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Enhancing Absorptive Capacity through Communication: Mediating Role of Trust and Knowledge Sharing: A Case of Virtual Universities

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Abstract

This study aims to highlight the importance of communication and absorptive capacity in virtual universities of Pakistan. In this relationship, this study also investigates the mediating role of trust and knowledge sharing. This study applies social exchange theory to understand the relationship among variables. Some of the relationship between variables was also supported through theory of knowledge creation. For this study, data was collected from 267 employees of two virtual universities in Pakistan. After running the reliability & validity tests, this study used PROCESS Macros by Hayes for mediation analysis. The results suggest that communication has a positive and significant impact on absorptive capacity. Results further prove that trust and knowledge sharing sequentially mediate the relationship between communication and absorptive capacity. The findings of the study reveal that greater opportunities of communication, trust and knowledge sharing among virtual employees leads to build their absorptive capacity. This study is useful for virtual organizations, as it provides a mechanism of communication to improve the absorptive capacity of cross-functional virtual employees under behavioral stress i.e. trust and knowledge sharing. This study suggests that future research may focus on specific team level analysis for innovative behavior etc.

Keywords: absorptive capacity, trust, knowledge sharing, cross-functional communication, virtual universities

1. Introduction

Virtualization through Information & Communication Technology (ICT) is helping firms to make collaborations in spite long distances (Schlacht et al., 2017). ICT transformed

organizational knowledge sharing structure and communication processes, both inside and outside of the organization from physical to virtualization (Homburg, 2018; Yu et al., 2010). Hence, the idea of formulating the virtually diverse team from dispersed locations, helped virtual firms to achieve knowledge enriched with distinct views and diversified experience of virtual employees (Kim, 2018; Raghuram et al., 2019). In the era of highly changing global trends both technological and structural, the virtual organizations needs to maintain a knowledge sharing process for its virtual employees (Fischer & Pöhler, 2018; Sousa & González, 2017).Virtual organizations are on one hand revolutionizing the way of communication and trust on virtual system (Altbach, 2002; Sarker et al., 2011). On the other hand, it is a way to develop absorptive capacity through knowledge sharing among employees (Junni & Sarala, 2013; Pimmer et al., 2014). With this swept of globalization and ICTs, it is necessary for the virtual organizations to develop a strong ability towards absorptive capacity among their virtual teams (Junni & Sarala, 2013; Lee et al., 2014). In order to build the absorptive capacity of virtual team, the virtual organizations are facing challenges like behavior interventions i.e. communication and trust (Webster & Wong, 2008) and so on. These behavior interventions are seems difficult to implement in virtual teams for building their absorptive capacity (Liao et al., 2007).

Supported from previous studies, it may be claim that virtual universities contain a high level of diversity among its employees (Kaminska & Borzillo, 2018; Kyriakoullis & Zaphiris, 2016). Due to diversity in employees, (Beckett, 2008) stated that virtual organizations are facing communication and behavioral issues due to lack of utilization and implementation of absorptive capacity in employees. While reviewing the literature, it was also found that this study is amongst the first few studies in which absorptive capacity of virtual universities is addressed (Denicolai et al., 2016). Hence, it is highly demanded for this sector to have a strong ability of absorptive capacity in virtual employees. As various studies have already found that absorptive capacity for the institutions is a valuable input for innovation performance, competitive advantage (Chen et al., 2009) new product development (Darawong, 2015), IT projects and practices used in manufacturing organizations (Tu et al., 2006), ERP adoption (Mayeh et al., 2016) and many more.

The study of Davis et al. (2015) suggested that there is a need to apply theories under behavior sciences across behavioral dimensions. Some other researchers have also emphasized in their future research directions on the need of testing behavioral dimensions that include knowledge sharing in virtual organizations (Liu et al., 2015; Ratten, 2014; Wang & Noe, 2010). The premise of our research is based on these directions as mentioned above where we aim to test and explore certain behavioral factors among employees of virtual educational institutes of Pakistan. Further, a limited literature is available to explain the absorptive capacity for virtual organizations in connection with behavioural sciences (Darawong, 2015). In doing so, our study probes for an answer to the following questions;

- Is communication significantly related to absorptive capacity?
- Does trust and knowledge sharing sequentially mediate the relationship between communication and absorptive capacity?

By addressing the aforementioned research questions, this research contributes in the present stock of literature on absorptive capacity and its process, mechanism and usefulness in virtual universities. The application of Social Exchange Theory to establish that absorptive capacity is develop through exchange relationship, will open the new endeavors of research. This research highlights the significance of behavioral interventions of virtual teams i.e. communication, trust and knowledge sharing in context with their ability to build absorptive capacity. This research provide a tough input to top management and decision makers of virtual universities to prepare policies and mechanism for knowledge sharing in their virtual teams. Through this study, they are also able to apply the absorptive capacity process under a trustworthy environment. This research also provides useful information for the employees of virtual universities with respect to their roles in building their absorptive capacity through knowledge sharing process.

2. Literature Review

2.1 Paradigm Shift in Virtual Education

Education play a dynamic role in development of societies all around the world. Education was defined by Kohlberg and Mayer (1972) that it is a "transmission of cultural believes". It was further defined as "a multicultural accepted beliefs " by Mezirow (1981) and then a paradigm shift of primary education and higher education was introduced by Dandekar (1991). Like other sectors, this sector also experienced a rapid globalization (Bennell & Pearce, 2003). Due to this development, the era of face-to-face education was shifted to virtual education with the use of ICTs.

2.1.1 Initiatives in Pakistan for Virtual Universities

The developing countries have accepted the challenge to become more competitive for technological advancement in comparative with developed countries (Inglis & Bradley, 2005; Montobbio & Rampa, 2005). This acceptance of challenge increasingly reshaping the higher education from physical to modern tools of learning i.e. network based learning and E-learning. Amongst the developing countries, Pakistan has also taken many initiatives towards virtual educational institutions. One of the initiative is establishment of Higher Education Commission of Pakistan (HEC) in 2002 by Govt. of Pakistan (Batool & Qureshi, 2007; Nawaz & Kundi, 2010). The HEC is responsible for apropos creativities towards higher education in Pakistan. HEC has taken several initiatives in education sector of Pakistan. One out of them is establishment of virtual universities. Two virtual universities were established in Pakistan by HEC i.e. Virtual University of Pakistan, Lahore (VU) and Allama Iqbal Open University, Islamabad (AIOU) and so on.

2.2 Absorptive Capacity

In the presence of highly globalized and ICT based world, the institutional environment are showing a focused towards knowledge based institutions for doing businesses (Gómez, 2015). Different sectors, disciplines, institutions and industries are shifting towards knowledge based system (Le & Hayter, 2018). Scholars provide a significant importance of knowledge based system to increase the performance of employees as well as organizations itself for example in higher educational institutes (Al-Kurdi et al., 2018; Ebner et al., 2008), multiple decision making in economic frameworks (Balcerzak &

Pietrzak, 2016), financial institutions (Castrogiovanni et al., 2016) and business or project based organizations (Nicolini, 2016; Pemsel et al., 2016) and so on.

For aforementioned knowledge based system, the ways of doing business are continuously changing. The institutions, for instance are responding to the changing business needs, recognize the value of knowledge either new or old and integrate it with their current requirement(s) to apply it for commercial motives (Cohen & Levinthal, 1990). Knowledge sharing is also considered as a dominant source for competitive advantage in educational institutions as well (Mahdi et al., 2019). In order to make educational institutions as knowledge based organizations, absorptive capacity is one of the area which need good attention (Da Silva & Rapini, 2018) and its importance is highly significant for ICT based virtual educational institutes.

In knowledge-based organizations, absorptive capacity is conceptualized in different ways. Cohen and Levinthal (1990) define absorptive capacity (AC) as the capability of a person to recognize the importance of new knowledge and to integrate and apply it for commercial motives. Other researchers argued that the absorptive capacity of firms and organizations are more likely to be a by-product of routine activities for knowledge sharing among employees in the organizations (Van-Den et al., 1999). Some of the researchers stated that unidimensional concept of AC is having limitations for measurement in relationship with other variables (Camisón & Forés, 2010). In order to overcome this problem, the AC has further two dimensions i.e. Potential Absorptive Capacity and Realized Absorptive Capacity (Jansen et al., 2005). This study used AC in these two dimensions.

Potential absorptive capacity (PAC) was defined by Zahra and George (2002) who asserted that PAC includes two important elements, knowledge acquisition and assimilation of available knowledge. In virtual teams the environment for the employees is diverse where acquisition and assimilation of knowledge leads to better working in virtual organizations. As the PAC of virtual teams improves, virtual organizations get facilitated to achieve their goals both operational and strategic in nature (Batarseh et al., 2018; Batarseh et al., 2017). The second dimension of absorptive capacity is Realized Absorptive Capacity (RAC) that also includes two things i.e. knowledge transformation and exploitation of available knowledge (Zahra & George, 2002). Both these dimensions leads to introduce and implement new global trends from external environment within in the virtual organizations to increase the work efficiency of the employees (Escribano et al., 2009; Moos et al., 2013).

2.3 Social Exchange Theory

Since 1922, a paradigm shift named as “Social Exchange Theory (SET)” was introduced by (Malinowski, 1922) and this introduction of SET enabled the Organizations to understand the workplace behaviors. So, the origin of this theory was started at least in 1920s (Mauss, 1925). The theory also linked with various other disciplines like social psychology (Gouldner, 1960), sociology (Blau, 1964) and anthropology (Firth, 1967) and so on.

Wals (2007) postulated that SET has also applied for knowledge exchange among employees. He further postulated that in order to make a sustainable world and infinite

existence of humans on earth, knowledge exchange is necessary and such exchange can be made between employees as a receiver or a sender; and organizations needs to retain all knowledge for sustainable future. In the era from 2000 to 2015 the world achieved a fast track of developmental goals through technological advancement (Foley et al., 2017). The basic mechanism of all technologies have been achieved to the maximum desired level and will be grown by exponential multiplication. Due to said exponential multiplication, the world may face the issues of sustainability (Tsai & Liao, 2017). Now from January 2015 the United Nation (UN), through its agency UNDP, has issued the narrative of sustainable development goals (Wellard, 2017). Due to this narrative of sustainable world, the physical world is now shifting to virtual world (Holden et al., 2017). Therefore, due the importance of virtual organizations, this study can use SET to examine the relationship of communication, trust and knowledge sharing on absorptive capacity for virtual educational institutions in Pakistan. (Easterby-Smith et al., 2008) while analyzing the absorptive capacity process, stated that empirical work of Cohen and Levinthal (1990) was related to research and development (R&D) firms only. Whereas the AC followed from the observation of reification. The conceptual discussion of AC is broader and applicable in other organizations as well and social exchange is more appropriate to test absorptive capacity. Hence, this study chooses social exchange theory for empirically understanding of AC.

2.4 Relationship among Variables

2.4.1 Communication and Trust

In virtual organizations, both communication and trust and important factors for virtual team building (Lukić & Vračar, 2018). The term communication was defined as a timely sharing of meaningful information either formal or informal (Riley, 1954; Rogers & Shoemaker, 1971), the term trust is defined that one can be relied on other or one can accept the other asking to him through words or written statement (Anderson & Narus, 1984; Rotter, 1967). The researcher Ruppel and Harrington (2000) explored the link between communication and trust for Organizations and found a significant positive correlation between communication and trust of employees in presence of ethical work climate, commitment, and Innovation. The researchers Jarvenpaa and Leidner (1998) found a positive relationship between communication and trust for intervention of across geographical virtual teams. Similarly, the researchers (Ball et al., 2004) have also found a positive relationship between communication and trust for the prospects of customer loyalty in IT based virtual businesses. Therefore, based upon the aforesaid discussion, following hypothesis is need to be empirically tested:

- **H_1**: Communication will be positively related to trust towards virtual educational institutions of Pakistan.

2.4.2 Trust and Knowledge Sharing

The term knowledge was defined by Liebeskind (1996) as " the information whose validity has been established through tests of proof". Dixon (2000) have also described the term "knowledge sharing" as "a kind of knowledge which shared through exchange of behavior." With respect to the theory of knowledge creation, it is considerably admitted in literature that institutional knowledge is naturally created by employees through routine work and interpersonal trust (Nonaka & Konno, 1998). A one of the

major issue arises is that the institutions were struggling for transfer of institutional know-how to the employees and from employees to organization (Sirmon et al., 2007). As it is believed that trust is a vital factor in explaining knowledge sharing between employees and socially attached members of the Organizations (Butler, 2001; Mayer et al., 1995). The knowledge sharing either tacit or explicit with the employees are based on trust; and further believe that the provided knowledge is reliable and the knowledge source is honest (Hsu et al., 2007; Usoro et al., 2007). Therefore, hypothesis for the impact of trust on knowledge sharing is need to be empirically tested:

- **H_2:** Trust will be positively related to knowledge sharing towards virtual educational institutions of Pakistan

2.4.3 Knowledge sharing and Absorptive capacity

Cohen and Levinthal (1990) defined it as the capability of a person to recognize the importance of new knowledge and to integrate it and to apply it for commercial motives. It also defines that the absorptive capacity of the firms is more likely to be a by-product of routine activities for knowledge sharing among employees in the organizations (Van-Den et al., 1999). Knowledge sharing also described the behavior of peoples regarding distribution of acquired knowledge to others either within certain community or otherwise (Yu et al., 2010). Lane and Lubatkin (1998) further augmented that AC is a dyad level construct denoted rather than a firm's level construct. A one other research of Zahra and George (2002) reveals that the knowledge sharing take place at both ends, when employees interact with each other and this double effect can also double the absorptive capacity of the Organization. (Massey & Montoya-Weiss, 2006) revealed that some time Organizational knowledge creation process may not successful because of the low absorptive capacity in employees. The study of Daghfous (2004) have found that social interactions have an impact on absorptive capacity of the organizations for knowledge creation process in the Organization. Whereas the studies of Lee et al. (2014) and Liao et al. (2009) have also tested these assumptions for the virtual organizations. The results suggested that in virtual organizations the knowledge sharing among virtual teams, employees are the best tool to develop their absorptive capacity. The empirically investigation of this relationship is tested by following hypothesis:

- **H_3:** Knowledge sharing will be positively related to absorptive capacity towards virtual educational institutions of Pakistan.

2.4.4 Communication and Absorptive capacity

Communication among employees play a very dynamic role in developing the absorptive capacity of Organizations (Cohen & Levinthal, 1990). From the studies of Van-Den et al. (1999) it has often been seen that within the innovation system of the organizations; all employees are on the same directional line. Various other studies also referred that in spite of clear directions for innovation potential, already existed, but organizations may failed to achieve innovation due to poor communication among employees and low absorptive capacity (Melkas et al., 2010; Nooteboom, 2000). The absorptive capacity from an individual to organizational level portray the mechanism that organizational absorptive capacity depends upon individual members (Argote & Ingram, 2000; Silverberg, 1991). Only building the absorptive capacity for individual employees,

without linking it with firms innovation, may not be beneficial for the organizations (N. Da-Silva & Davis, 2011). The cross functional communication among employees was considered a basic factor for building the internal capacity of the employees and absorptive capacity of the organizations (Darawong, 2015; Ford, 1996). From the studies of (Mayeh, 2010; Mayeh et al., 2016) it was admitted that communication through trust have an impact on absorptive capacity in connection with implementation of ERP system. Therefore, this study empirically tested following hypothesis:

- **H_4:** Communication will be positively related to absorptive capacity towards virtual educational institutions of Pakistan.

2.4.5 Mediating Role of Trust and Knowledge Sharing

Communication is one of the main developer of trust (Morgan & Hunt, 1994). Various studies found a good relationship between communication and trust in various institutions (Anderson & Weitz, 1989; Anderson & Narus, 1990). Whereas study of Hendriks (1999) has also witness that communication in an organizations leads to contribute in knowledge sharing (Hendriks, 1999). Communication add in knowledge exchange by capturing the value of knowledge exchange process (Mohr & Spekman, 1994). Liao et al. (2007) suggested that depth and diversity of experience in employees affect their absorptive capacity in both positive and negative direction. In Organizations, the knowledge creation can be possible, if two people exchange and share their knowledge with each other. (Miller, McAdam, Moffett, Alexander, & Puthusserry, 2016) suggested that some time lack of trust may cause less knowledge creation in the Organization and resultantly less absorptive capacity of employees. The study of Ratten (2004) reveals that the main indicator of success for ICTs based firms is mainly their absorptive capacity . They investigated that trust between firms and within ICT firms plays a vital role in facilitating absorptive capacity and this effect is reversely effected in case of low trust. In order to implement a successful ERP system, the absorptive capacity has a significant impact through communication and trust (Mayeh, 2010; Mayeh et al., 2016). The study of Arnulf, Dreyer, and Grenness (2005) suggested that in the supply chain management projects the trust and knowledge sharing have a relationship with AC. This study empirically investigates these mediating roles through following hypothesis:

- **H_5:** With respect to virtual educational institutions of Pakistan, trust and knowledge sharing sequentially mediates the relationship between communication and absorptive capacity.

2.5 Research Model

As discussed the study examine the role of communication, trust, knowledge sharing in explaining the absorptive capacity of virtual educational institutions of Pakistan. The model of this study is appended below:

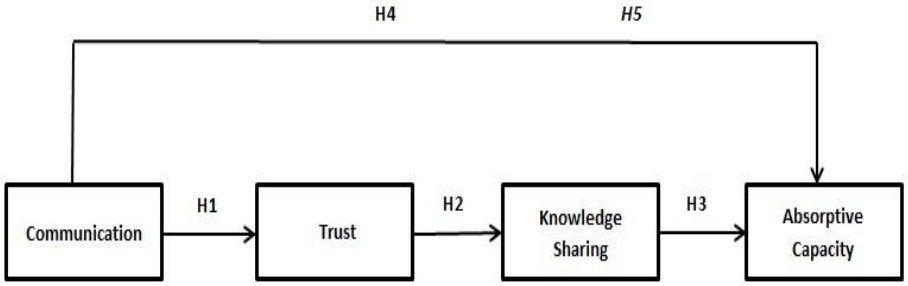

Figure 1: Research Model

3. Research Methodology

This research statistically analyzed the role of communication on absorptive capacity in virtual educational institutions of Pakistan. The mediating role of two other variables i.e. trust and knowledge sharing has been analyzed in the said relationship. The Primary data for this research was collected through online survey i.e. Questionnaires that contained 34 items on variables and 10 items for demographic information. This research divided the questionnaire in 02 parts. The 1st part is about the demographic information and 2nd part is about the underlying variables. Keeping in view of variables, total 34 questions has been drawn by researchers as mentioned in measurement table 1. The target population of the study is all employees of two distance-based universities in Pakistan. One is Virtual University of Pakistan (VU) and second is Allama Iqbal Open University (AIOU). Velicer and Fava (1998) proposed "rule of 10"; which explains that appropriate sample size of the study, has to be ten times the number of items in the study. Keeping in view the suggestion suggested by Velicer and Fava (1998); 350 questionnaires were distributed among respondents. 272 questionnaires were received back; 78% is recorded as a response rate. Five responses were deleted, as they were found as incomplete due to missing data. A total 267 responses has been used for data analysis of this research.

3.1 Measures

For the current research, instruments (appendix-I) developed and tested by past researchers were adopted. The measures were found with good reliabilities. As it is generally accepted that already tested measures leads to enhance the significance of the research findings (Eisenhardt, 1989; Ioannidis, 2005). Further, it also lessen the likelihood of instrumentation intimidation (Einarsen et al., 2009). Measurement table along with reliability factor is also given below. A seven (07) point Likert scale was used.

Table 1: Measurement Table

No.	Variables	Scale	Item	Reliability	Reference
1	Communication	1-7	05	0.84	(Wu et al., 2006)
2	Trust	1-7	04	0.87	– DO –
3	Knowledge Sharing	1-7	04	0.93	Thomas and Laurence, 1998)
4	Absorptive Capacity				– DO –
4.1	Acquisition of Potential Capacity	1-7	06	0.79	(Jansen et al., 2005)
4.2	Assimilation of Potential Capacity	1-7	03	0.76	– DO –
4.3	Transformation of Realized Capacity	1-7	06	0.72	– DO –
4.4	Exploitation of Realized Capacity	1-7	06	0.73	– DO –

3.2 Data Analysis

For data analysis we use MS Excel, SPSS (V.22), AMOS (V.20) and PROCESS developed by (Hayes, 2013).

4. Results

4.1 Measurement Model Evaluation

4.1.1 Initial Measurement Model Evaluation

In order to ensure sample adequacy, this study conducted KMO and Bartlett's Test and its value was found as 0.907 (acceptable between 0.8 to 01). Hence, responses of 267 employees were found adequate for further analysis. In this research, a test named as "Confirmatory Factor Analysis (CFA)" was conducted. The main purpose behind CFA test was to identify the items of measures that represent the study concepts. In this regard following tests were conducted.

"Chi-square test (also written as x^2) is performed in order to measure the difference of covariance in observed and estimated variables. It has a formula like x^2 = (N-1) to calculate the values.

In this study, the initial test for chi-square showed the value 1228.956 and value for Degree of Freedom (DF) is 2.377. Here DF is defined as "the information in shape of mathematical values available for estimating the model"(Hair et al., 2009).

The study also conducted the tests named as "Goodness-of-fit (GOF)". These test suggested the controls on estimated values over observed values. In this research these tests used to specify that how research model reproduced the covariance between factors of latent variable. The covariance of estimated over the observed variables was described in GOF model or it can also be explained that it summarized the difference between values expected under the research model and observed values (Hair et al., 2009). Following tests were run in AMOS 20 to analyze GOF model:

A test named as RMSEA is an abbreviation of "Root Mean Square Error of Approximation" was applied in this study. This test was used to analyze misfit / fit of

population used in this research. Under this test, the values which are closer to 0 is accepted as superior for model fit. Various researches also told that value <0.05 along with 95% confidence interval has considered as an acceptable model fit. In this research, the RMSEA value at initial measurement showed 0.072 and this is not a good fitted model. This study has also conducted a test named GFI which is an abbreviator of "Goodness of fit Index. The researcher told GFI is also used to measure a model fit between the research hypothesis and proportion of covariance in data matrix (Kline, 2011). Some other researchers (Jöreskog, 2004; Moustaki et al., 2004) inserted that "GFI estimations compared the tested model of research with no model at all". In this research, a value of 0.763 was reported as GFI in initial measurement model which is not good. Researcher accepted that GFI must be >0.85.

A test named as "Comparative Fit Index (CFI) was also performed in this research. It is also named as "The Bentler Comparative Fit Index (CFI)". This test is mostly used to compare the specific model with some alternatives. The value >0.90 accepted as a model best fitted (Hair et al., 2009). In this study, a value of 0.815 was reported at the initial measurement model which is lower as compared to acceptable values.

4.1.2 Final Measurement Model Evaluation

After reviewing the initial measurement model and fit indices results, the model was re-estimated for acceptable / better results. Modification indices (MI) were analyzed, that helped in identifying the problematic indications. Hence, three items of dependent variable i.e. Absorptive Capacity (AC3, AC10 and AC21) were deleted. Validity test was conducted to estimate and measure the correctness of concept used in the research model (Hair et al., 2009). This test also used by other researcher for testing hypothetical concept (Kline, 2011).

In performing the test for construct validity two sub categories i.e. Convergent and discriminant validity were examined. As reported by (Kline, 2011) that Convergent validity describe the level of indication of latent construct in sharing the proportion of variance in common. Whereas the discriminant validity describe the level of construct is distinct from other constructs (Hair et al., 2009).

For tests of comparative fit index (CFI), TLI, NFI, and incremental fit index (IFI) etc. top researches Byrne and VD-Vijver (2010) has suggested that the values should be >0.90. However, the value of all these tests if ranging between any value of 0.80 and 0.89 shall be considered marginal fit and values between 0.60 and 0.79 shall be considered as a poor fit and value < 0.60 as a very poor fit. The author further suggested that for the purpose of RMSEA test, the value less than 0.05 is considered as good and value ranging between 0.05 and 0.08 as a reasonable fit and value between 0.08 and 1.0 as a poor fit and any value from 1.0 is a very poor fit (Hooper et al., 2008).

Table 2: Initial, Final and Structure Measurement Model

	Initial Measurement Model Estimation	Final Measurement Model Estimation	Status	Structure Measurement Model Estimation
Chi-square (*x*2)	1228.956	629.391	Improved	737.284
***x*2 / df**	2.377	1.570	Improved	1.825
CFI	0.815	0.932	Improved	0.901
TLI	0.799	0.921	Improved	0.886
IFI	0.817	0.933	Improved	0.903
NFI	0.721	0.835	Improved	0.807
GFI	0.763	0.866	Improved	0.854
AGFI	0.727	0.835	Improved	0.820
RAMSEA	0.072	0.046	Improved	0.056

This study used AMOS (20) to perform all tests for validity and reliability. Gaskin (2012) has issued a statistical tools packages; (macro file) to test reliabilities and validities. This study has also used the said statistical tool package to check discriminant validity, convergent validity, and composite reliability. Correlation values are depicted in below table 3. In order to analyze the level of consistent measure in measuring what is intended to be measured, the reliability test is required. This test described the consistency of the results across various times. This study also conducted the test for two sub-categories of reliabilities i.e. composite reliability and Cronbach alpha. The test named as "Composite Reliability (CR)" is used for measuring the reliability (Bacon et al., 1995; Wellard, 2017) and it should be above 0.70. Cronbach's alpha (CA) test conducted to quantify the scale of reliabilities (Sekaran, 2000). Under CA test, all reliabilities are >0.65 which shown good internal consistency. The focus was on two measures of reliability: CA which is widely applied whereas CR is more general measure in its use (Peterson & Kim, 2013). Both CR and CA were found acceptable on the same definition of reliability with Minor assumptions. CR measure belongs to a generic framework of modeling while CA is based on the classical true score model of psychometrics. The purpose of using CR along with CA is that CA is shown some restriction in measurement of special cases (Raykov, 1998a). According to the simulation experiments, the statistical properties of CR measure proved to be more acceptable (Bacon et al., 1995). Conversely, the study revealed additional evidence concerning the unsuitability of CA as a measure of reliability. The results suggest that CR measure of reliability should supersede CA in all applications (Da-Silva et al., 2000; Hair et al., 2011; Raykov, 1998a, 1998b).

Table 3: Validities, Reliabilities, Mean, Standard Deviation and Correlation

	CR	CA	AVE	Mean	S.D	COMM	Trust	KS	AC
COMM	0.828	0.793	0.500	6.0037	0.80365	(0.705)			
Trust	0.805	0.772	0.509	6.1339	0.69579	0.549**	(0.713)		
KS	0.907	0.787	0.713	6.0637	0.74160	0.454**	0.459**	(0.844)	
AC	0.974	0.884	0.905	5.6392	0.78985	0.542**	0.581**	0.493**	(0.951)

Note: CR* composite reliability, AVE* Average Variance Extracted, COMM* Communication, KS* Knowledge Sharing, AC* Absorptive Capacity. Values mentioned with ** are correlation values.

This study conducted discriminant validity test by calculating average variance extracted for every pair of constructs of this research and by comparing its values with square of correlation between constructs. Based upon the results, it is indicated that all constructs are different from one another. It is shown as a diagonal values enclosed in the bracket.

In order to measure correlation between variables studied in this research, Bi-variate analysis has been made. The study has also get mean values of communication, trust, knowledge sharing and absorptive capacity to conduct required test in SPSS file. Above mentioned table 3 showed the results of bi-variate analysis. This described that all the variables studied under this research are significantly correlated. Communication is positively correlate with trust ($r=0.55$ $p<0.01$) with knowledge sharing ($r=0.45$ $p<0.01$) and with absorptive capacity ($r=0.54$ $p<0.01$). The mediating variable - I i.e. trust has also positive correlation with knowledge sharing ($r=0.46$ $p<0.01$) and with absorptive capacity ($r=0.58$ $p<0.01$). The mediating variable i.e. knowledge sharing was also found significantly correlated with absorptive capacity ($r=.49$ $p<0.01$).

4.2 Descriptive Analysis

Table 4 depicts the results of descriptive statistics of this study.

Table 4: Respondents Profile Statistics (Percentage, Mean & SD)

Sr. No.	Demographics	Sub-Categories	%	Mean	SD
01	Gender			1.38	0.49
		Male	62%		
		Female	38%		
02	Age			2.87	0.72
		20-30	31%		
		31-40	53%		
		41-50	14%		
		51 and above	2%		
03	Designation			2.51	1.62
		Level-I (Director/ HOD/ Principal/ Incharge/ Regional Incharge)	27%		
		Level-II (Administrator/ Manager/ Assistant)	39%		
		Faculty members	34%		
04	Education			3.5	1.21
		Masters and below	57%		
		M.Phil	33%		
		PhD	10%		
05	Specialization			3.36	2.87
		Management Sciences	40%		
		Computer Sciences	22%		
		Social Sciences	16%		
		Others	22%		
06	Total Work Experience			2.19	0.95
		1-5	20%		
		6-10	52%		
		11-15	20%		
		16-20	4%		
		21 -25	3%		
		26-30	1%		

4.2.1 One-Way Analysis of Variance (ANOVA)

Gender, age, designation, education, specialization and total work experience were proposed as a control variable for this study. The ANOVA test results showed in Table 5 discovered that gender ($F= 1.194$, $p = 0.275$), age ($F= 0.812$, $p = 0.368$), designation ($F= 0.131$, $p = 0.717$), education ($F= 0.023$, $p = 0.881$), specialization ($F= 1.040$, $p = 0.309$) and total work experience ($F= 0.065$, $p = 0.798$) were found insignificant**.**

Table 5: ONE WAY ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Gender	Between Groups	0.744	1	0.744	1.194	0.275
	Within Groups	165.202	265	0.623		
	Total	165.947	266			
Age	Between Groups	0.507	1	0.507	0.812	0.368
	Within Groups	165.440	265	0.624		
	Total	165.947	266			
Designation	Between Groups	0.082	1	0.082	0.131	0.717
	Within Groups	165.864	265	0.626		
	Total	165.947	266			
Education	Between Groups	0.014	1	0.014	0.023	0.881
	Within Groups	165.933	165	0.626		
	Total	165.947	266			
Specialization	Between Groups	0.649	1	0.649	1.040	0.309
	Within Groups	165.298	265	0.624		
	Total	165.947	266			
Total Work Experience	Between Groups	0.041	1	0.041	0.065	0.798
	Within Groups	165.91	265	0.626		
	Total	165.95	266			

4.4 Regression Analysis

Mediation analysis was conducted using PROCESS developed by Hayes (2013). All hypotheses were tested by using said PROCESS and direct and indirect paths were analyzed. The study has reported the regression results in terms of Beta values, S.E values, T values and P values. Hayes Model No. 6 was used in this research to test the relationships. Through model 6, this research conducted a sequential mediation regressions analysis. By using Model 06, it is checked that how communication effect the absorptive capacity and how trust and knowledge sharing sequentially mediate this relationship. Following are results mediation analysis:

The results in below table 6 and Figure 2 shows that COMM has a positive and significant relationship with trust (β=0.475 $p<0.001$) and an significant relationship with KS (β=0.2691, $p<0.001$). Moreover a significant relationship exist between trust and KS

(β=0.3197 p<0.001); trust and AC (β=0.3735 p<0.001); KS and AC (β=0.236 p<0.001). The direct effect of COMM on AC also depicted a significant relationship (β= 0.251, p<0.001). The bootstrap total indirect effect in table 6 reveals that effect of communication on absorptive capacity through trust and knowledge sharing is also significant (B 0.2817, SE 0.0610, LLCL 0.1705 and ULCL 0.4080). Moreover, the limits for bootstrapping confidence interval (both upper and lower), does not include Zero (0) in result.

Table 6: Regression Results & Bootstrapping Confidence Interval

		B	SE	T	P
Indirect Effect (a1)	Communication → Trust Independent Variable → Mediator 1	0.475	0.045	10.685	***
Indirect Effect (a2)	Communication → Knowledge Sharing Independent Variable → Mediator 2	0.267	0.058	4.599	***
Indirect Effect (d)	Trust → Knowledge Sharing Mediator 1 → Mediator 2	0.319	0.067	4.766	***
Indirect Effect (b1)	Trust → Absorptive Capacity Mediator 1 → Dependent Variable	0.385	0.065	5.913	***
Indirect Effect (b2)	Knowledge Capacity → Absorptive Capacity Mediator 2 → Dependent Variable	0.236	0.057	4.125	***
Direct Effect (C Prime)	Communication → Absorptive Capacity Independent Variable → Dependent Variable	0.251	0.056	4.470	***
Total Effect (C)	Communication → Trust → Knowledge Sharing → Absorptive Capacity Independent Variable → Mediator 1 → Mediator 2 → Dependent Variable	0.533	0.050	10.499	***

"Bootstrap result for total indirect effect i.e. from communication to Absorptive capacity through trust and knowledge sharing"

	Boot	SE	LLCL	ULCL
Communication → Trust → Knowledge Sharing → Absorptive Capacity	0.2817	0.0610	0.1705	0.4080

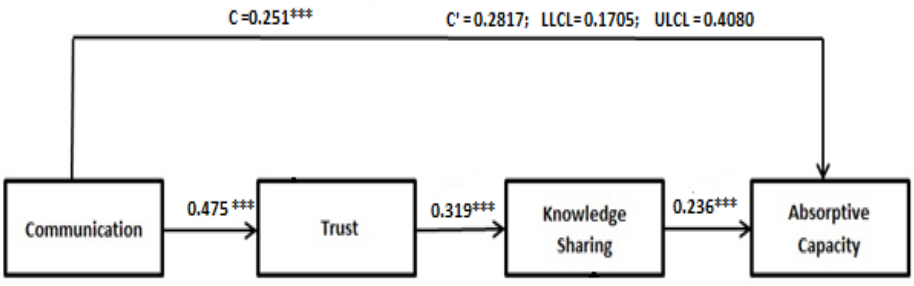

Figure 2: Statistical Diagram on Sequential Mediation; Depicting the Influence of Communication on Absorptive Capacity, Mediated By Trust and Knowledge Sharing

5. Discussion

5.1 Major Findings

Five hypotheses were prepared for this research and based upon the empirical results; all the five hypotheses were accepted. This research found that communication has a positive and significant relationship with absorptive capacity. Hence, communication among employees of virtual educational institutions helps them to develop the absorptive capacity. Study results depicted that employees of virtual educational institutions have frequently interact with each other through virtual connections to solve day to day as well as job related issues and employees share their experience to address challenges. The organizations need to create opportunities of communication among employees to develop their absorptive capacity. H_4 of this study is related to this insertion and also claimed that communication has a positively impact on absorptive capacity ($\beta= 0.251$, $p<0.001$). Before this study, although findings and debate of the researchers was available to find a direct link between communication and absorptive capacity. The cross functional communication among employees was considered a basic factor for building the internal capacity of the employees and absorptive capacity of the organizations (Darawong, 2015; Ford, 1996). From the studies of (Mayeh, 2010; Mayeh et al., 2016) it was admitted that communication, trust and absorptive capacity of the organizations have a significant impact on the organizational capacity for implementation of ERP system. Now this is a first study that found a direct link of communication and absorptive capacity in virtual educational institutions. This study proved that communication among employees leads to develop an absorptive capacity in virtual educational institutions.

This paper also investigated that communication have significantly positively related to trust towards virtual educational institutions. It means that when virtual employees communicate with each through virtual connections, trust is a major factor to believe that the given communication is right and in the best interest of the institution. Therefore, an organization needs to increase the level of communication so the level of trust can also be increased and vice versa. The statistical results of H_1 ($\beta=0.475$ $p<0.001$) have also supported the previous studies claiming that communication takes place with a better level of trust between the receiver and sender. Homans (1958) have found this relationship among small teams, Allert and Chatterjee (1997) have found this relationship among groups and Ruppel and Harrington (2000) have found this relationship among Organizations. This study is the first study which has found the positive and significant relationship of communication and trust in virtual universities.

Through the preset study, it is pointed out that the employees of virtual educational institutions of Pakistan have showed their will for knowledge sharing among virtual members. On the basis of empirical results, one can easily believe that trust is either a bridge or a barrier in the way of knowledge sharing. The knowledge sharing will take place in presence of highly trusted environment among the virtual employees and vice versa. H_2 projected that trust is significantly and positively related to knowledge sharing. The statistical results, in this regard, proven that trust is significantly and positively relate with knowledge sharing in virtual educational institutions of Pakistan ($\beta=0.319$ $p<0.001$). This study also proven various earlier studies i.e. (Berkes, 2009; Tom et al., 2012) and (Hsu et al., 2007; Usoro et al., 2007) which have already found this relationship in various other sectors.

The employees of virtual educational institution have given their opinion in favour of this new insertion in existing research that better knowledge sharing behavior leads to a better level of absorptive capacity and vice versa. H_3 of this research claimed that knowledge sharing is significantly and positively related to absorptive capacity. This insertion also accepted (β=0.236 $p<0.001$). Results revealed that employees of virtual educational institutions of Pakistan have a behavior of knowledge sharing to develop the absorptive capacity of the employees of the institutions. The respondent claimed that they have energetically shared their expertise and knowledge with each other. The study of (Levin et al., 2002) has also revealed that the knowledge sharing was more effective when the knowledge recipient have an ability to understand such knowledge and this understanding would leads to develop the absorptive capacity of the employees. Further, in the studies of (Rafique et al., 2018, 2019) the knowledge sharing was found a significant and positive predictor of absorptive capacity of employees in pharmaceutical industry of Pakistan. Now this study also empirically identified that in an organizational setup the knowledge sharing among virtual employees has a significant and positive relationship with absorptive capacity in virtual universities of Pakistan.

It is a first study, which proved that trust and knowledge sharing have sequentially mediated the relationship between communication and absorptive capacity. Through this present study, it is proved that communication can be accepted under a trusted behavior, knowledge sharing can also be done through trusted behavior and all this sequence leads to develop the absorptive capacity of employees of virtual educational institutions of Pakistan. H_5 is also related to this insertion. The results of all other variables are given in above findings except communication and knowledge sharing. The study of (Al-Nahyan et al., 2019) found a positive impact of communication on knowledge sharing for construction industry. The statistical results stated that the bootstrap total indirect effect in above table 6 reveals effects of communication on absorptive capacity through trust and knowledge sharing was also significant (B 0.2817, SE 0.0610, LLCL 0.1705 and ULCL 0.4080). The bootstrap confidence intervals, both upper and lower, have not included Zero (0) in results and it indicated that mediation existed among variables.

5.2 Research Implications

First, this research has extended the existing body of literature in the field of organizational knowledge management and different dimensions of behavior sciences i.e. communication and trust. These dimensions of behavioral sciences have tested for across behavioral theories i.e absorptive capacity. Second, this study provides significant support to the social exchange theory by arguing that in Pakistan, building of absorptive capacity in the employees of virtual universities is an exchange relationship. Virtual universities need to provide its employees a communication mechanism under trustworthy and knowledge sharing environment and in exchange absorptive capacity of the employees will be increased. Third, the findings of this study are also supported through theory of knowledge creation (Nonaka & Konno, 1998; Nonaka & Toyama, 2015). As more the individual contexts i.e. communication in trustworthy environment is increased among employees of virtual universities in Pakistan along with an increase in their shared context i.e. knowledge sharing will leads to increase their absorptive capacity. Fourth, this study is a leading study on virtual universities in context to

employees social behaviors, knowledge sharing mechanism to build their absorptive capacity. Fifth, this paper tested the hypothesized relationships in Pakistan - South Asian region (earlier known as sub-continent) and depicted picture of eastern culture. Sixth, the top management, policy makers, and employees of virtual universities would understand the ways of acquiring knowledge under dynamic environment from geographically separate units/campuses as well as other employees of same unit / campus. Seventh, the development in the absorptive capacity would facilitate to the virtually connected organizations to maintain their institutional memory to meet the 21st century challenges.

5.3 Conclusion

The primary purpose of the study was to identify the factors affecting absorptive capacity of virtual universities of Pakistan. We identified that virtual universities are facing a problems of low absorptive capacity in their virtual teams. While reviewing the literature, it was found that factors of behavioral sciences have not been empirically tested for absorptive capacity for virtual universities. Aggressive literature review on the absorptive capacity provided the basis of testing communication, trust and knowledge sharing for absorptive capacity. On the basis of theories and study of existing literature, five hypotheses were established. Later, two virtual universities in Pakistan were approached for data collection.

The empirical results provide a good support to social exchange theory and theory of knowledge creations by two ways. First, this research identified that for virtual universities in Pakistan, the absorptive capacity of virtually engaged employees is developed through an exchange relationship. The virtual universities need to provide better communication under trusted and knowledge sharing environment, and as an exchange of this relationship, the absorptive capacity of the employees will be increase. Second, in order to increase the absorptive capacity of the virtually engaged employees, virtual universities need to maintain a knowledge creation mechanism for two context i.e. individual context and shared context. As more the individual context of the virtual employees is increase i.e. communication and trust, along with the shared context i.e. knowledge sharing, it will leads to increase their absorptive capacity. Statistical analysis presented that communication among employees of virtual universities significantly impact on absorptive capacity. So it may be refer to say that greater opportunities of communication by using the modern tools of 21st century age would promote trust among employees which would provide the basis for knowledge sharing and resultantly leads to develop the absorptive capacity.

5.4 Limitations of Study and Future Research Direction

In spite all efforts, this study has also a few limitations which may be removed in future research. First, this research was designed for all employees of virtual universities of Pakistan rather focused on specific unit / team / group in the same university. The future research may be made on small teams/groups of employees and cross sectional examination of the same team / group. Second, across sectional nature of the study as during this research the data was collected at a single point of time. Whereas, longitudinal research design for data collection may produce different results. Third, in addition to the contracts used in this study for absorptive capacity, other variables of behavioral sciences

like innovative behavior and social responsiveness may also explore for absorptive capacity of virtual universities.

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