.0525	0.0525
<b>Outputs</b>				
<i>Sab</i> (Sobel's standard error for mediating effect)		0.0374	0.024217	0.0204
<i>ab</i> (Product path coefficient for mediating effect)		0.2706	0.042579	0.0383
<i>Tab</i> (T value for mediating effect)		7.2411	1.758204	1.8771
<i>Pab</i> (P value for mediating effect, one-tailed)		0.0000	0.03982	0.0307

### Appendix 14: Results of Testing Mediation Hypothesis using Bootstrapping Method

Hypothesis	Path a	Path b	Indirect Effect	SE	<i>t</i> -value	95% LL	95% UL	<i>p</i> -value
<b>H4</b>	0.618	0.438	0.271	0.036	7.433	0.211	0.331	0.000
<b>H4a</b>	0.100	0.427	0.043	0.024	1.798	0.004	0.082	0.037
<b>H4b</b>	0.090	0.427	0.038	0.020	1.968	0.006	0.071	0.025
<b>H4c</b>	0.572	0.427	0.244	0.040	6.128	0.178	0.310	0.000

## Appendix 15: Details of Bootstrapping Procedure for Mediation

	H4 - Path b	H4 - Path a	H4 - a*b	H4-SE (a*b)	H4a - Path b	H4a - Path a	H4a - 2b*2a	H4a-SE (2b*2a)	H4b - Path b	H4b - Path a	H4b - 2b*3a	H4b-SE (2b*3a)	H4c - Path b	H4c - Path a	H4c - 2b*4a	H4c-SE (4b*3a)
<b>Sample 0</b>	0.467	0.673	0.314	0.036	0.440	0.111	0.049	0.024	0.440	0.119	0.052	0.020	0.440	0.568	0.250	0.040
<b>Sample 1</b>	0.446	0.629	0.280		0.468	0.131	0.061		0.468	0.026	0.012		0.468	0.530	0.248	
<b>Sample 2</b>	0.411	0.611	0.251		0.391	0.146	0.057		0.391	0.002	0.001		0.391	0.528	0.207	
<b>Sample 3</b>	0.493	0.621	0.306		0.291	0.134	0.039		0.291	0.067	0.019		0.291	0.548	0.159	
<b>Sample 4</b>	0.457	0.635	0.291		0.437	0.170	0.074		0.437	0.075	0.033		0.437	0.456	0.199	
<b>Sample 5</b>	0.487	0.736	0.359		0.526	0.066	0.035		0.526	0.021	0.011		0.526	0.625	0.329	
<b>Sample 6</b>	0.510	0.595	0.303		0.499	0.018	0.009		0.499	0.080	0.040		0.499	0.638	0.318	
<b>Sample 7</b>	0.396	0.635	0.252		0.343	0.003	0.001		0.343	0.165	0.057		0.343	0.629	0.216	
<b>Sample 8</b>	0.438	0.524	0.229		0.428	0.104	0.045		0.428	0.087	0.037		0.428	0.604	0.259	
<b>Sample 9</b>	0.476	0.676	0.321		0.400	0.099	0.039		0.400	0.062	0.025		0.400	0.579	0.232	
<b>Sample 10</b>	0.448	0.658	0.295		0.383	0.129	0.050		0.383	0.114	0.043		0.383	0.588	0.225	
<b>Sample 11</b>	0.501	0.621	0.311		0.513	0.071	0.037		0.513	0.069	0.035		0.513	0.601	0.308	
<b>Sample 12</b>	0.449	0.556	0.250		0.411	0.155	0.064		0.411	0.135	0.055		0.411	0.522	0.214	
<b>Sample 13</b>	0.416	0.640	0.266		0.442	0.091	0.040		0.442	0.048	0.021		0.442	0.513	0.227	
<b>Sample 14</b>	0.459	0.609	0.280		0.434	0.206	0.089		0.434	0.029	0.012		0.434	0.519	0.225	
<b>Sample 15</b>	0.524	0.666	0.349		0.429	0.132	0.056		0.429	0.048	0.021		0.429	0.558	0.240	
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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<b>Sample 4998</b>	0.491	0.553	0.271		0.433	0.045	0.020		0.433	0.098	0.042		0.433	0.572	0.248	
<b>Sample 4999</b>	0.429	0.661	0.284		0.427	0.075	0.032		0.427	0.121	0.051		0.427	0.564	0.241	
<b>Sample 5000</b>	0.452	0.649	0.293		0.470	0.140	0.066		0.470	0.016	0.007		0.470	0.580	0.272	