Determinants of Online learning performance during Covid 19: The study of online management systems and the user satisfaction

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Purpose: The main purpose of the study is to examine the impact of the system quality, information quality, and service quality on the user satisfaction and actual usage of students regarding online learning systems. Meanwhile, the study has also examined the mediating role of user satisfaction and actual usage between the system quality, information quality, and service quality and performance influence of Students regarding online learning systems.

Method: For the data analysis we have used the SEM-PLS, which is one of the most robust statistical techniques to analyze the data related to social issues involving path relations. The measurement of the variables is taken from prior studies. The data is collected from the students studying in Chinese public universities.

Results: The findings indicate that the greater the interactivity, flexibility, reliability, and responsiveness of online learning offered by online learning in accessing up-to-date and accurate information, the more satisfied and pleased are students to rely on this service. The students consider the system to be in line with their needs and requirements. Students regarding online learning system is also influenced by the satisfaction of students and the real usage of online learning. Once students consider online learning necessary in the completion of academic activities, the real usage and satisfaction of students increases as well that resulting in improved performance. The level with which the quality of work is improved by using a system along with the achievement of set tasks, reduced errors, improved performance, and job control is referred to as performance impact.

Research Limitations/Implications: The basic determinant having the most significant influence on students' academic performance was task-technology-fit (TTF), based on performance-importance map analyses. Practitioners must incorporate task-technology-fit (TTF) in the implementation and promotion of online learning activities across public universities of China.

Practical Implications: It has been the first attempt by any researcher to incorporate compatibility and task-technology-fit (TTF) as mediators with reference to study online learning effectiveness. Thus, a significant contribution has been made by this research to a local body of IS expertise related to online learning.

Originality/Value: The study is among the pioneers on the issues related to online learning systems and user satisfaction in Chinese.

Background

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In December 2019, a new virus named Corona was discovered in a seafood market in Wuhan (Huang et al., 2020). The person-to-person transmission was seen by the clinical analysis results of the coronavirus (Yener., 2021). This declaration was done after the assessment of the deadly and high severity along with the rapid transmission of the virus across the world. It was announced to maintain social distancingcontrol of the transmission of the virus. The intentional increase in the physical gap between people for preventing the dissemination of disease is called social distancing (Nerlich& Jaspal, 2021). Businesses all across the world were forced to shut down. Schools were closed and sports activities were avoided. Educational instructions were forced to conduct online learning regimes. The use of web-based technologies, i.e. internet for educational purposes, management of the program, and instructional delivery is called online learning (Heo et al., 2021).

In the Era of technology, online learning has emerged as one of the most effective and efficient applications of mass digital technology. In available literature I,t is known as distance learning, 'e-learning, and blended learning. In online learning, we deliver instruction by connecting the internet with the help of different gadgets such as smartphones tablets, laptops and desktops computers (Clark & Mayer, 2016). Now the government programs are combined through online learning which helps in increasing the use of modern technology in the field of education (Isaac, Aldholay, & Abdullah, 2019). Flexibility and convenience are the main advantages of learning online. For the students there is the flexibility of schedule as they can access relevant material any time and its availability make the access easy (Isaac et al., 2019). In addition to this, the variety of different programs and courses helps in making the right choice through which students can easily manage their study time. There is an opportunity for students to effectively communicate and intermingle with high learners and have enough time for mesmerizing the information (Isaac et al., 2019). Moreover, online learning provides equal learning opportunities to the people of rural and urban areas (Habtoor, Arshad, & Hassan, 2020).

In information ssystemsas per the available literature, the latest version of DeLone and McLean Model is the best among all available options in terms of outcome and technology (Mardiana, Tjakraatmadja, & Aprianingsih, 2015; Tam & Oliveira, 2016). In the information system literature, the most recognized frameworks include the DMISM (Model of Information Systems Success) (Tam & Oliveira, 2016) and its revised version (Mardiana et al., 2015). The model has credibility in terms of utilizing technology and its outcomes. The latest western technologies have been examined extensively by previous studies along with their application in the modern world (Panigrahi, Srivastava, & Sharma, 2018). The advantages of utilizing these technologies have not been embraced. Therefore, there is a need for incorporating the outcomes and benefits of specific technological uses by adopting an approach, which analyzes the influence of general quality, including system, service, and qualities of information on the satisfaction of the user and real utilization. Thus, it influences performance. In order to measure the success of IS efforts, this technique has been adopted at a wider scale(Taherdoost, 2018).The results were contradictory, showing an influence of overall quality on

the practical application and satisfaction of users(Correa, Rondan, & Arenas, 2017; Tam & Oliveira, 2016).Several researchers, along with Aparicio et al. (2017) andChiu et al. (2016), debated about the irrelevance of these relationships. The arguments referred to the need for incorporating some more intervening variables, which are related to the applications and contexts of technologies.

China was regarded as land with fewer traits of individualism and prevalent social influences as resilient relationships. Therefore, for implementing a certain technology, there is a of compliances of the values of people/users along with the social norms. So, Chen, and Wan (2019) identified this issue as a number of studies have doubt on the positive influence of online learning on the performance of students. For instance, it was found by Sharma, Gaur, and Saddikuti (2017) that online learning has influence on the performance of students, however, the influence is weak and negative which could be due to several variables, including a lack of compatibility. Moreover, the compatibility was incorporated as a mediator by Sharma et al. (2017)in an investigation related to e-learning.The research was similar to some published articles as the investigation was done on the industrial gap in China regarding online learning. However, the study has some theoretical contributions. The TAM (technology acceptance model) of Mugo, Njagi, and Chemwei (2017) was extended by incorporating individual characteristics, i.e. anxiety variable.

Further, DMISM was extended by Isaac et al. (2019)focusing on individual attributes such as self-efficacy. More contributions were made to DMISM through the incorporation of organizational characteristics, i.e. transformational leadership (Isaac et al., 2019). Alternatively, the focus has been shifted by this study to the task characteristics and social norms, which include the fit between task and technology and compatibility. It was mentioned by Aldholay, Abdullah, and Isaac (2019)that cultural and social characteristics are the main problems related to the adaption of online learning. The significance of the role of compatibility in IS has been studied by Isaac et al. (2019). The study was a systematic review of literature resulting in the introduction of a conceptual model, which was not empirically tested before. Alternatively, the role of task-technology fit and compatibility were empirically investigated as an extension to DMISM with reference to the online learning system (OLS) in China.

Moreover, the contradictory findings in the literature related to the influence of overall quality on real utilization and satisfaction of user were tried to be explained by incorporating task-technology fit and compatibility as mediators. The influence of real utilization and satisfaction of user on performance was analyzed as well. The existing studies on DMISM have given mixed findings related to the influence of real utilization and satisfaction of users on performance (Correa et al., 2017; Stefanovic, Marjanovic, & Delić, 2016). A positive association was found between performance and real utilization and satisfaction of users. However, these relationships were found to be insignificant. It was argued by Panigrahi et al. (2018)that it is not sufficient to fully describe the relationship without incorporating the match of technologies with related tasks. TTF was considered by Alanazi, Frey, and Niileksela

(2020)as an important factor in the utilization of the latest technologies in institutions.

It is revealed by such contradictory results that some intervening variables must be incorporated that may have an influence on the relationship between performance and real utilization and user satisfaction (US). Therefore, intervening variables must be incorporated, such as TTF. TTF is a variable, which is regarded as the degree to which users are benefited by technologies in performing job-related tasks. It was discovered by Aljarboa and Miah (2020)thatthe use of technology influences performance. A similar relationship was found by Spies, Grobbelaar, and Botha (2020). In the current research, compatibility has been incorporated as a mediating factor in the relation of general quality, real utilization and satisfaction of users. The role of compatibility as a mediator makes this research different from a theoretical perspective. Firstly, TTF has been used as a mediator between the relationship of real utilization and satisfaction of users. Secondly, it has been used to analyze the influence on performance with reference to online learning in China.

1.0.Literature Review

The transformation of digital technology is not a new process. Higher educational institutions have been using digital tools for years (Marion, &Fixson, 2021). The digitalization of higher educational institutions is an important issue, which must be considered by several stakeholders. It involves the ability of institutions to implement ICT in every field of education. Educational institutions must provide professionals to face challenges and bring up

their solutions (Ashiq et al., 2021). It has been suggested by this transformation that sustainable management must be integrated to cope up with the latest technologies and challenges of the recent pandemic (Abad-Segura et al., 2020). The total of all the digital processes, which are required to initiate the digital process, is called digital transformation within the higher institution context. Digital transformation gives opportunities to higher education institutions to positively and optimally apply digital technologies (Ashiq et al., 2021). The process of digital transformation also involves preparing strategies that are required for establishing trust, amalgamation, process thinking, and reinforcement of every party, collaborative, organizational, and individual knowledge (Sarfarz et al., 2021). It was argued by Sarfarz et al. (2021) that recent transformation will be regarded as a revolution in the higher education system as a process. Moreover, it will become an institution over the next 50 years, as face to face educational system has changed to online and hybrid programs using teacher-centered, and objectivist methods of teaching for several domestic, provisional, and home-grown universities. It involves the application of reformed technologies to improve constructivism, cooperative pedagogy, and learner-centered for universities working across the world. Literature studies have claimed that online education is a new social process, which is gaining popularity because of the alternative for a face-to-face classroom. However, it has been considered a disruptive process. Digital transformation has been enabled by Covid-19 in higher education. These outcomes were the results of the crisis because of the Covid-19 pandemic. The new

transformation in the higher education institutions will take several years as different management regulations have been given in fewer number days. Resultantly, the branding of the online education system as a disruptive process has been changed to "messiah" status (Strielkowski, 2020).

Several difficulties are emerging in sophisticated information systems, and researchers strive to improve the quality and functioning of the latest technologies to achieve improved future growth. Therefore, general quality has been analyzed as a second-order construct, which includes system, service, and information qualities (Riandi, Respati, & Hidayatullah, 2021). Moreover, the intensity with which users feel that technology is easier to adopt, learn and connect is referred to as SQ. The degree to which information sourced by users from online learning is regarded to be organized, timely, thorough, and updated is referred to as information quality. The quality of service refers to tangibility, empathy, reliability, responsiveness, functionality, and assurance (Chinyamurindi & Shava, 2015; Mardiana et al., 2015). It has been suggested by this research that with the improved general quality of latest technologies, a positive influence is created on the lifestyle of users by their adoption and utilization.Isaac et al. (2019) examined the influence of general quality on compatibility and beliefs(Stefanovic et al., 2016; Li et al.,2021). The researchers were determined to reveal a meaningful relationship between the variables.

The adoption of the latest technology and its utilization is considered to be determined by compatibility in the field of information systems (Ozturk, Bilgihan, & Nusair, 2016). Similarly, it was suggested by Masood and

Egger (2019)compatibility is a crucial determinant in the adoption of IS innovation. The level of innovations perceived to be aligned with the current values, needs, and previous experiences of users is referred as compatibility. There is a need for literature studies in the field of education and internet to pay attention to the compatibility variable. It was found by Cabanillas, Fernández, and Leiva (2019)in technology application that mobile systems are preferably adopted in case of high compatibility. The intensity of online learning technologies fitting with students' values, beliefs, and lifestyles is referred to as a disposition in this research. Compatibility was found to have an influence on US. However, a purposeful relationship was developed byCabanillas et al. (2019)between the compatibility and utilization of mobile programs with reference to China.

The study will investigate the purposeful influence of compatibility on real utilization and US as well (Sharma et al., 2017). The extent of individuals adopting the functions of an information system based on frequency, nature, and time of utilizing a specific technology is referred to as real usage (DeLone & McLean, 2016). Similarly, real usage in the online learning field refers to the time of utilization and frequency. It was revealed by DeLone and McLean (2016)that the influence of utilizing a system on factors for the effectiveness of IS should be assessed for investigating the use of technologies. The effectiveness of IS may include the performance and satisfaction of the user. The influence of real usage by incorporating these variables has been analyzed by several researchers. Some researchers have found a meaningful relationship between real usage, US, and

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performance (Alanazi et al., 2020; Correa et al., 2017). However, it has been argued by some researchers that the relationship is irrelevant. The influence of real usage on US has been examined in this study (Isaac, Abdullah, & Ramayah, 2017). It has been proposed by this research that the greater the time duration and frequency of using the latest technologies by studies, the greater is their capability to complete the assigned activities. Moreover, students become able to fulfil their academic responsibility by using these technologies.

One of the critical success factors is the user's general satisfaction, which is used in determining the adoption of new systems. Thus, it has been applied by several researchers in IS practices (DeLone & McLean, 2016; Taherdoost, 2018). The satisfaction of the user has been regarded as the level of users perceiving systems as effective and beneficial. However, the disposition has been defined byCheng (2020)as the satisfaction of the user for the system with regard to its qualities, functions, quickness, and formats.
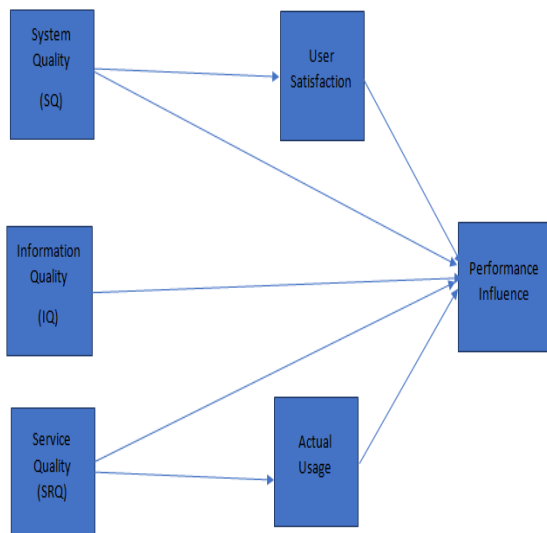

Figure 1.

Conceptual Framework

Similarly, disposition has been defined as the level with which students feel satisfied by online learning in terms of fulfilment of their expectations (Aldholay et al., 2019). It has been confirmed by several researches that the satisfaction of users plays a significant role in IS practices with regard to technological applications and different contexts. The meaningful influence created on the performance of a user is referred to as the satisfaction of a user (Isaac et al., 2017). It was discovered by Aldholay et al. (2019) that there exists a meaningful relationship between the satisfaction of a user and related advantages. It has been suggested by this research that students are able to fulfil their responsibilities and finish the assigned tasks when they are satisfied with such technologies. Thus, such technologies will become a necessity for students in achieving their educational obligations. The degree of a system matching the requirements of a task is referred as TTF in this research (Cheng, 2020). This concept was defined by Shyr and Chen (2018)as the level with which students are supported by technologies in performing their activities or tasks. In a similar way, the level to which a specific system is suitable for performing a task as per the needs is regarded as disposition (Shyr & Chen, 2018). Without incorporating TTF, the use of technology in an institution cannot be fully described by real usage (Panigrahi et al., 2018). The positive influence of TTF on the behaviours of the user has been analyzed by several researchers. The positive effects of TTF were examined by Spies et al. (2020)on variables related to IS effectiveness, such as net advantages and performance effectiveness. Previous research studies are consistent with these findings of reflecting a

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positive relationship between individual performance and TTF (Alanazi et al., 2020; Aljarboa & Miah, 2020). The effects of TTF on the relationship of performance, US, and real usage have been analyzed in this research built on the direct and confirmed effects of US and real usage on performance (Isaac et al., 2017). Moreover, the purposeful influence on performance created by TTF has been investigated.

Real intention and usage have been used as endogenous variables by researchers in analyzing the influence on adopting specific technologies. With the development of new technologies and changing trends, the focus of the study is on analyzing outcomes in terms of using the system, improving performance to measure the success of the system (Isaac et al., 2017; Taherdoost, 2018). The performance impact in this study has been defined as the extent to which student performances are influenced by online learning based on different factors, including the acquisition of knowledge, competence, productivity, and resource savings (Isaac et al., 2017).Therefore, the following research hypotheses have been proposed:

H1: SQ has significant impact on the US of students regarding OLS.

H2: IQ has significant impact on the US of Students regarding OLS.

H3: SRQ has significant impact on the US of Students regarding OLS.

H4: SQ has significant impact on the actual usage of students regarding OLS.

H5: IQ has significant impact on the actual usage of Students regarding OLS.

H6: SRQ has significant impact on the actual usage of Students regarding OLS.

H7: SQ has significant impact on the performance influence of students regarding OLS.

H8: IQ has significant impact on the performance influence of Students regarding OLS.

H9: SRQ has significant impact on the performance influence of Students regarding OLS.

H10: US has significant impact on the performance influence of Students regarding OLS.

H11: Actual usage has significant impact on the performance influence of Students regarding OLS.

H12: US mediates the relationship between SQ and performance influence of Students regarding OLS.

H13: US mediates the relationship between SRQ and performance influence of Students regarding OLS.

H14: US mediates the relationship between IQ and performance influence of Students regarding OLS.

H15: Actual usage mediates the relationship between SQ and performance influence of Students regarding OLS.

H16: Actual usage mediates the relationship between SRQ and performance influence of Students regarding OLS.

H17: Actual usage mediates the relationship between Information quality (IQ) and performance influence of Students regarding OLS.

2.0.Methodology

The current study is planned toa chive the specific objectives aiming direct between and among the variables of the study. Based on the research objective the study has employed the survey-based methodology and data is collected with the aid of a self-administered questionnaire(Asada, Basheerb, & Irfanc, 2020; Bhatti, Abareshi, & Pittayachawan, 2016;Henseler, Hubona, & Ray, 2016; Nuseir, Basheer, & Aljumah, 2020)). A total of 345 useable questionnaires were obtained from the process which were then encoded into the SPSS software. No missing values were found in the data set, which resulted in 84.6% response rate.

For the data analysis we have used the SEM-PLS, which is one of the most robust statistical techniques to analyse the data related to social issues involving path relations. The measurement of the variables is taken from the prior studies. The results of the current study are discussed in next section.

2.1.Measurement

A survey form was developed for this study, including 32 items. For analysis, a multiple item Likert scale was adopted in line with the research methods used in studies of information system. As suggested by previous studies, the Likert scale was used to measure constructs (Isaac et al., 2017;Zia-ur-Rehman et al., 2021). On the Likert scale, 1 referred to strongly disagree, and number 7 referred to strongly agree. The respondents in the survey were Arabic speakers. Thus, the survey questionnaire was formulated in English language and translated into Arabic. For accuracy of the translated survey form, backtranslations were done. Back translations are done when surveys are conducted in cross-cultural environments. In order to validate

measurements of constructs, previous research was used. the guidelines given by Lajuni, Bujang, and Karia (2018)were used to estimate the number of items for every construct. The researchers recommended the use of a few best items. The questionnaire was distributed in the public universities of China .

3.0. Results

The SEM-PLS is a two-dimensional statistical tool involving measurement or inner model analysis, and the structural or outer model analysis. The measurement model basically involves a systemic analysis of the reliability and validity of research framework basing on the data collected reliability (Adeleke et al.,, 2015; Hair et al., 2016; Henseler et al., 2016). The measurement model is supplementary to the structural model as establishment of reliability and validity is mandatory for the establishment of structural paths. The measurement model of the current study is shown in the figure 1.
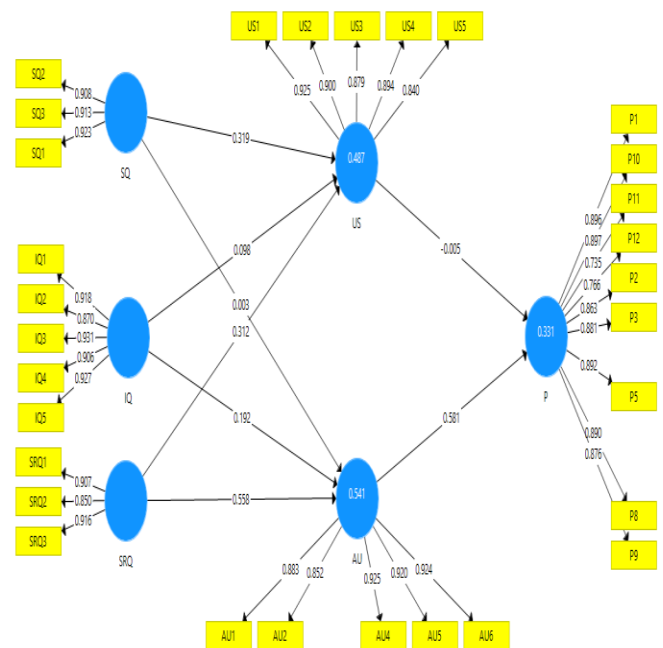

Figure 2: Measurement Model

The first step in measurement model is to determine the loading of each item involved in the analysis(Adeleke, Bahaudin, & Kamaruddeen, 2015; Hair, Hult, & Ringle, 2016; Henseler et al., 2016). Using PLS-algorithm the study has determined the outer loading and setting the cut of value of 0.70 the items with the loading 0.70 or less are excluded from the analysis(Akter, Wamba, & Dewan, 2017; Singh & Prasad, 2018).

Table 1.
Outer Loadings

	AU	IQ	P	SQ	SRQ	US
AU1	0.883					
AU2	0.852					
AU4	0.925					
AU5	0.920					
AU6	0.924					
IQ1		0.918				
IQ2		0.870				
IQ3		0.931				
IQ4		0.906				
IQ5		0.927				
P1			0.896			
P10			0.897			
P11			0.735			
P12			0.766			
P2			0.863			
P3			0.881			
P5			0.892			
P8			0.890			
P9			0.876			
SQ2				0.908		
SQ3				0.913		
SRQ1					0.907	
SRQ2					0.850	
SRQ3					0.916	
US1						0.925
US2						0.900
US3						0.879
US4						0.894
US5						0.840
SQ1				0.923		

The next step in Measurement mode is to determine the model as reliable. The Cronbach's Alpha, Composite Reliability, and , Average Variance Extracted (AVE) are the key indicators used in accessing the reliability of the given model(Hair et al.,2017; Henseler et al., 2016;

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Richter, Cepeda, & Roldán, 2016:Basheer, KhorramI, & Hassan, 2018; Ong & Puteh, 2017;(Basheer, Siam, Awn, & Hassan, 2019; Hatamifar, Darban, & Rezvani, 2018: (Hameed, Waseem, & Dahri, 2020; Henseler et al., 2016; Ong & Puteh, 2017).The results presented in the table 2 shows that all the vales of reliability indicators are above the threshold values.

Table 2: Reliability

	Cronbach's Alpha	rho_A	CR	(AVE)
AU	0.942	0.947	0.956	0.812
IQ	0.948	0.952	0.960	0.829
P	0.954	0.960	0.961	0.734
SQ	0.902	0.903	0.939	0.837
SRQ	0.870	0.875	0.921	0.795
US	0.933	0.935	0.949	0.789

The next step is to ensure the validity of model. Using the Fornell-Larcker Criterion the study has ensured that the model of the study is valid (Hair et al., 2016; Hameed, Nawaz, Basheer, & Waseem, 2019; Ong &Puteh, 2017).

Table 3: Validity

	AU	**IQ**	**P**	**SQ**	**SRQ**	**US**
AU	0.901					
IQ	0.686	0.899				
P	0.576	0.577	0.857			
SQ	0.649	0.869	0.502	0.900		
SRQ	0.730	0.882	0.561	0.860	0.891	
US	0.907	0.650	0.533	0.672	0.672	0.888

Once the measurement model is completed, the SEM-PLS enters into the next step, which is estimation of paths coefficients. Thus, in present study, a bootstrapping method is performed by employing 5000 samples to measure t-statistics for testing the proposed hypotheses (Akter, Fosso Wamba, & Dewan, 2017; Hair et al., 2016; Henseler et al., 2016).
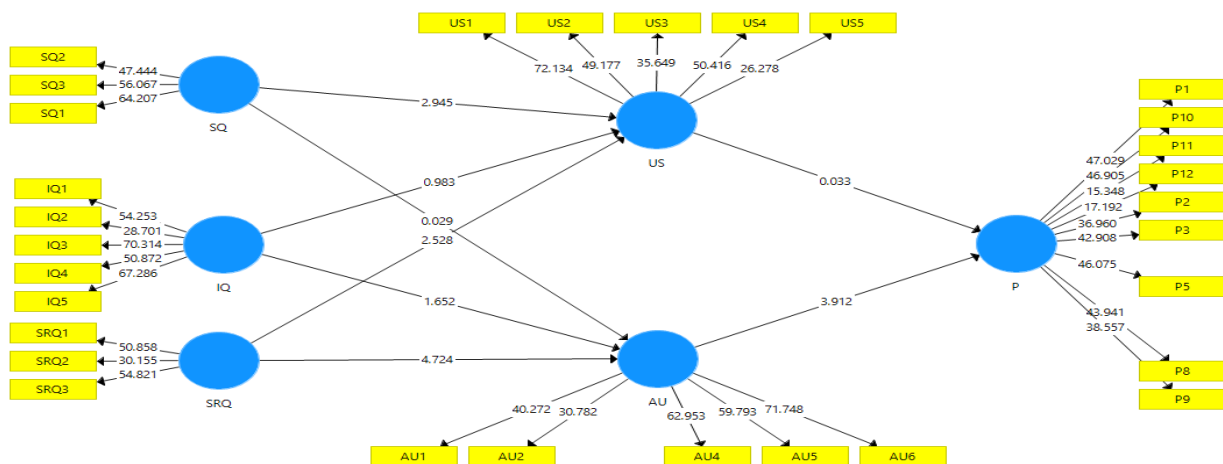

Figure 3: Structural Model

Table 4: Direct Relationships

	(O)	(M)	(STDEV)	(|O/STDEV|)	P Values
AU -> P	0.581	0.594	0.148	3.912	0.000
IQ -> AU	0.192	0.206	0.116	1.652	0.049
IQ -> P	0.111	0.124	0.073	1.509	0.066
IQ -> US	0.098	0.107	0.099	0.983	0.163
SQ -> AU	0.003	-0.001	0.098	0.029	0.488
SQ -> P	0.000	-0.002	0.078	0.001	0.500
SQ -> US	0.319	0.318	0.108	2.945	0.002
SRQ -> AU	0.558	0.550	0.118	4.724	0.000
SRQ -> P	0.323	0.319	0.078	4.159	0.000
SRQ -> US	0.312	0.306	0.123	2.528	0.006
US -> P	-0.005	-0.013	0.162	0.033	0.487

Table 5: Mediation

	(O)	(M)	(STDEV)	(|O/STDEV|)	P Values
IQ -> AU -> P	0.111	0.123	0.178	2.420	0.000
SQ -> AU -> P	0.112	0.211	0.160	3.027	0.000
SRQ -> AU -> P	0.324	0.326	0.107	3.032	0.001
IQ -> US -> P	-0.001	0.001	0.023	0.022	0.491
SQ -> US -> P	-0.002	-0.002	0.053	0.032	0.487
SRQ -> US -> P	-0.002	-0.007	0.055	0.030	0.488

However, the inner path model can successfully be determined if valid and reliable estimates are obtained in the outer model estimation process. The structural or outer model is estimated through R-square or coefficient of determination, which shows how much variance of endogenous construct is due to exogenous constructs in the model. The R-value is defined as weak, moderate and substantial by Hatamifar et al. (2018) depending on the values, such as, 0.67 is represented as substantial, 0.33 as moderate and 0.19 as weak. If endogenous latent construct is explained by only a few independent variables, then we will likely obtain moderate R-square.

Table 6: R-Square

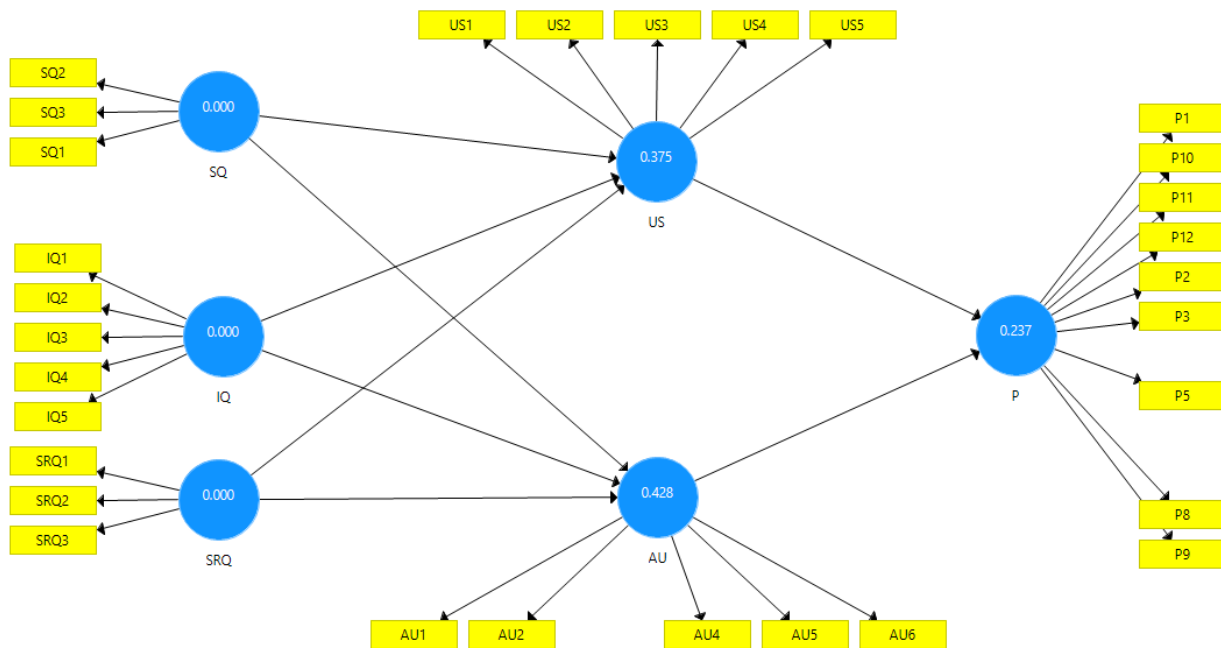|	R Square	R Square Adjusted
AU	0.541	0.534
P	0.331	0.325
US	0.487	0.480

Figure 4: Blindfolding

Furthermore, another criterion for inner path model assessment is the predictive relevance test by Shuhaiber (2018). This test measures whether the model has predictive ability.

Table 7: Q-Square

	SSO	SSE	Q² (=1-SSE/SSO)
AU	1085.000	620.251	0.428
IQ	1085.000	1085.000	
P	1953.000	1490.320	0.237
SQ	651.000	651.000	
SRQ	651.000	651.000	
US	1085.000	678.195	0.375

4.0. Results and Conclusion

The general quality creates a purposeful impact on compatibility as found in the current study. It reflects that when the quality of online learning is high based on different factors such as interactivity, flexibility, functionality, ease of use, and responsive in delivering accurate, relevant, up to date, and precise information, the students feel that the system or service is consistent with their needs, lifestyles, and values.

Moreover, the results show that there is a meaningful influence of compatibility on real usage. This suggests that as the OLS is consistent with the values, needs, and lifestyles of students, the greater is the use of online learning by them (Cheng, 2020; Clark & Mayer, 2016). In a similar way, the satisfaction of students is influenced by compatibility that shows a consistency between the needs of students and offerings of the OLS. Students are increasingly satisfied when the OLS is in accordance with their lifestyles, values, needs, and expectations. Moreover, students perceive their decision to rely on online learning as good. It is demonstrated by this research that

the general quality has an indirect influence on the real usage of online learning by the students mediated through compatibility. These findings have been based on a survey of students studying in nine public universities in China .

With better offerings of an OLS in terms of interactivity, flexibility, responsiveness, ease of use and reliability, the greater is the use of online learning by the students in accessing up to date and accurate information. Online learning is regarded by students in line with their lifestyles, values, and needs (Clark & Mayer, 2016). The general quality creates an indirect impact on the satisfaction of students of nine public universities of China , which is mediated through compatibility.

Therefore, it has been found that performance is influenced by TTF, which is in line with the results of some previous researches (Alanazi et al., 2020; Aljarboa & Miah, 2020; Spies et al., 2020). The satisfaction of students and actual usage create indirect influences on the performance of the OLS mediated through TTF. The sample was based on students of nine public universities in China . It was revealed that as the system fulfils the expectations of students, they will increase the duration of using online learning. This increased real usage leads to improve productivity and academic proficiency. However, it must be kept in consideration that the practice fits the methods of learning things, which are important in performing academic activities.

The inconsistent results of a direct association between three variables proposed by Aldholay et al. (2019), and Isaac et al. (2017) are based on the mediation effects. In explanation, when students of nine public universities of China increase their real usage of online learning because of their satisfaction, the ways of learning things are improved as well.

The awareness of the practice will improve for achieving and completing academic obligations. The performance of students will improve in three key areas, including efficiency, acquisition of knowledge, and productivity. Efficiency refers to the achievement of coursework tasks easily and quickly. Acquisition of knowledge refers to the sourcing of the latest ideas, information and skills for improved learning. However, productivity is improved performance in terms of learning and educational outcome. These three key areas are improved, which leads to an enhanced fourth factor, i.e., competency. Competency is improved through reduced errors.

5 Implications

The practices of online learning have been studies based on the adoption of technology. The post usage models have been clarified in this research. The informational success model proposed by Delone& Mclean was extended in the study. The practice was implemented in modern settings with different OLSs in China. A structural model was validated in this research for the general quality of the OLS. This was formed to improve the validity of the model. The model was based on three constructs of the first order, i.e., information, system, and service qualities. The compatibility and TTF variable were added in the information success model of Delone& Mclean model for developing a more rigid and improved model.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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