To adopt or not to adopt? The determinants of cloud computing adoption in information technology sector

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ABSTRACT

This research is mainly focused on the adoption of cloud computing in the information technology (IT) industry of a developing country, Pakistan by using the theoretical lens of technology acceptance model (TAM) and Elaboration Likelihood Model (ELM). Cloud computing, being one of the latest technologies in the field of IT, has been recently adopted by organizations around the globe, although developing nations have recently started using this technology in their supply chain processes. This study involved the employees of IT industry working in the capital city of Pakistan, i.e. Islamabad. Sample respondents consisted of 213 employees of the IT based organization. Data was collected online by employing structured questionnaires based on past literature. The results revealed that there exists a positive and significant relationship between perceived security, argument advantage, source credibility and perceived usefulness. Additionally, the outcome of the study supported the significant relationships between perceived usefulness and attitude towards adoption of cloud computing, perceived usefulness and intention to adopt cloud computing, and attitude towards cloud computing and intention to adopt cloud computing. The research study has managerial and practical implications. It is one of first of its kind that explores some of the factors leading to adoption of cloud computing in of IT companies in Pakistan.

1. Introduction

Cloud or distributive computing is becoming one of the most famous and promising technologies providing combined services of software and hardware leading to increased use of cloud all over the world across industries. Cloud is virtualized database which contains an integrated pool of data hosted by the server. The enormity of data offered through cloud makes it appealing for a variety of departments, sectors and industries to fetch useful information at anytime from anywhere via web. Like other sectors, cloud computing has become a significant trend in Information Technology (IT) industry (Vasiljeva et al., 2017). Cloud or distributive computing is also referred as locating the computing resources through the internet as it helps to make it dynamic as well as flexible.

Cloud computing has been termed as a significant transformation in computing in the recent decades [1]. A successful cloud infrastructure delivers the best quality of service to its users [2]. There are number of factors that can influence the adoption of cloud computing including performance, trust, security, cost, and energy consumption [3–5].

Although, it has been in use by most of the Western countries, the adoption of cloud computing is still in its infancy stage particularly in developing countries [6].

Cloud computing can offer an array of benefits for the organizations to enhance their businesses and use technology efficiently. It helps to reduce the costs of the organizations such as the upfront cost of computing and installation of many cutting-edge information technology services. However, despite many benefits of cloud computing, many organizations are gradually discovering that their investments in the development of information technology are being under-utilized [7] and the adoption of this technology is slow in most of the countries [8]. One of the reasons of this slow adoption of cloud computing may be that there are some challenges also associated with adoption of such technologies [9–11] thus making it essential to examine various factors that lead to better adoption of cloud computing especially for small and medium sized organizations. Thus we aim to answer the research question: What are the factors that lead to adoption of cloud computing the supply chain processes of IT industry in Pakistan?

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In order to answer our research question, we draw on the theories of Elaboration Likelihood Model (ELM) and Technology Acceptance Model (TAM). This paper puts forward a theoretical framework using perceived security, argument advantage and source credibility to explore the relationships among perceived usefulness, attitude, and intention to use cloud computing in supply chain processes in organizations. By doing so, we add following two contributions to the existing body of knowledge. First, we combine ELM and TAM to study the factors that contribute towards adoption of cloud computing in the supply chain processes of IT firms in a developing country, Pakistan. Secondly, we explore the effect of perceived security as an antecedent to perceived usefulness and attitude and intention to adopt could computing in the supply chain processes of these firms.

The rest of the paper is structured as follows. In the proceeding section, we provide the underlying theory used in our model. We further define and explain the constructs of the model and propose hypotheses in light of the existing literature in the domain. In the third section, we provide the methods and measures used in the paper. Next, we discuss the results of the statistical tests performed followed by discussion and implications of these results. Finally, in the last section, we conclude our research along with the implications to provide future avenues of research.

2. Theoretical background and research framework

The underlying theories employed for this study include Technology Acceptance Model (TAM) and Elaboration Likelihood Model (ELM). Both of these theories complement Rogers theory of diffusion of innovation theory [12] and explain the adoption of information systems and technologies. Many researchers have previously used these theories in explaining how technological innovations are adopted in a variety of industries [13]. ELM precisely consists of two types of processes. The first process consists of the central route of the merits of the arguments of a message while the peripheral route involves cognitive resource and associations based on peripheral cues (Lin and Lin, 2018). ELM proposes that the peripheral variables influence the personal beliefs like usefulness and attitude that explains the technology acceptance behavior. The theory of ELM has been used in previous studies to examine how information technology is adopted in domains like social psychology, marketing, IT and e-commerce [14,15]. Bhattacherjee and Sanford [14] explored the impact of argument quality and source credibility on perceived usefulness and technology acceptance in IT. Similarly, Sussman and Siegal [16] investigated the impact of argument quality and source quality on perceived usefulness in computer-supported channels.

2.1. Cloud computing

The National Institute of Standards and Technology (NIST) defines cloud or distributive computing as "*a pay-per-use model to enable availability of e data throughout the organization, to make it convenient for the employees to access data anytime from anywhere on demand access of the network to a shared pool of resources of the configurable computing which can be networks, storage, services, applications and servers etc. of the organization. It can instantly provisioned and release with minimal efforts by the company management or the interaction of the service provider for the organization*" (Mell and Grance, 2011). Distributed computing is the phenomenon that has changed the way people use networking through the ease of use of PC frameworks on the web [17]. It is an innovation which offers comfort to the clients with the assistance of system, servers and applications [18]. Distributed computing allows cost reduction and builds the ability for economies of scale (Yoo, 2011). Because of its wide range of advantages and business solutions, cloud computing is becoming popular across industries [19–21].

2.2. Perceived security

Perceived security is the degree of safety that can be provided to the users against any theft or criminal behavior [22]. It protects the application and makes the users free from worry and anxiety of being robbed of personal or official data. Cloud computing has raised numerous security challenges. On one hand, distributed computing has been termed as the cutting edge design of IT enterprises [23,24] but, on the other hand, it brings application programming and databases together on massive server networks, where the regulation of the data may not be completely dependable [25,26]. Subsequently a considerable number of firms are still not inclined towards adopting it. One of the factors for such an attitude is the lack of trust due to absence of physical presence. However, researchers have argued that in order to cater to the problem of trust, service quality can play a significant role [27,28].

Realization of security difficulties is necessary that could prompt breach of data or loss of information; since security is one of the biggest determinants of adoption of any new technology [29]. Basically the adoption of every new Information System (IS) includes unique challenges which should be carefully and tactfully handled by applying suitable counter measures [30,31]. Security provisions and selected security controls are generally an integral part of the standard frameworks alongside other relevant framework prerequisites [32]. But yet, the cloud framework proposes one of a kind security challenge and it is critical for the firms that adopt it to assess it in detail [25,33].

Data protection is considered to be an important factor to ensure integrity of an organization and its operations [34]. The breach of useful information is the vine for all the hackers and is a most profitable business in the dark world, so taking measures in stopping such practices would support in flourishing the cloud and will attract more enterprises [35]. There should be logical and physical integrity of the data processes, for instance, particular hardware or software can be utilized in order to ensure the security of data [36]. Besides, various measures can be used in order to protect the data and increase its security. IT systems can be protected through various measures in order to ensure that data cannot be modified by unauthorized people [37]. Input controls can also be used to trace who accessed data at what time along with the purpose of the access. Development of log file keeps a record of log in and log out of the system [38].

Disclosure is also an important element for the protection of personal data sets. It preserves the right to use, control and secure the data, and protects the confidentiality of data [39]. Cloud computing aims to protect the data and guarantee its confidentiality. In order to keep data secure, access of the data is kept in control depending upon the role and job of the employee [40]. The encryption techniques and the secure channel transfer of data help in the securing the purpose and has been very successful in providing its customers with better and secure systems.

2.3. Argument advantage

Two of the important components of the ELM theory are argument advantage and source credibility. Argument value has an effect on the apparent convenience of the cloud or distributed computing [41]. It can furnish prompt access to equipment assets with no huge upfront cost for clients. The cloud builds up a versatile framework which could be shared by various end clients, although they may utilize it in altogether different ways individually [42]. But the best thing is that they do not need to keep a backup of equipment, utilities, or require a huge server to run the data processes for their businesses [31].

Moving to the cloud wipes out costly programming arrangement and the progressing cost of running and keeping up of huge sets of servers. It helps reduce the expenses related to overseeing and keeping up IT frameworks, since, instead of obtaining costly frameworks and gear, it lower costs by utilizing specialist organization's assets by paying

a membership charge [43]. Hence, the requirement for a huge IT groups to deal with the cloud server farm activities is not required [44].

Additionally, cloud computing helps to save the costs associated with the purchasing, implementation, replacement and management of hardware and software. It also helps to make the accessibility easy because remotely anyone can have access to the data at any time. There is always automation in the maintenance and upgrades which also plays its role in the low cost as there is no requirement to spent finances for this purpose [45].

2.4. Source credibility

The implementation of the latest algorithm for information security and the big data innovations help the user to access quickly with no real threat in between making it faster and reliable for human resources all around the globe [46]. Enterprises are widely accepting the cloud or distributive computing in the industries due to the sharing of the information, its movability and interoperability between private and public clouds [47]. The management of the records and the back tracking becomes easier as the data is placed at one place which allows anyone at any part of the world to access it [48]. The availability of data in case of damage also increases its usefulness since fast recovery can be done and the danger of loss is eliminated to its maximum [49,50].

2.5. Perceived usefulness

Perceived usefulness is one of the key variables which originated from the TAM theory of innovation and which encompasses the ease of use and usefulness of new technology [51,52]. Cloud computing is more convenient for the industry and provides many latest services. It is perceived by many that cloud computing immensely lowers the cost and free the organization from various expenses. Moreover, it reduces the hassles of purchasing, installation and maintenance of many of the software applications required by the organizations. Cloud computing is also competent enough to reduce the carbon footprint as it is environment friendly and have very little negative impacts on the environment due to its usability. Cloud or distributive computing is more appropriate, environment friendly and appealing to the originations in a variety of industries [53]. According to Almaiah and Al-Khasawneh [54] perceived usefulness and perceived ease of use are considered as most significant factors affecting adoption of new technologies such as cloud computing. Cloud computing plays a vital role in the revolution of industry through innovation of the technologies and changes in the structure which lead to the enhancement of the economic activities. Cloud computing helps provide an opportunity to overcome the barriers of communication in organization, knowledge sharing and infrastructure of communication technology. It also helps to empower the customers by improving the performance, functionality and tracking of data. Finally, it helps to make the processes more efficient, transparent and reliable [55].

Cloud helps the companies to manage large volume of data by just one click and it also improves accessibility factor in the industry. Cloud computing is one way to enable total data management of the organizations. Some companies use shared computing services to lower their computing cost and to keep the data saved at server [56]. Additionally, having shared cloud services helps the organization to achieve environmental benefits; as it require fewer servers to build and run the systems. Cloud computing helps to mainstream the business activities and reduce the time to sell the product by enhancing customer loyalty and tailors customer communications. Cloud computing also helps in the management of organization's past records more efficiently and in the entire transformation of the direction of the business from traditional to digital, making it forward thinking, making more responsive and robust [57,58]. Due to all of these positive qualities cloud computing is perceived as a useful technology by its users around the globe.

2.6. Attitude and intention to use cloud computing

Rajaraman [59] mentioned in their research that cloud computing is here to stay and is considered as the greatest advancement of the decade in processing. Cloud computing has also shown mediating role to enhance organization's competitive advantage [60]. Even so, the debate whether to adopt clouds is still a question mark for many companies in the developing. However, it is evident that the firms which took the bold decision of adopting cloud computing have been successful to decrease their cost in dramatic ways. Yet, this transformation is not simple and requires a whole new setup and resources across the supply chains [61] and thus it is imperative to study the attitude and intention to use this technology.

The organizations are enjoying many benefits due to cloud computing and their attitude has changed towards the new system because of the maintenance free environment [30]. Other reasons include security protocols and data encryption, resulting in users' confidence that the information is secure [24,62]. Studies reflect that the adoption of cloud computing by the users is also strongly dependent on their attitude [3,63,64].

2.7. Hypothesis development

Adoption of cloud computing in any firm's supply chain influences the decision makers to think about the associated risks [65,66]. Perceived security acts as a threatening barrier for adoption of cloud computing. Perceived security is considered as one of the prime factors that affect adoption of cloud computing [47,67]. With respect to cloud computing, perceived security refers to data protection, disaster management and business survival [68]. Leakage or theft of data, privacy of organization, and access and identity management are some of the security threats that are considered key barriers in adoption of cloud computing [69,70]. This is further reinforced by Jede and Teuteberg [71] that perceived security can have positive effects on cloud computing usefulness. So, if high security is promised by the cloud computing service provider to its supply chain partners, perceived usefulness of cloud computing can be improved [72]. Hence it is hypothesized that:

H1. Perceived security has a positive effect on users' perceived usefulness of cloud computing.

Elaboration Likelihood Model (ELM) suggests vigilant, methodical elaboration of the main and peripheral parts of the arguments and reinforces Technology Acceptance Model (TAM) that external factors may influence the adoption of IT technology (Lin and Lin, 2018). One major benefit of cloud computing is the instant sharing of information across organization in different geographical areas [73]. Additionally, with adoption of cloud computing, the cost of sharing information also reduces. It enables efficient and effective business practices in organizations to optimize supply chain activities and makes the business practices more flexible as per requirement of the customers resulting in higher market share [50,74]. Cloud computing also aids to scale up the services in lesser time thus increasing the productivity of the work and business [75]. All such advantages effect perceived usefulness of cloud computing. Hence, in light of the above arguments and using the theory of ELM, the following hypothesis is proposed:

H2. Argument advantage has a positive effect on users' perceived usefulness of cloud SCM.

In addition to argument advantage, source credibility has also been linked by past researchers for factors leading to the adoption of IT technology (Lin and Lin, 2018; [50]). For the users, it is critical to consider source of information as they consider efficacy of the information based on source credibility [76]. Persuasive, commercial, and helpful information from suppliers and other experts is used to assess the usefulness of cloud computing [41]. ELM also suggests that source
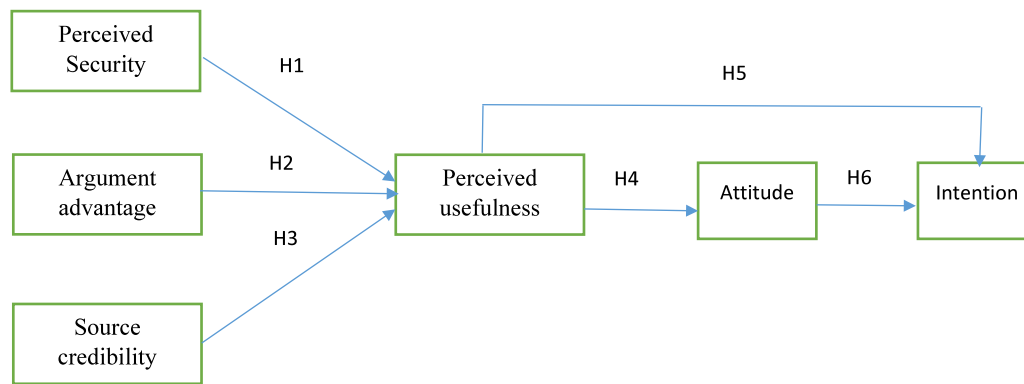
Fig. 1. Research framework.

credibility has positive impact on the usefulness of the cloud in supply chain management (Lin and Lin, 2018). Thus the next hypothesis is presented as:

H3. Source credibility has a positive effect on potential users' perceived usefulness of cloud SCM.

Based on Technology Acceptance Model proposed by Davis [51], perceived ease of use and perceived usefulness act as antecedents of user attitude that effects the adoption and use of a given technology. TAM also maintains that perceived usefulness has a direct and significant impact on the actual intention to use a particular technology. Perceived ease of use and perceived usefulness have proved to be integral components of TAM. These factors show positive effect towards attitude and adoption of technology across industries [8]. TAM has also proved to be effective in examining adoption of cloud computing (Dawson, 2015; Asadi et al., 2017). This study examines the adoption of cloud computing technology in supply chains of different organizations. Like other technologies, cloud computing has wider and deeper impact on organizational performance as well [71]. Based on the positive outcomes, users form favorable perception for a given technology. End user's outlook towards the adoption of the cloud computing relies on the capacity of the system to address the issues of clients in the inventory network [3]. Based on the above discussion, following hypotheses are suggested:

H4. Perceived usefulness has a positive effect on attitude towards cloud SCM usage.

H5. Perceived usefulness has a positive effect on cloud SCM usage intention.

H6. Attitude has a positive effect on cloud SCM usage intention.

Based on the arguments and proposed hypotheses, the research framework of this study is shown in Fig. 1. The proposed framework is based on ELM and TAM theories. As per the previous literature by Lin and Lin (2018), we also argue that TAM alone does not account for all the factors that may lead towards the attitude and intention of technology adoption. Therefore, following previous literature we propose that perceived security, argument advantage and source credibility all leads towards higher perceived usefulness of cloud computing technology and this will lead towards better attitude and intention to adopt it, as shown in the figure below.

3. Research methodology

Quantitative study best assists the accurate implementation of the design of the study and ensures the measures of the reliability and validity. Primary data for the cloud computing adoption in the IT sector was collected by the distribution of questionnaires via email to test the model. The respondents were asked to fill the questionnaires in their routine work environment and they willingly took part in the survey. This method ensured less interference from the researcher and minimized the likelihood of any possible biasness while gathering the data. This technique also helped the respondents to fill the questionnaires at their own comfort and allowed them to take their time to respond according to their opinion and experience. The data was cross sectional in nature as the data was gathered at one point of time.

The population of this study comprised of IT companies operating in Islamabad and Rawalpindi cities of Pakistan and the data was gathered in the year 2019. The questionnaires were sent to the firms' supply chain-related employees. An adequate sample size was required to get the desired level of the precision and confidence essential to meet the objectives of the research study. Sample size was based on the criteria suggested by Sekaran and Bougie [77] whereby sample size that is greater than 30 and less than 500 is considered appropriate for such a study. Due to the lack of a consolidated database of the IT companies in Islamabad and Rawalpindi, a convenience sampling approach was employed by the researchers. This technique has been practiced by the previous researchers as well (see e.g. [78–80]; Sivakumar et al., 2020). Around 300 employees were approached for data collection. 213 valid responses were received to run the tests and conduct analysis resulting in a response rate of 71%. The demographics information collected from the respondents comprised of gender, work experience in the supply chain department, education, and job title. For the purpose of getting responses, a seven-points Likert scale was employed to measure the response of each respondent with 7 as strongly agree and 1 as strongly disagree.

3.1. Research instrument

A questionnaire was designed by the researchers consisting of items based on the previous literature on the cloud computing. Perceived usefulness measure comprised of 04 items and was adopted from Venkatesh and Davis [81]. 04 items to measure argument advantage and source credibility were adopted from Lin and Lin [41] whereas attitude was measured using 03 items and intention through 04 items adopted from Bhattacherjee and Sanford [14]. Construct of the perceived security was taken from the study of Changchit and Chuchuen [82] comprising of 04 items. The details of the items used in the study are given in Annexure.

Demographics

Table 1 shows the demographic profile of the respondents of the survey.

Table 1
Demographic profile of respondents.

Gender of the respondents		
	Frequency	Percent
Female	15	7.04
Male	198	92.96
Work experience of respondents		
	Frequency	Percent
I year	29	13.61
3 year	52	24.41
5 year	58	27.23
10 year	42	19.71
Others	32	15.02
Education of respondents		
	Frequency	Percent
Undergraduate	44	20.66
Graduate	0	0
Masters	163	76.53
PHD/Post Doctorate	6	2.82
Job title of respondents		
	Frequency	Percent
Production	12	5.63
Sales	15	7.02
Administration	28	13.14
Purchasers	30	14.08
Others	128	60.09

Table 2
Reliability analysis.

Reliability analysis		
Variable	No. of items	Cronbach's alpha
Perceived security	4	0.840
Argument advantage	4	0.823
Source credibility	3	0.788
Perceived usefulness	4	0.880
Attitude	3	0.812
Intention	4	0.913

Table 3
AVE and CR.

AVE and CR analysis			
Variable	No. of items	CR	AVE
Perceived security	4	0.892	0.675
Argument advantage	4	0.882	0.653
Source credibility	3	0.876	0.703
Perceived usefulness	4	0.918	0.736
Attitude	3	0.888	0.727
Intention	4	0.939	0.793

Table 4
Factor loadings.

CFA analysis		
Variable	Item	Factor loadings
Perceived security		
	PS1	0.802
	PS2	0.873
	PS3	0.792
	PS4	0.818
Argument advantage		
	AA1	0.801
	AA2	0.813
	AA3	0.834
	AA4	0.783
Source credibility		
	SC1	0.841
	SC2	0.858
	SC3	0.815
Perceived usefulness		
	PU1	0.859
	PU2	0.869
	PU3	0.818
	PU4	0.884
Attitude		
	A1	0.899
	A2	0.865
	A3	0.790
Intention		
	I1	0.910
	I2	0.919
	I3	0.858
	I4	0.872

Table 5
Correlation analysis.

Correlation analysis						
	AA	A	I	PS	PU	SC
Argument advantage	0.808					
Attitude	0.465		0.853			
Intention	0.571		0.676	0.890		
Perceived security	0.	530	0.471	0.510	0.822	
Perceived usefulness	0.627	0.621	0.693	0.519	0.858	
Source credibility	0.601	0.423	0.499	0.553	0.591	0.838

AA = Argument Advantage, A = Attitude, I = Intention, PS = Perceived Security, PU = Perceived Usefulness, and SC = Source Credibility. Square root of average variance extracted (AVE) is shown on the diagonal of the matrix.

4. Data analysis and results

According to the Hair et al. [83], Cronbach alpha is used to assess the reliability of the data. The values of Cronbach alpha between 0.60 and 0.70 in exploratory research are considered satisfactory while in more advanced stages the values between 0.70 to 0.90 are considered good. Whereas the values below 0.60 indicate the lack of reliability. Results of the reliability analysis in Table 2 indicate that the values for all the variables for Cronbach alpha are > 0.7 reflecting inter item consistency of all variables.

Values of the AVE greater than 0.7 is considered as good and the level of 0.5 is considered as acceptable [84]. Composite reliability is a less biased estimate of the reliability of the data as compared to the Cronbach alpha, the accepted value of the CR is 0.7 and above. As seen from Table 3, the values of CR for all variables are greater than 0.7 hence ensuring internal consistency and reliability. The AVE values of the variables perceived security and argument advantage are greater than 0.65 which are considered as acceptable whereas the values of the AVE of the variables source credibility, perceived usefulness, attitude and intension are greater than the 0.7 hence ensuring the validity of research instrument.

As shown in Table 4, the results indicate that all items loaded well i.e. greater than 0.50 or greater on their intended construct (Fornell and Larker, 1981). The results of the statistical test of the correlation are presented in Table 5.

4.1. Hypothesis testing

To examine the hypotheses, multiple regression analysis was performed using SPSS and the complete model was run in SmartPLS. Results are displayed in Table 6. In the first three hypotheses, perceived usefulness was tested with perceived security, argument advantage and source credibility. All three relationships proposed in the hypothesized model were positive and significant and hence accepted. Hypothesis 1 proposed impact of perceived security on perceived usefulness (F =
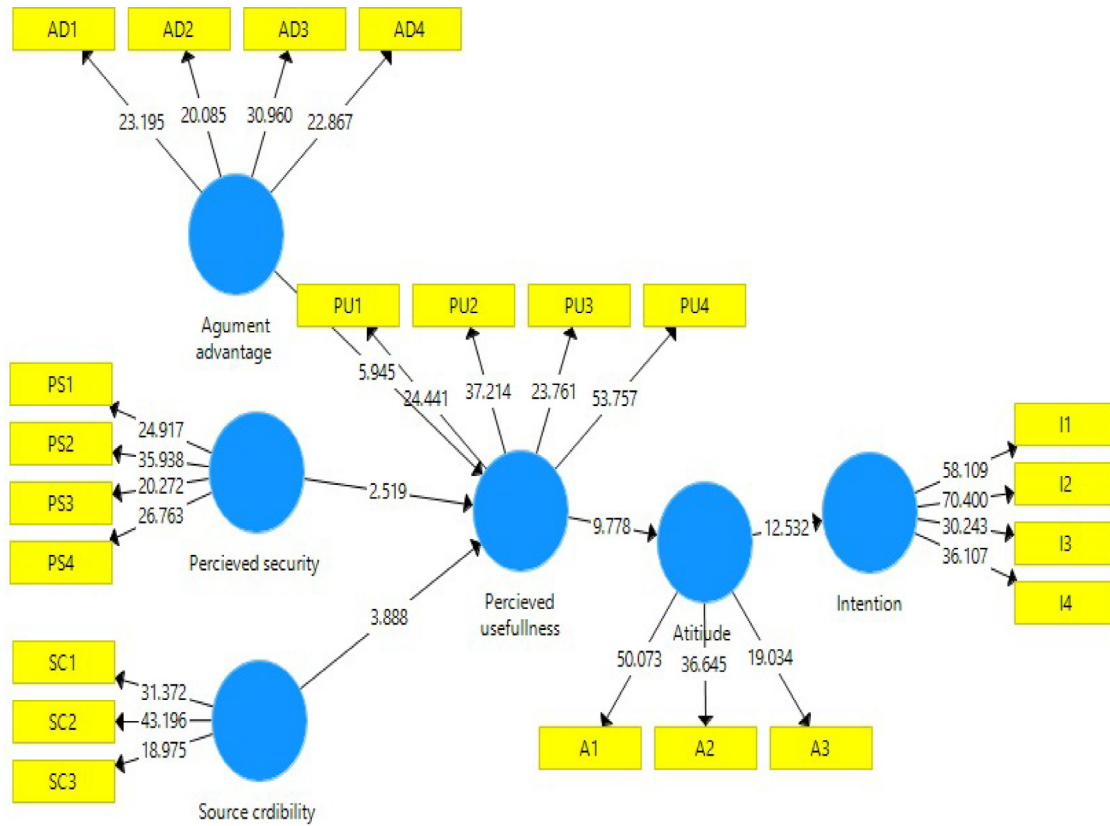
Fig. 2. Model testing.

Table 6
Hypothesis testing.

Direct hypotheses testing							
HYP	IV	DV	R Square	F	Beta (β)	T	Sign
H1	PS	PU	0.259	73.685	0.509	8.584	0.000
H2	AA	PU	0.386	132.86	0.622	11.527	0.000
H3	SC	PU	0.345	111.312	0.588	10.550	0.000
H4	PU	A	0.375	126.536	0.612	11.249	0.000
H5	PU	I	0.473	189.233	0.688	13.756	0.000
H6	A	I	0.44	165.477	0.663	12.864	0.000

73.685, $\beta = 0.509$, t = 8.584 > 1.96). Hypothesis 2 proposed impact of argument advantage on perceived usefulness, (F = 132.86, $\beta = 0.622$, t = 11.527 > 1.96); whereas Hypothesis 3 proposed impact of source credibility on perceived usefulness, (F = 111.312, $\beta = 0.588$, t = 10.550 > 1.96).

Hypothesis 4 proposed impact of perceived usefulness on attitude, and the results supported the original hypothesis (F = 126.536, $\beta = 0.612$, t = 11.249 > 1.96). Hypothesis 5 proposed impact of perceived usefulness on intention, (F = 189.233, $\beta = 0.688$, t = 13.756 > 1.96); and Hypothesis 6 proposed impact of attitude on intention (F = 165.477, $\beta = 0.663$, t = 12.864 > 1.962) and the results supported these hypotheses. Hence, all these three hypotheses were accepted. The whole model was also tested in Smart PLS and is illustrated in Fig. 2.

5. Discussion and implications

The main objective of the study was to investigate the effects of the source credibility, argument advantage and perceived security on the perceived usefulness of the adoption of the cloud computing. It will help the organizations to move towards the adoption of the cloud computing especially in a resource constrained developing country context. In this way, IT firms belonging to a developing country can

identify and adopt measures that will help them to fully utilize the benefits of cloud computing.

Drawing on the theories of elaboration likelihood model (ELM) and Technology Acceptance Model (TAM), this paper puts forward a theoretical framework using perceived security, argument advantage and source credibility to explore the relationships among perceived usefulness, attitude, and intention to use cloud computing in supply chain practices in organizations. The study showed the significance of these variables for the adoption of cloud computing services for the supply chain management in the IT industry of Pakistan. The results endorsed that perceived security, argument advantage and source credibility are strong predictors of perceived usefulness w.r.t cloud computing in the IT industry. These results are in line with the existing literature on cloud computing [24,25,30,47]. Jede and Teuteberg [85] confirmed the association between perceived security and perceived usefulness of cloud computing. Lin and Lin [41] also confirmed the positive association of argument advantage and source credibility with perceived usefulness. All three predictors showed positive significant relationship with perceived usefulness however, argument advantage showed strongest effect on perceived usefulness, which is also in line with the result of Lin and Lin [41].

The study also showed positive association between perceived usefulness and attitude and then attitude and intention. These results are also endorsed by Idhalama and Fidelis [64] and Zaman and Khurshid (2020) stating that perceived usefulness is positively associated to attitude which has a strong influence on adoption of new technology.

6. Conclusion, limitations and future work

Adoption of cloud computing in the supply chain management can enhance the productivity and effectiveness of the organization by many folds. This study provides an understanding to the strategic importance of moving towards the adoption of cloud computing services for the

supply chain management. Further this study also explores as to how perceived security, argument advantage and source credibility affect the perceived usefulness of the adoption of the cloud computing. This study will help the organizations to understand the underlying concepts of adoption of cloud computing proving to be beneficial for them in the future.

Despite its novelty and usefulness for IT sector in a developing country, this study also has its limitations. As the population sample of the study was only from Pakistan and limited to the twin cities Islamabad and Rawalpindi, so future studies can be conducted in different cultures and contexts. Similarly, the results of the study cannot be generalized for all the sectors as the study was only focused on the IT sector of the country. Future researcher can consider other predictor variables like perceived privacy, perceived cost and stability, and top management initiative to test the model of attitude and intention to use cloud computing. Future researchers can test the same model in other sectors and industries. Furthermore, future researchers can also test the model with the help of longitudinal data.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

Annexure

Argument Advantage

Cloud SCM services provide immediate access to hardware resources (e.g. coordinate plane; share information with suppliers)
Cloud SCM services make it easier for my firm to scale up my services to client demand (e.g. faster time to market)
Cloud SCM services drive my job toward new possibilities
Overall, cloud SCM services provide persuasive advantages

Source Credibility

Cloud SCM services companies provide helpful information on their websites
Cloud SCM service companies have good reputations
Cloud SCM service's companies are credible

Perceived Security

I believe that by using cloud SCM, the company that provides the service will protect my data from the theft
I believe that by using cloud SCM, the company that provides the service will prevent unauthorized access to my files
I believe that by using cloud SCM, the company that provides the service will have the means to prevent the loss of my data
I believe that by using cloud SCM, the company that provides the service will encrypt my data

Perceived Usefulness

Using cloud SCM services in my job will increase my productivity (e.g. make my work faster)
Using cloud SCM services in my job will improve my performance (e.g. make my work better
Using cloud SCM services in my job will make me more effective (e.g. help me make better decisions)

I find cloud SCM services to be useful in my job

Attitude

Using cloud SCM services in my job is a (bad … good) idea
Using cloud SCM services in my job will be (unpleasant … pleasant)
Overall, I (dislike … like) the idea of using cloud SCM service in my job

Intention

I intend to use cloud SCM services in my job more often in the near future
I intend to use cloud SCM services for more of my job responsibilities
I intend to use cloud SCM services more often with customers
I intend to use cloud SCM services more often with suppliers

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