

Research Article

Moderating Effects of Gender and Resistance to Change on the Adoption of Big Data Analytics in Healthcare

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The big data analytics (BDA) has dragged tremendous attention in healthcare organizations. Healthcare organizations are investing substantial money and time in big data analytics and want to adopt it to get potential benefits. Thus, this study proposes a BDA adoption model in healthcare organizations to explore the critical factors that can influence its adoption process. The study extends the technology acceptance model (TAM) with the self-efficacy as an external factor and also includes gender and resistance to change (RTC) as moderators to strengthen the research model. The proposed research model has been tested on 283 valid responses which were collected through a structured survey, by applying structural equation modeling. Our results portray that self-efficacy is a strong predictor of intention to use BDA along with other TAM factors. Moreover, it is confirmed by the results that RTC dampens the positive relationship between intention to use and actual use of BDA in healthcare organizations. The outcomes revealed that male employees as compared to female employees are dominant towards the positive intention to use BDA. Furthermore, females create more RTC than males while adopting BDA in healthcare organizations. Theoretical and practical implications, limitations, and future research directions also underlined in this study.

1. Introduction

In today's technology-oriented world, the use of information technology (IT) is increasing, and the final data generation is extremely fast. Many resources, such as cell phones, computers, medical records, government records, and social media, are continuously generating data at a very high pace. The world has generated 1.8 zb of data up to 2011, and it is expected that this volume will be increased in 2020 up to 35 zb [1]. This growing volume of data is the reason that why this era is called the age of big data. Organizations are interested in big data analytics (BDA) because it solves several problems that organizations are facing. In addition, BDA is particularly important in the field of healthcare, and healthcare organizations are among the top ten organizations moving towards BDA [2]. In healthcare organizations, BDA can help to suggest prescription, forecast the future trend of diseases, manage better

patient health records, and use it for strategy making [3]. The best example of the use of BDA in healthcare is Google flu trend (GFT) in which they predict the reasons for the H1N1 flu virus and gather the data of patients through BDA. Furthermore, the findings of GFT are recognized by many healthcare organizations that it was very realistic and close to the real causes [1]. Healthcare organizations can adopt a sustainable healthcare system in the form of BDA [4].

According to a survey, 76% of big companies are investing in BDA [5], and healthcare organizations have big ration in it. Meanwhile, existing literature elaborates that organizations are in the adoption phase, therefore, it is essential for the healthcare industry to have an adoption model of BDA before implementation to understand the most important factors in the adoption [6]. To identify the adoption behavior regarding an innovative technology such as BDA is required to be judged prior to the implication which can lead towards its successful diffusion.

Employees are key stakeholders and have a strong impact on the adoption of new technologies because ultimately employees will not adopt the technology if management does not pay attention to the factors that can generate positive willingness to use technology. Moreover, the prior literature is evident that many technologies are failed after influential implementation by organizations (top management) due to resistance from employees [7–10]. Meanwhile, the current systems in healthcare organizations are not capable of analyzing the high volume, velocity, and variety of big data and ignoring a huge amount of significant data in the process of analyzing [11]. Although healthcare organizations consider the importance of BDA, unfortunately, the research of BDA acceptance and implementation in healthcare is behind than other industries like marketing and banking [2]. It is, therefore, necessary to establish a link between several factors in the adoption of BDA to measure employees' perceptions of its use in healthcare organizations, particularly in developing countries. Previous studies have found that people with more computer self-efficacy (SE) feel a technology is more useful and easier to use [12–18]. Therefore, this study also describes SE as an external factor which is integrated with the technology acceptance model (TAM) to design the framework for the current study.

The literature mostly highlights the importance, challenges, and benefits of BDA in healthcare organizations [3, 19, 20]. Only a few studies discussed the adoption factors at a very basic level [4, 21, 22]. Several limitations are still existing, and several factors are not focused that are important for BDA adoption in the healthcare particularly the role of gender, which is important in measuring the behavioral intentions [23]. Prior literature argued that gender differences vary in different factor relationships and are needed to be studied to check the effects of the actual relationship with regard to gender [24]. The relationship between latent constructs can be positive or negative, depending on gender. Therefore, researchers cannot determine the actual effect of exogenous factors on endogenous factors without assessing gender differences [25]. Moreover, the lack of studies in context to measuring BDA adoption in healthcare organizations motivates us to investigate the crucial role of gender in the adoption of BDA in healthcare organizations.

Furthermore, resistance to change (RTC) in employees against the adoption of innovative technology is a critical barrier to its implementation [4, 26]. The healthcare organizations are also facing a huge RTC from employees when they are implementing different healthcare systems like online healthcare record system [27, 28]. Moreover, RTC has a dual effect, on one side it resists the adoption and implementation process, and on another side, it also changes the perception of those employees who want to adopt the technology [29]. Thus, it is worth important to investigate the role of RTC in the adoption of BDA in healthcare organizations, which has been less focused by the prior scholars [4]. Moreover, previous literature also established that RTC is more severe in female as compared to the male [30]. The study of Abbas Pakdel [31] highlighted the fact that in most cases RTC only created from the female side, so to establish the original picture of the RTC, the influence of gender difference regarding RTC should be studied. Therefore, this study integrated the moderating role of RTC as well as the impact of

gender in the adoption of BDA in healthcare organizations in developing countries from the employee's perspective, which has not been discussed by scholars. It is justified by the conclusions of this study that SE is a strong proctor of Perceived usefulness (PU), Perceived ease of use (PEOU), and intention to use (IU) of BDA. Meanwhile, RTC also negatively moderates the relationship of IU and Actual use (AU) of BDA. Especially the results of gender are fascinating; the males are dominant in the relationships of SE and PU, SE and IU, PEOU and PU, and PU and IU of BDA. Moreover, females are dominant in the moderating role of RTC, means females creating more RTC towards the adoption of BDA.

Further, the authors discuss the relevant literature in Section 2. Theoretical framework and hypotheses are in Section 3. Section 4 describes the material and method. The results are elaborated in Section 5. Discussion and conclusion are in Section 6. Section 7 includes implications, limitations, and future research.

2. Literature Review

BDA can be defined as the technology that can extract valuable information from the big volume, velocity, and variety of data [5, 15]. The study of Yasin et al. [32] has defined BDA as a system that has the ability to gather, store, analyze, and communicate the big database. So, in this study, the authors consider BDA as an innovative technology that can extract hidden useful information from the huge volume, velocity, and variety of healthcare big data, and the information provided by BDA can help to improve the healthcare facilities. However, in the world of technology innovations; acceptance and rejection of technology is always a big issue and concern in the information system (IS) field [23]. It is important to highlight the factors of concern that might influence the adoption of innovative technologies such as BDA with respect to healthcare organizations, particularly in developing countries like Pakistan. Countries around the globe are shifting from traditional ways of analyzing data to BDA for decision making, even in healthcare [5]. In SAARC countries, Pakistan was the first that launched e-government in 2002 [33] and also in the countries that are the largest contributor in IT. Pakistan is also at the initial phase of BDA adoption, particularly in healthcare as compared to other sectors such as marketing, banking, and so on [4]. Ministry of information technology (MOIT) following a program for the development of BDA among the various industries, especially in the healthcare for recording and analyzing the big data which can be used for further decision making by doctors, physicians, consultants, and other concerned [26]. In May 2018, Pakistan launched "National Center in Big Data and Cloud Computing (NCBC)" that is based on 12 laboratories from 11 universities around the country that are specialized in the field of medicine, agriculture, energy management, and distribution, to boost the trend of BDA among the various industries [34]. It is concluded by the above-cited literature, Pakistan has a potential to adopt the BDA and significantly required to implement BDA, especially in healthcare because of a huge amount of valuable healthcare data wasted and cannot be used in decision making due to the non availability of BDA [35–38].

However, besides all the importance of BDA, employees are responsible for operating BDA in healthcare for gathering, recordings, and analyzing the health data that can be used for further decision making. Therefore, the employee's intention can significantly contribute to the adoption of BDA in healthcare organizations. This study aims to explore the impact of key behavioral characteristics on the employee's intentions of BDA adoption in healthcare organizations in Pakistan. Employees can play a significant role in the success and failure of such innovative technology; therefore, it is important to identify the employee's intention regarding the adoption of BDA in health organizations. TAM is the most used model to check the adoption of innovative technologies. Several studies provided evidence that factors of TAM are a powerful predictor of the adoption of different innovative technologies like healthcare record system, online shopping, e-government, and mobile shopping apps [23, 39–41]. Meanwhile, the studies applied TAM model in organizational context to identify the employees' intentions to use the innovative technologies [4, 5, 42, 43]

The studies also used the TAM model to investigate the adoption mechanism of BDA and proved that PU and PEOU are powerful characteristics of IU [4, 5, 42], however, ignored the important part of external variables that can strongly influence the both PU and PEOU. It is confirmed from the literature that TAM is insufficient to predict the individual intentions to adopt a technology, and suggested that TAM should extend with other factors to increase the specificity and predictive power [44]. The lack of discussion in the previous literature regarding the current issue motivates the researchers to fill this gap, by implementing the extended TAM to investigate the adoption of BDA among the employees of healthcare organizations of Pakistan.

3. Theoretical Framework and Hypotheses

The theoretical framework of this study is based on extended TAM; integrated with the self-efficacy (SE) as a key external factor predicting PU, PEOU, and IU in adoption of BDA among the employees of healthcare organization [5, 23, 43, 45]. Meanwhile, this study incorporated RTC as a moderator to empirically investigate its impact on the actual adoption of BDA in the healthcare organization of Pakistan. Moreover, grounded on the strong literately support; this study also describes the role of gender as a moderator between all relationship to fulfill the existing gap in the research which has not been discussed in the current study settings.

3.1. Self-Efficacy. In the present study, the computer self-efficacy (SE) can be defined as the individual ability to perform a given task by using a computer. In this study, individual means the employee of an organization who is directly or indirectly related to the use and development of BDA. Prior studies explored that the individual who has more computer SE will perceive a technology more usefulness and ease to use [16, 17, 23]. It suggests that if an individual perceives that he can smoothly perform the computer-related tasks, definitely it will increase the PU and PEOU.

Many prior studies demonstrated the importance of SE in the healthcare as the study of [17] concluded in the context of electronic health record system acceptance in nursing school, SE of nursing students positively influenced the PU and PEOU. Further, they explored that through training as they increase the SE of students, the PU and PEOU of the students about system also increase. The study of [23] use SE as an antecedent variable and validate its significant relation with PU, PEOU, and IU the electronic health record system. Moreover, Ibrahim & Sun [16, 46] also authenticated that SE is a significant predictor of PU, PEOU, and IU in the context of mobile health service and E-learning system, respectively. So, on the basis of the mentioned literature, we propose that SE will positively influence the PU, PEOU, and IU of BDA system in healthcare.

H1a: Self-efficacy has a positive relationship with the PU.

H1b: Self-efficacy has a positive relationship with the PEOU.

H1c: Self-efficacy has a positive relationship with the IU.

3.2. Perceived Usefulness. PU is a degree to which an employee of organization perceives that the use of the system or technology will enhance his or her performance in daily job tasks [47]. In this study, we can define PU as the perception of an individual that the use of BDA will enhance his performance in his or her daily job. PU is the most potent predictor of IU and widely used variable in the field of adoption of technologies [48]. Prior literature declared that PU is a crucial variable while predicting IU of technology [4, 49]. The study of Ambak et al. [50] concluded that PU has a significant positive relationship with the driver's IU of electric cars. The study of Dutta [23] established the strong positive influence of PU on the user's IU of online healthcare record. The study of Wu & Chen [51] also proved the direct positive relationship of PU with a user's IU of massive open online courses. Many studies demonstrated the PU positive direct predictor of IU the BDA [4, 43, 49, 52]. So, with the essence of the TAM model, we also propose that PU has an influence on IU of BDA in healthcare.

H2: PU has a positive relationship with IU of BDA.

3.3. Perceived Ease of Use. PEOU can be defined as the extent to which an individual or employee perceives that the use of the system or technology will make his or her job effortless [47]. In the context of the current study, PEOU can be defined as the use of BDA in healthcare will make the daily job tasks of practitioners effortless. For example, BDA provides the ease of acquiring analyzed health record and recommendations regarding medication. Prior literature established the influence of PEOU on both IU and perceived usefulness [51]. Many previous studies established the direct influence of PEOU on PU and IU of different technology or systems, i.e., in the context of massive open online course [51], online health record [23], mobile health services [46], and drivers IU of electronic cars [50]. PEOU has more importance in BDA context because BDA contains a high volume of heterogeneous data. So, a user of BDA might feel difficult to use this system. Another reason that increases the importance of this variable is that BDA system is relatively new, and the user might take

low PEOU. Previously many studies used PEOU in the field of BDA to predict the PU and IU [4, 43, 49].

Therefore, based on previous literature, this study also proposes that PEOU has a positive influence on PU and IU.

H3a: PEOU has a positive relationship with PU.

H3b: PEOU has a positive relationship with IU of BDA.

3.4. Intention to Use BDA. The IU is an individual's good or bad feelings about the usage of any technology. In this study, we can define IU as the positive or negative feeling of practitioner regarding usage of BDA in the healthcare job. IU is the first step towards AU of any technology [53], and it already has established a strong predictor of AU [4, 54]. IU is an essential mediator between the independent variables and AU of technology [45]. Many studies in the context of different technologies adoption established a significant positive relationship between IU and AU [55]. In the field of BDA, it is evident from the previous literature that IU of BDA has a positive relationship with the AU of BDA [4, 43]. Thus, keeping in mind the previous literature, this study also hypothesized that:

H4: IU of BDA has a positive relationship with AU of BDA.

3.5. Gender. IT is now an essential part of life, and gender differences should study that can impact its adoption and implementation [21]. Gender-based differences are most important to be investigated in technology adoption [56]. In the acceptance of technologies research, only a few studies incorporated this construct and most of the studies, unfortunately, neglected this vital aspect [23]. Development of skill level and perceptions in both the female and male are different in different societies, and it needs to study the gender differences in different societies regarding the acceptance of technologies [54]. Many studies only used this variable to indicate gender differences, and only a few studies consider it as a moderator between predictor variables and IU [23]. This study considers gender differences as a moderator and investigates its impact on the behavioral perception of an employee regarding the adoption of BDA. The moderator impact of gender in relationships among SE, PU, PEOU, and IU is established significant by previous literature [34] in different research settings. The study of Vekiri and Chronaki [57] investigates the moderating effect of gender in the online education field and concluded that female students have less computer efficacy compared to male. Mostly in developing countries, female interaction with the computer is lesser than male, and this lesser experience and exposure makes female weaker in this area of computer SE. The study of Gefen and Straub [58] also studied moderating effects of gender and demonstrated the meaningful, significant impact of gender differences of PU and PEOU towards an IU of technology. The study of the Moon and Kim [59] reported that males are dominant on female regarding PEOU that is due to the dominance of SE. The study of Venkatesh et al. [60] proved that males are ahead from females in PU of technology.

In the field of BDA, there is a lack in the literature regarding the inclusion of this critical factor as a moderator. The

study of Shahbaz et al. [4] suggested that future studies should focus on Individual differences (gender) in the field of BDA adoption. The study of Brock [53] also highlights the importance of gender in the section of future directions. Prior literature also highlights gender differences in RTC. The study of Pakdel [61] concluded that females create more resistance to change compared to males against the adoption of innovative technology. Another study empirically proved that RTC from females was higher than males [30]. Prior studies ignored the gender difference in this study context. So, this study also aims to bridge this gap by studying the impact of gender on the moderating impact of RTC between IU of BDA and AU.

So, in the light of previous literature, the investigation of the moderating impact of gender difference in the context of BDA adoption brings further insight into the field of BDA. Therefore, we hypothesized;

H5a: Gender will moderate the impact of SE on PU.

H5b: Gender will moderate the impact of SE on PEOU.

H5c: Gender will moderate the impact of SE on the IU of BDA.

H5d: Gender will moderate the impact of PU on IU of BDA.

H5e: Gender will moderate the impact of PEOU on PU.

H5f: Gender will moderate the impact of PEOU on IU of BDA.

H5g: Gender will moderate the impact of IU of BDA on AU of BDA.

H5h: Gender will moderate the moderating impact of RTC on the relationship between IU of BDA and AU of BDA.

3.6. Resistance to Change. The situation of difference between the old and new way of thinking is called change [62]. RTC is the behavior of an employee that resists him or her to adopt the real or prospective change [63]. Employees create a resistance towards change to protect the status quo [64]. In this study, RTC can be defined as the resistance of healthcare organization employees against the change of switching the old healthcare system to BDA to protect their comfort zones. Employees always create RTC in the implementation of the new innovative system because it contradicts with the old habits and comfort zones of employees [31]. Organizations should train employees, improve their skills, and motivate them to avoid the RTC while implementing new systems [40]. The factor of RTC is very important to study in the field of behavioral intentions [45] and reported that RTC has a negative impact on the adoption of innovative technology in the previous research [65].

The study of Lallmahomed, et al. [66] highlighted the importance of RTC in the adoption of E-government and reported the negative impact of RTC in the adoption of E-government system. The study of Alomari et al. [67] also studied RTC in the field of IT adoption and concluded RTC as one of the major factors that are the cause of failure of IT system implementation. In the field of technology adoption, many other studies also highlight the RTC as a barrier in technology adoption [31, 68, 69]. Specific to the healthcare sector, the American health and human services department faced a strong RTC from employees when they are adopting e-health record system [39]. Prior literature elaborated that RTC is a key barrier in the adoption of IT in healthcare and need to be

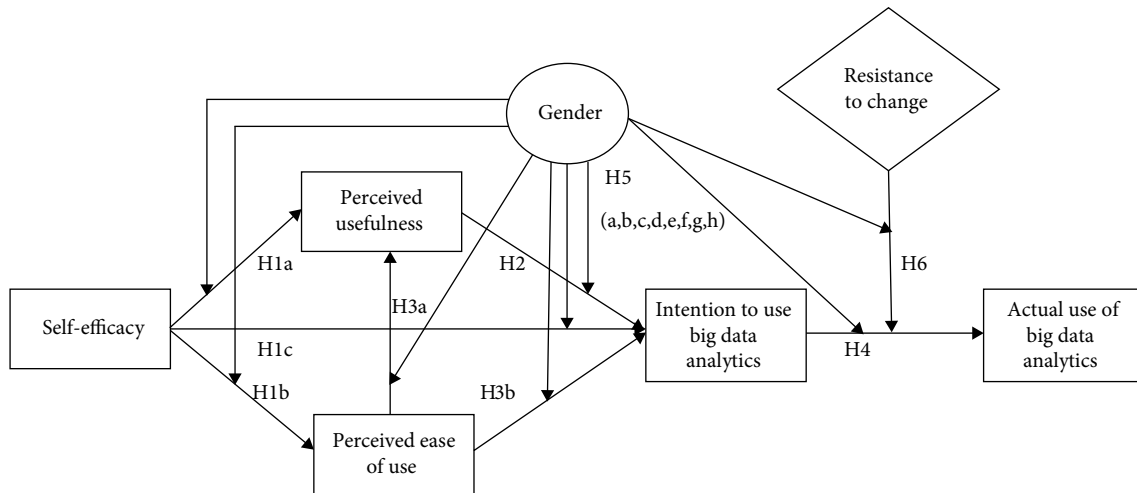


FIGURE 1: Research Model.

studied in different innovative technologies adoption in a different sector [70–72].

The study of Nejati et al. [26] used RTC as a moderator and find that RTC negatively moderates the relationship of IU and AU of green supply chain management system. Another study of Stavros et al. [73] used RTC as a moderator and established RTC a strong moderator between the relationship between psychological capital and organization citizenship behavior. In the field of BDA, recently the study of Shahbaz et al. [4] investigated the moderating role of RTC between IU and AU and proved negative moderation. The study also suggested that RTC should study in different cultures, populations, and sample sizes to increase its generalization in BDA research. So, in this study, we also investigate the RTC as a moderator. Therefore, we hypothesized;

H6: RTC moderates the relationship between IU of BDA and AU of BDA.

In this study, the authors on the basis of previous literature and research gaps propose the research model. Figure 1 represents the proposed research model.

4. Materials and Methods

In this section, the authors describe the sample size, data collection method, and instrument development that is used to collect data.

4.1. Measures Development. In this study to preserve content validity, the authors adopted the measures from the same context of previous studies. The detailed measurement items are provided in Table 1. The questionnaire was divided into three units; the first unit described the purpose and introduction of search with the surety to keep the data secret, and the results of the research will be shared with them. The second unit consisted of demographical information like gender, age, education, and the third unit consisted of 20 items of all variables. A questionnaire is the best tool to conduct a research survey [74,75]. The 7 points Likert scale used to

record the responses from 1 to 7, strongly disagree to strongly agree, as many studies used it [48, 76, 77]. The three-item scale of Self-efficacy was adopted from [78]. The three-item scale for each PU and PEOU was adopted from [79]. The scale of IU and AU of BDA consists of three items adapted from [60]. The four-item scale of RTC was adopted from [65].

4.2. Pilot Test. To validate the research instrument, this study conducts both pre-test and pilot test. In pretest, there were eight experts in which three professors of information management department, three doctoral students of the information management department and two doctoral students from medical studies participated. The instrument items were discussed with the panel and formation, length, wording, and appropriateness of items maintained by editing. After that, a pilot test was conducted on 40 self-selected participants from the sample size, and these responses are not included in the main analytics. The demographical information of the respondents is 23 were male respondents, and 17 were female respondents. Two, twenty-four, eleven, and three respondents were 18 to 25, 25 to 35, 35 to 45, and above 45 years old, respectively. Furthermore, 19 respondents had a bachelor's degree, 17 were master's degree holders, and 4 were doctoral degree holders. The results of the pilot test were again discussed with experts, and the instrument refined. One item of perceived usefulness (PU4) excluded due to factor loading problem. The results of the pilot test (see Table 2) represent that the values of factor loading and Cronbach's alpha are within the prescribed range [24]. So, it proved the validity of the instrument.

4.3. Sampling and Data Collection. This study used a survey method through a questionnaire to test the research model. The survey method is handy to analyze behavioral relationship among constructs [81], especially in intention-behavior [82]. The population of this study is healthcare organizations of Pakistan. So, the authors selected the organizations of Punjab Pakistan that cover 63% of the total population area [4]. The authors used a convenience sample method as it is a suitable

TABLE 1: Measurement items

Constructs	Items	Sources
<i>Self-efficacy</i>	SE1	I believe that I can learn to use BDA more easily
	SE2	I have the capability to use BDA
	SE3	I believe using BDA is more comfortable for me
	SE4	While using BDA, I am not afraid that I might operate it wrong
<i>Perceived ease of use</i>	PEOU1	BDA will be easy to use for me
	PEOU2	I believe that using BDA is challenging and frustrating
	PEOU3	My understanding of BDA is very clear
<i>Perceived Usefulness</i>	PU1	I think BDA is useful in making my day-to-day job decisions.
	PU2	Using BDA will help me make a better decision
	PU3	BDA will help me to understand better Management actions that directly affect me as an employee
<i>Intention to use BDA</i>	IU1	I intend to use BDA
	IU2	I intend to perform my job-related tasks by using BDA
	IU3	I intend to use BDA frequently
<i>Resistance to change</i>	RTC1	I am not interested in BDA
	RTC2	I feel uncomfortable in changing my current working methods and start using BDA
	RTC3	I am not interested in using BDA to perform my job-related activities
	RTC4	I am not used to using BDA to perform my job-related activities
<i>Actual use of BDA</i>	AU1	I often use BDA to manage my job-related activities
	AU2	I often use BDA to make strategies regarding healthcare activities
	AU3	I often use BDA to manage and analyses healthcare data

technique where availability of respondent varies [83]. The parent university of the author already signed a memorandum of association with various industries including healthcare organizations under the “university and industrial research linkage department” for the collaboration of the university employees with the industry for research purpose [84]. So, by using this link, detailed contact data were taken, and a total of 450 questionnaires were distributed through online survey site Google survey to the emails of healthcare organizations employees that are using the available healthcare information system or associated with development and maintaining of the healthcare information system. The online survey is convenient due to data collection consistency [14]. The author also gave a reminder to the respondents who did not fill the questionnaire after fifteen days, through a cell phone call. So, 301 filled questionnaires were received, and 283 valid responses were selected for analysis after scrutiny.

5. Results

In this study, we used SPSS v23 to check the validity, reliability, and exploratory factor analysis (EFA). The authors employed structural equation modeling (SEM) to test the research model. AMOS v23 used to conduct SEM and confirmatory factor analysis (CFA) as it is one of the powerful tools for SEM and CFA [85]. AMOS is also very powerful to evaluate moderation relationships and group analysis [86]. SPSS is also used to demonstrate demographical information that is shown in Table 3. According to the demographical information, 124 out of 283 are males, and 159 are females that are 43.8% and 56.2%, respectively. 230 out of 283 (81%) respondents are within the

TABLE 2: Pilot test results

Variables	Items	Loadings	Cronbach's Alpha
<i>Self-efficacy</i>	SE1	.843	0.908
	SE2	.846	
	SE3	.784	
	SE4	.704	
<i>Perceived ease of use</i>	PEOU1	.850	0.852
	PEOU2	.929	
	PEOU3	.767	
<i>Perceived Usefulness</i>	PU1	.870	0.897
	PU2	.918	
	PU3	.864	
<i>Intention to use BDA</i>	IU1	.820	0.955
	IU2	.781	
	IU3	.840	
<i>Resistance to change</i>	RTC1	.948	0.960
	RTC2	.955	
	RTC3	.959	
	RTC4	.947	
<i>Actual use of BDA</i>	AU1	.885	0.938
	AU2	.886	
	AU3	.877	

age bracket of 25–45 years, and 264 out of 283 (93.3%) either have a bachelor's degree or master's degree. So, our sample is young educated and almost equally gender diverse.

5.1. Measurement Model. Firstly, the authors ensured the sample adequacy by using the Kaiser–Meyer–Olkin (KMO)

TABLE 3: Demographical Information.

Category		Frequency	Percentage (%)
Gender	Male	124	43.8
	Female	159	56.2
	Total	283	100.0
Age	18–25	37	13.1
	25–35	102	36.0
	35–45	128	45.2
	45 and above	16	5.7
	Total	283	100.0
Education	High school/ diploma	4	1.4
	Bachelor	139	49.1
	Master	125	44.2
	Doctoral	15	5.3
	Total	283	100.0

test, and KMO value of this study is 0.859 that is above the threshold point of 0.8 [87]. So, there is no issue of sample adequacy. To address an important issue of common method bias (CMB), this study implies Harman's single factor test and the first factor explained only 34.522% of variance after categorizing the items into six subgroups. This value is below the standard value of 40% [88].

Furthermore, the authors measured reliability and validity. The values of Cronbach's alpha are ranging from 0.854 to 0.966 that are above the cutoff point of 0.7. The values of composite reliability (CR) are ranging from 0.864 to 0.966, and the AVE values are ranging from 0.682 to 0.876. Both the values of CR and AVE are above the threshold point [89, 90]. After that, EFA conducted to ensure that measures are according to their respective variables and factor loadings of all items are ranging from 0.772 to 0.955, above the cutoff point of 0.7 and proved that there is no issue of factor loadings [24]. Table 4 represents the values of factor loadings, CR, AVE, and Cronbach's alpha. The square root of AVE is represented in Table 5 that elaborated that the value of the square root of AVE for each construct is above the value of all inter-construct linked with the variable. It ensures the discriminate validity of all constructs [62].

Moreover, before moving towards path analysis, this study conducted CFA through AMOS to ensure the validity and consistency of constructs of the research model. The results show the values as CMIN/DF is 2.071, RMSEA is 0.062, PClose is 0.024 while CFI is 0.965, GFI is 0.902, TLI is 0.957, IFI is 0.965, and NFI is 0.935. All the above values are within the acceptable range [24] that proved that the model is a good fit.

5.2. Structural Model. After confirmation of the data reliability and validity and good fitness of model, the authors move towards the path analysis. The results of path analysis show the values as CMIN/DF is 2.235, RMSEA is 0.066, PClose is 0.190, CFI is 0.963, GFI is 0.973, TLI is 0.936, IFI is 0.964 and NFI is 0.937. These results are within the standard acceptable range [24] and show the model is a good fit. Furthermore, the authors measure the path coefficients. Figure 2 represents

the results of path coefficients. SE has a significant positive relationship with PU ($\beta = 0.375$ and p -value is less than 0.001), PEOU ($\beta = 0.487$ and p -value is less than 0.001), and with the IU of BDA ($\beta = 0.269$ and p -value is less than 0.001). So, H1a, H1b, and H1c are supported. The relationship between PU and IU of BDA is also found significant positive ($\beta = 0.155$ and p -value is less than 0.01). Thus, the study accepts the H2. The relationships of PEOU with PU ($\beta = 0.281$ and p -value is less than 0.001) and IU of BDA ($\beta = 0.348$ and p -value is less than 0.001) are significant. Therefore, the study accepts H3a and H3b. IU of BDA also has a significant positive association with the AU of BDA ($\beta = 0.352$ and p -value is less than 0.001) that allows accepting H4. The results also explained 42% variance in PU, 34% variance in PEOU, 50% variance in IU of BDA, and 30% variance in AU of BDA.

5.3. Moderation Impacts. In this study, the authors proposed two moderators named as RTC and gender. Both factors moderated different relationships. The first moderated RTC has a negative significant moderating impact on the relationship between IU of BDA and AU of BDA ($\beta = -0.248$ and p is less than 0.001). It means that the RTC in employees dampens the positive relationship between IU of BDA and AU of BDA see Figure 3. Thus, the study accepts the H6.

To evaluate the moderating impact of gender differences, the multi-group test executed the strength of the path coefficient. First, two groups were created male and female, and then the multi-group test was executed through AMOS. The results in Table 6 demonstrate that gender moderates the relationship between SE and PU, SE and IU of BDA, PU and IU of BDA, PEOU, and PU, and the moderating role of RTC between IU and AU. In these, all relationships males are dominant as compared to females expect the moderating role of RTC between IU of BDA and AU of BDA in which females are dominant as compared to males. So, based on these results, the study accepted H5a, H5c, H5d, H5e, and H5h. Remaining all relationships found insignificant means gender is not moderating the relationships between remaining factors. In other words, there are no gender differences between those relationships. Therefore, the study rejects H5b, H5f, and H5g.

6. Discussion and Conclusion

BDA has the ability to change the standers of treatment and increases the strategic level of healthcare organizations. Adopting the BDA in healthcare increases not only the performance but also cuts the cost of healthcare expenses that organizations bear due to non-implantation of BDA. To achieve the objectives, this study enhances the knowledge in research and practice about the adoption of BDA in healthcare. According to the empirical results, the constructs of TAM, i.e., PU and PEOU, along with SE, have a significant positive impact on IU. SE also found a strong predictor of PU, PEOU, and IU of BDA. Moreover, PEOU also has a strong positive influence on PU. The results of this study are consistent with the results of [23, 44]. These findings suggest that first of all, SE is more important. If the healthcare organization employees have no computer SE, then they never have the IU of BDA,

TABLE 4: Results of Factor Loadings, Composite reliability (CR), and AVE.

Variables	Items	Loadings	Cronbach's Alpha	CR	AVE
<i>Self-efficacy</i>	SE1	.800	0.897	0.897	0.687
	SE2	.857			
	SE3	.795			
	SE4	.784			
<i>Perceived ease of use</i>	PEOU1	.828	0.902	0.905	0.761
	PEOU2	.869			
	PEOU3	.833			
<i>Perceived usefulness</i>	PU1	.772	0.854	0.864	0.682
	PU2	.874			
	PU3	.803			
<i>Intention to use BDA</i>	IU1	.795	0.905	0.906	0.764
	IU2	.821			
	IU3	.828			
<i>Resistance to change</i>	RTC1	.953	0.966	0.966	0.876
	RTC2	.942			
	RTC3	.955			
	RTC4	.949			
<i>Actual use of BDA</i>	AU1	.903	0.916	0.917	0.787
	AU2	.910			
	AU3	.898			

TABLE 5: Correlation matrix and the square root of AVE.

	RTC	SE	AU	PEOU	IU	PU
RTC	<i>0.936</i>					
SE	0.093	<i>0.829</i>				
AU	0.153*	0.298***	<i>0.887</i>			
PEOU	0.006	0.542***	0.148*	<i>0.873</i>		
IU	-0.009	0.549***	0.408***	0.588***	<i>0.874</i>	
PU	0.023	0.588***	0.118 [†]	0.501***	0.475***	<i>0.826</i>

Italic values represent each variable's square root of the AVE. level of Significance: [†] $p > 0.050$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

and they never felt the BDA is easy and useful even in reality the BDA system is very easy and useful. So, first of all, a healthcare organization should emphasize on a training program that increases the computer SE of the employees if they are computer illiterate. Then the BDA developers in healthcare organizations should focus on the ease and usefulness of it to get desired adoption intention from employees. The usefulness of the BDA means employee feels that with the use of BDA, his or her healthcare job will improve. Usefulness is more important than PEOU in healthcare, means if the system is not improving the healthcare job performance of employees, they will not adopt it even it is very easy to use. Furthermore, the study checked the impact of RTC between the relationship of IU of BDA and AU of BDA and found a significant negative impact as consistent with the results of [4]. It means even the employees have the computer SE and IU of BDA due to PU and PEOU of the BDA, but the RTC is a big barrier in the convergence of IU into AU of BDA. The RTC dampens the positive relationship between IU and AU. Thus, healthcare organizations should eliminate the RTC in the employee by motivating them and by adopting different techniques of

reducing RTC in an employee for the successful adoption of BDA system.

Meanwhile, the major contribution of this study is to empirically test the gender differences in the field of BDA adoption in healthcare organizations, which was neglected by the previous scholars. The gender significantly moderates the relationship between SE and PU; SE and IU; PEOU and PU; PU and IU. Our results are consistent with the results of [23, 58]. In all these relationships males are dominant on females means SE of male members are more than females, and they feel the BDA is more useful compared to females, and they have more intention towards an IU of BDA due to this. The results also elaborate that as compared to female employees, male employees feel BDA more easy to use, and ultimately, this ease increases the PU of BDA. Furthermore, the impact of gender on the moderating role of RTC between IU and AU of BDA describes that females are more influencing in this case than males. It means that females are creating more RTC than males. It is generally perceived that female are laggard to engage with the innovative technologies as compared to male [16]. They are willing to remain unchanged and feel more

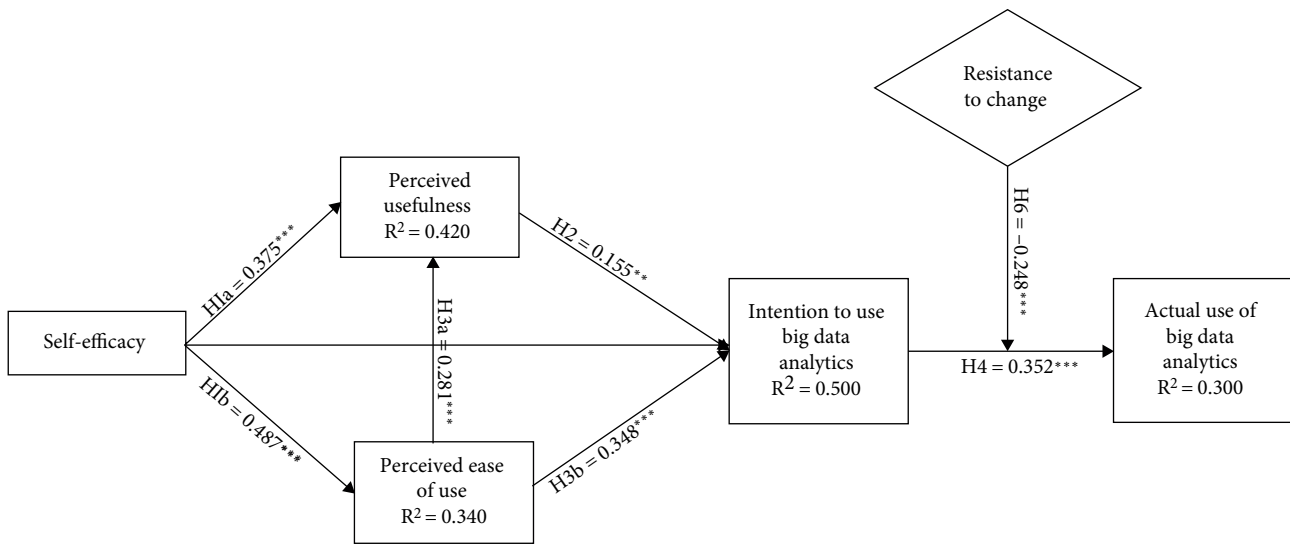


FIGURE 2: Path coefficients and significance level Significance: ** $p < 0.01$; *** $p < 0.001$.

comfortable in the existing work patterns. Therefore, they might be against the adoption and the use of BDA at their workplace, which required to put more efforts to lean. Another reason for creating more resistance from the female is the polychronic role of female [56]. The polychronic role means that females are trying to manage more than one task of different roles at a time. Especially in Pakistan, females are managing job activities with routine household activities and social activities at the same time [91]. This burden of different roles also shapes her behavior to create resistance against innovation for the sake of work-routine. Remaining all relationships are not significant means there are no gender differences in remaining relationships. Healthcare organizations should primarily focus on a female employee. The organizations should more be trained and motivate female employees, give special incentives, and all the encouragements that can increase SE, PU, and PEOU about BDA and also reduce RTC against BDA.

BDA recognizes as the solution of many healthcare issues in healthcare organizations, and healthcare organizations are among the top ten industries who want to adopt BDA. The BDA has the ability to improve medical treatment, forecast diseases trends, reasons for diseases, and help in making efficient healthcare strategies. Thus, to fulfill this need of the healthcare industry, this study contributed a BDA adoption model by extending the original TAM model with an external factor self-efficacy and two moderators, gender, and resistance to change. The results of the study provided a better understanding of theory and practice that what are the important factors while adopting BDA in healthcare. The results of the study suggest developers of the BDA technology should develop BDA in healthcare organizations in such a way that it operates to be easy and more importantly it will fulfill the job requirements of the employees. The fulfillment of job requirements leads the perception of the employee towards PU, and ultimately, these factors create IU in employees regarding the BDA adoption. On the other hand, the results suggest to management of healthcare organizations that first of all increase the self-efficacy in employees and control the RTC in

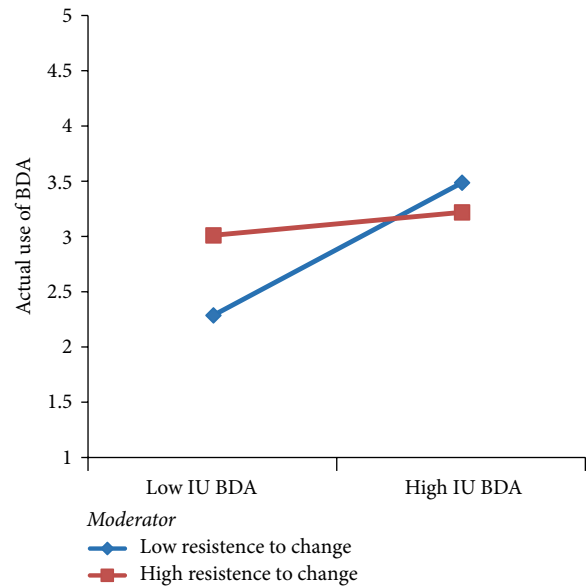


FIGURE 3: Effect of Moderation; IU= Intention to use.

employees against BDA by using extrinsic motivation and other tools of decreasing RTC. The important conclusion is that the managers should focus more on the females regarding SE and RTC.

7. Implications, Limitations, and Future Research

In this section, the study describes the theoretical and practical implications of the study, limitations of the study, and future research directions.

7.1. Implications. The study contributes to theory and practice in several ways. First of all, this study increases the limited impact of TAM by increasing it with external factor

TABLE 6: Multi-group analysis with gender as a moderator

H. No	Hypothesis		Standardized path coefficient			
			Male	Female	Differences	Results
H5a	Self-efficacy	Perceived usefulness	.411**	.209**	.202**	Supported (Male> Female)
H5b	Self-efficacy	Perceived ease of use	.077	.342***	.265 ^{ns}	Not supported (No difference)
H5c	Self-efficacy	Intention to use BDA	.373***	.130	.243*	Supported (Male> Female)
H5d	Perceived usefulness	Intention to use BDA	.209*	.205**	.004**	Supported (Male> Female)
H5e	Perceived ease of use	Perceived usefulness	.306***	.035	.271*	Supported (Male> Female)
H5f	Perceived ease of use	Intention to use BDA	.245**	.220**	.025 ^{ns}	Not supported (No difference)
H5g	Intention to use BDA	Actual use of BDA	.196**	.363***	.167 ^{ns}	Not supported (No difference)
H5h	Interaction (RTC*IU)	Actual use of BDA	.015	-.405***	-.390**	Supported (Female> Male)

Significance: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$; ns= not significant.

and moderating factors in the theory of BDA acceptance in healthcare. Furthermore, the instrument of this study not only consists of a technological perspective but also includes behavioral and demographical perspective to evaluate the adoption of BDA. The healthcare organizations are investing in BDA and currently in the phase of adoption of BDA. This study provides a strong base in theory regarding the adoption of BDA to these organizations. This study also contributes towards both theory and practice about the RTC in an employee. In theory, it increments the new vital factor to study in the field of BDA adoption in healthcare. In practice, the study guides practitioners on how this factor creates a barrier in the adoption of BDA, and it needs to be fixed. This study also contributes both in theory and practice to how gender differences contribute towards IU of BDA system, and establishes the understanding that it is a barrier in technology diffusion. Finally, this study provides a better understanding of the BDA adoption in healthcare and a step forward towards the technology improvement in healthcare organizations.

Moreover, the results of the study also suggest some policies to healthcare organization regarding the successful adoption of BDA. The first one is the healthcare organizations should improve the computer self-efficacy of the employees through training, workshops, and job skill improvement training. The special focus should be on females because according to the results of the study, they are creating more resistance against BDA adoption due to lack of SE. The second policy that this study suggests to healthcare organizations is about the reduction of the polychronic role of female employees. This is one of the reasons that force female employees to resist the BDA adoption and management can reduce this barrier with the PEOU the BDA.

7.2. Limitations and Future Research. Although this study has a noteworthy contribution to theory and practice, even the authors acknowledge some limitations in the study. There are main three limitations in this study, and based on the limitations, the author suggests three further research aspects. First of all, the sample size of this study was not too big and belongs to one country means from one culture that limit the scope of the study. In the future, further studies can increase the sample size and apply this study model from a

multicultural perspective. Furthermore, the sample size is from a developing country, and the results of the same model may vary in a developed country. So, the further researchers may implement this model in the developed country to increase the generalization of the model. Secondly, the authors recommend further research that model should be empirically tested in a longitudinal perspective to record the changes in the user's behavior. Thirdly, this study checks the moderating effects of one demographical variable (gender). Further studies may check the impact of other demographical variables like age, education, and experience in the same field. Moreover, future research also explores some RTC reduction factors like extrinsic motivation to overcome this crucial barrier in the way of adoption.

Data Availability

The Primary data used to support the findings of this study are available from the corresponding author upon request. The contact information of the corresponding author is (Muhammad Shahbaz; shahbaz755@yahoo.com).

Conflicts of Interest

There are no conflicts of interest among authors.

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