Perceived Quality and Satisfaction with e-Learning during COVID-19: Moderating Role of co-Production

Nozha Erragcha* and Hanène Babay

***Abstract*—In the context of emergency remote teaching, this study proposes a conceptual model that examines (1) the relationship between perceived quality and learner satisfaction with an e-Learning service in pandemic situation and (2) to test the moderating role of co-production of this service on this relationship. The study was conducted among 338 Tunisian students who took online classes during the second wave of COVID-19. The research uses of structural equations method (AMOS 21) to test the direct relationship and the Hayes process for the moderation test. The results show that the direct relationship between perceived quality and online learner satisfaction is significant and positive and that this relationship is positively moderated by co-production. Practical implications have finally been identified in order to improve the success of online education especially in the case of a crisis.**

***Index Terms*—E-learning, perceived quality, satisfaction, co-production.**

I. Introduction

Following its first appearance in Wuhan, the COVID-19 pandemic spread wildly around the world [1]. Its spread led to taking unusual measures such as social distancing [2] and lockdown. These measures had immediate effects on daily life in terms of disruptions to rituals and restrictions on freedom to travel, to public places, etc. [3]. In addition, whatever the end of the pandemic, it should have long-lasting economic, social, political and cultural impacts. The impact of this pandemic on education appears equally important [4]. Educational institutions were forced to close their doors everywhere to cope with the exponential rise in the number of infected people, this has compelled teachers to use the Internet and technology to develop digital learning environments within education systems [5]-[7]. They also used social media platforms [8] to ensure educational continuity during the lockdown period.

E-Learning is a mode of education that, through its economic, educational and social benefits, is considered as an optimal means of meeting the major challenges of training [9] particularly in times of health crisis. However, the extent to which the needs and concerns of the stakeholders involved are addressed appears to be critical to the adoption and success of this mode of education [10]. With respect to the pandemic situation imposed by COVID-19, adherence to this mode of learning has been inevitable as people are forced to distance themselves from each other [2]. However, this accession was not without its difficulties but was largely influenced by the implementation of the required skills and means [11], and by the tendency of some actors to resist this change [12]. And yet, the pandemic has been an opportunity for the educational world to be fully open to digitization [13]. From now on, several forms and learning tools have become particularly widespread, including on-line training and conferences, audiovisual recordings, illustrative videos, etc. Thousands of documents and course materials converge into PowerPoint, PDF and Word to be shared via social media sites or online learning platforms adopted by higher education institutions such as Moodle. We have also experienced forms of hybrid learning [14]. In such a situation, the learner becomes involved in this transformation and begins to play a participatory role [15]. This participation affects, among other things, the learner's commitment [15] and takes him from passive public status to active player status [16]. Thus, the course is now provided in a logic of co-production.

In marketing, the concept of co-production has been widely treated as a variable that can influence consumer behavior and perceptions of service delivery [17], [18]. However, this concept is still rarely addressed in the context of e-learning, especially in the era of the pandemic.

Despite researchers' interest in distance education and its advantages in a pandemic situation, Researchers are still concerned to reveal the factors that can encourage learners to voluntarily adopt this mode of learning and the modalities to make the learning experience desired and not only inevitable. Indeed, the success of online teaching remains closely linked to the satisfaction of learners with the online learning activity. However, this satisfaction seems to depend on several factors. These factors are not strictly concerned with the technical aspects of learning and the devices used, but also with the methods of steering the online learning activity, which are based in particular on encouraging learners to participate. In this research, learner participation is not seen as an antecedent of learner satisfaction but as a moderator of the perceived quality-satisfaction relationship. This moderating role was not considered in past research, which is the main contribution of this research. Thus, this research aims to shed additional light on the role of co-production in the context of e-learning especially in a pandemic situation and aims to propose practical actions to stimulate the desired adoption of this mode of learning and fight against the harmful effects of the health crisis on education.

II. Literature Review

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Nozha Erragcha is with the Faculty of Economic Legal Sciences and Management of Jendouba, Tunisia.

Hanène Babay is with Fashion Institute of Monastir, Tunisia.

*Correspondence: erragcha@yahoo.fr

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A. E-Learning

E-Learning refers to the use of Internet technologies to provide a wide range of solutions that can improve knowledge and performance [19]. This type of learning makes it possible to have greater autonomy, to train at a distance and to have an individual [20] or collective learning path. Its basic principles imply that students are physically removed from instructors [21].

Since we are in a crisis situation, this research is not in the context of regular online teaching but rather of emergency remote teaching. This teaching is described by [22] as a temporary shift from teaching delivery to another delivery model due to crisis circumstances. According to [23], the efficacy of emergency remote teaching depends on several aspects including the role of the student, the role of the instructor, the characteristics of the communication channels, etc. It is also specific to the fact that urgency creates a set of challenges that could affect learners' level of satisfaction with this mode of learning. In a crisis situation, educators lack time to adjust their teaching materials [23]. In addition, these educators and their students may lack means (internet connection, electronic devices) and familiarization with the use of online teaching platforms [23], [24], which could make the online learning experience imperfect for learners [23]. They also seem frustrated by the lack of social connection inherent in this type of teaching compared to face-to-face teaching [23], [24].

E-Learning is usually provided on specialized platforms and designed for educational purposes. Nevertheless, since the rise of social networks and the explosion in the number of students connected to these sites, particular attention has been paid to the use of these networks for learning purposes [25]. Social networking sites offer features of interactivity and inherent usability that continue to attract users, this has generated interest from tutors and teachers to use it as a digital medium for learning and interaction with learners [26], particularly in the era of the COVID-19 pandemic [27].

Social media also play a pivotal role in knowledge sharing in online communities [28]. They are used to create and disseminate collective knowledge for learning parties [29]-[31]. In the context of learning, social media play a key role in access to information [27] but also in knowledge sharing. They enable teachers and learners to interact and collaborate with each other [27] through synchronous and asynchronous communication [32], [33]. They also allow learners to actively participate in the creation of informational content in relation to the courses taught. Thus, social media seem to respond to learners' quest for convenient learning, especially during periods of sanitary confinement.

B. E-Learning Perceived Quality

In the literature, the concept of quality of service has been differently conceptualized and defined. Much research has contributed to the knowledge of this concept, particularly with the contributions of three schools of thought: American [34]-[36], French [37] and Nordic [38]. The works of Parasuraman et al. [34], [36] put particular emphasis on the need to assess perceived quality on the basis of the perceptions of the client receiving the service. Parasuraman *et al.* [36] defined quality of service as an overall judgement, or attitude, on the superiority of service. Quality of service thus refers to an overall impression of the consumer around inferiority/superiority relative to an organization or service [39], [40]. Similarly, [41] defined perceived quality as the consumer's judgment of the degree of excellence or superiority attributed to an entity. For [40] "perceived quality of service is the result of a comparison of customer expectations and actual experience of service" (p. 37).

Parasuraman *et al.* [34] considered that the perceived quality of a service would result from a comparative process between what the customer considers to be the service offered by a company and its perceptions of the performance of that service. However, due to the intrinsic characteristics of the services (intangibility, separability, expiration, etc.), this concept is considered very complex. Its evaluation is also difficult for several reasons. First, it is necessary to judge the intangible aspects inherent in service while these are difficult to identify and quantify [34]. These aspects are then subject to different assessments by their clients [41], [42]. In addition, the assessment of a service remains significantly different from that of a good in terms of the characteristics on which the assessment is made [34].

In the context of higher education, this assessment is subject to becoming even more complex [43] because of specific characteristics such as students' cognitive participation in the service process, (2) the different parties involved in meeting the needs of the students, (3) the continuous nature of this service and (4) its long-term perspective. For all these reasons, [44] stated that this is a multi-tasking concept that lacks a correct definition. Thus, it is important to note that there is still no consensus on how to define and measure quality of service in this sector [45], [46]. However, in the context of this research, we choose to consider the perceived quality of e-Learning service as a one-dimensional concept and being understood as an overall assessment of the learner around the e-Learning service from which he has benefited.

C. Online Learner Satisfaction

The concept of satisfaction was first highlighted by [47] in his work in 1965. Consequently, many studies have undertaken to define and measure that in the context of the consumption of products and services [48]-[50]. Although we place ourselves in a particular context, that of learning, the marketing perspective implies that students are also considered end-customers and that satisfaction with an educational product/service is the result of an exchange between teachers and students [51]. Thus, the definition of learner satisfaction is similar to the traditional understanding of consumer satisfaction.

In this perspective, [52] defined perceived learner satisfaction or e-satisfaction [53]-[55] also referred to as web-based satisfaction [51] as the total perception of the experience of online learners consuming the e-Learning service. Giese and Gote [56] defined it as an affective response of varying intensity accompanying asynchronous learning activities of e-Learning, and which is stimulated by several aspects, such as content, use of the interface, customization and performance of learning [51]. Learner

satisfaction in the e-Learning context seems to derive from a cumulative satisfaction summarising a multitude of learning stages (starting with the motivation phase and ending up with the evaluation phase) and which can be spread over the entire educational path pursued by the learner. This is the reason why we have chosen to adopt the overall concept of satisfaction whereby learners are called upon to express their level of satisfaction with their online learning experience in terms of an overall and not specific assessment of a particular aspect of that experience.

D. Online co-Production

In the literature, the concept of co-production is based on the notion of "servuction" or service manufacturing [57] and is part of the practices of experiential consumption experiments [58]. Co-production is a global term designed to conceptualize the physical and mental participation of the customer in the production of the service and in the delivery process [59], [60]. Bettencourt *et al*. [61] defined co-production as "functional, collaborative involvement in the production of services, which is essential for successful service delivery". In a broad sense, co-production can be understood as the active participation of people in services. This "collaborative" aspect of the client is increasingly taken into account in marketing research [62], particularly those that occur within the framework of the dominant "Service-Dominant Logic" service logic. Indeed, as opposed to a dominant product logic (G-D Logic) based on an exchange of products between the consumer and the service provider [63], [64], the dominant logic of the service implies an exchange of skills and knowledge within a process based on co-production.

E-Learning is consistent with this logic. Learners can be "actors" or "co-producers" of the e-learning activity by accessing information, communicating with peers and tutors, and engaging in various learning activities [65]. They can thus form an experience [66] of collaborative learning that is fruitful and fostered by the recurring meetings of these stakeholders. Within this experience, learners participate in the creation of the knowledge that occurs there.Several researches suggests that e-Learning occurs easily on the basis of the constructivist approach [67], [68] where learners' collaboration leads to optimizing their own learning and that of others [68]. This collaboration tends to increase with the use of social media as a learning lever. Indeed, social media provides learners with the ergonomic means of contact, user-friendly exchange and interactive communication necessary for the proliferation of active collaboration. Thus, these learners are all the more encouraged to participate actively in the production of this service [69] especially by having the means and skills required for this participation, including technological tools and suitable individual and social skills [70]-[72].

As shown in Fig. 1, the conceptual framework of this research indicates a direct effect of perceived quality on learner satisfaction as well as the moderating role of co-production on perceived quality relationship - learner satisfaction. These relationships were tested during the COVID-19-lockdown period.

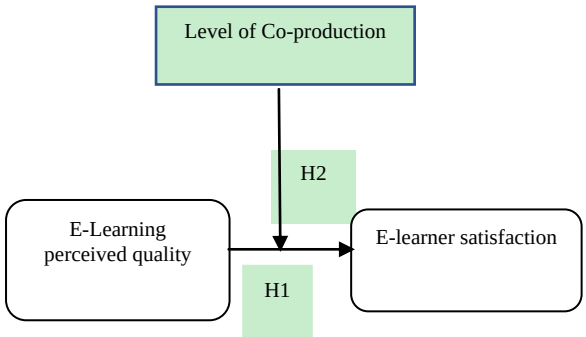

Fig. 1. Conceptual model.

III. Hypotheses

A. Effect of e-Learning Perceived Quality on Learner Satisfaction

In the literature, several studies have investigated the effect of perceived quality on learner satisfaction in the context of e-Learning. The majority of these studies are conducted outside of the pandemic context. Indeed, [73] showed that the satisfaction of online learners is influenced by the quality of service. More recently, [74], [75] have also shown that satisfaction is positively induced by the quality of e-Learning service. Moreover, by placing oneself in the conditions imposed by the health crisis, very little work has dealt with this relationship. We cite the work of [76] who demonstrated that learner satisfaction in India is positively related to the overall quality of e-Learning service in the era of COVID-19.

In this regard, while remaining in the pandemic context and placing ourselves in a different cultural context, we believe that this relationship still deserves to be considered. This being so, we can make our first hypothesis which is formulated as follows:

H 1. *Perceived e*-Learning *quality positively affects online learner satisfaction*

B. Moderating Role of Online co-Production

Past work has devoted much more attention to the concepts of perceived quality, satisfaction and co-production taken separately than to the relationship between these variables [77]. Indeed, research has attempted to measure client participation and its impact on perceived quality of service and satisfaction [78], [79]. For example, participation behaviour has been shown to have a positive impact on satisfaction, [69], [77], [80] and perceived quality [78], [81].

However, there are few studies on this concept in the context of e-Learning. Moreover, no research so far has addressed the moderating effect of co-production on the relationship between perceived quality and satisfaction in e-Learning. However, outside this context, research has been conducted on the moderating role of co-production [82], [83]. For example, [79] was shown that the positive relationship between the customer's involvement and the perceived performance of the service is moderated by the co-production of the service so that this positive relationship becomes stronger at a high level than at a low level of co-production of the service.

Co-production clearly acts on the collaboration of

beneficiaries with providers to improve production and service delivery [82], [84]. In the same logic as illustrated by these authors and in the context of e-Learning, it would be legitimate to think that at a high level of co-production, learners may consider themselves as active members of the learning activity and may have feelings of trust, pride and passion for the activity. These feelings can extend their roles to create and co-produce knowledge. In this context, learners would be motivated to seek new information or exchange creative ideas to improve the quality of the e-Learning service. Thus, and since it is the learners who evaluate the learning service, it is highly expected that the learners will appreciate the learning activities they have jointly designed or improved, which will proliferate their satisfaction with this service. Thus, a high level of co-production would lead to a perception of the quality of education as higher but also as a generator of a higher level of satisfaction.

In the case of low co-production, less involved learners may lack the motivation to collect information and interact with tutors and peers to improve the design and delivery of the learning service. Thus, these learners are more likely to view the quality of these services as less and not like the services provided. A low level of co-production would therefore lead to an unfavourable assessment of the quality of online teaching, which will generate a lower level of satisfaction among learners. Below, we make the following assumption:

H.2. *The positive relationship between e-Learning perceived quality and e-*learner *satisfaction is moderated by co-production of service e-Learning, such that the positive relationship was stronger on a high level rather than a low level of co-production of service*

IV. Method

A. Data Collection and Sample

With a view to subjecting the conceptual framework of this research to empirical validation, a convenience sample was collected with 338 Tunisian undergraduate and graduate students belonging to different public universities located on the Tunisian territory. 47% of them are male and 53% are female. 84% of the surveyed students are between 19 and 22 years old and 16% of them are between 23 and 27 years old. We are not limited to a particular discipline, institution, or geographic area. Data was collected by online questionnaire. The study was conducted a few weeks after online insured courses during the second wave of the pandemic. Teachers and learners with this experience used various learning tools during this period, including the Moodle platform officially adopted by the Ministry of Higher Education, social media sites and video conferencing applications such as Zoom, Microsoft teams, Skype, etc. The courses were delivered in terms of synchronous and asynchronous activities.

B. Instruments

The variables in our model was operationalized using measurement scales taken from the literature. Indeed, we adopted the [85] scale to measure perceived quality of e-Learning service. We used the [82] scale to measure satisfaction and the [86] scale adapted by [82] to measure the co-production variable. These multi-item scales were selected because they were validated in the literature and showed good psychometric quality in previous research. Items were subject to a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

V. Results

A. Exploratory Analysis and Reliability

In order to test the conceptual model, we first conduct exploratory factor analyses to verify the latent structure of the scales of measurement borrowed from the literature and their reliability. The ACP and Cronbach Alpha results for the variables in our model are presented in the following Table I.

The table shows that the representation quality of the items is higher than 0.5. For each of the dimensions obtained, the KMO indices are satisfactory and indicate the existence of an acceptable factor solution. Similarly, each dimension has a significant amount of information since the percentage of variance explained is greater than 70%.

TABLE I: Exploratory Analysis

Constructs	Items retained	Extraction	Eigenvalues	Components	α Cronbach's
Perceived quality	PQ1	0.776	2.837	0.881	0.8620
	PQ2	0.659		0.812	
	PQ3	0.705		0.840	
	PQ4	0.697		0.835	
KMO = 0.821, Meaning of Bartlett = 0.000					
Percentage of variance explained = 70.921%					
	Items retained	Extraction	Eigenvalue	Components	α Cronbach's
Satisfaction	SAT1	0.755	2.151	0.869	0.8025
	SAT2	0.718		0.847	
	SAT3	0.679		0.824	
KMO = 0.705, Meaning of Bartlett = 0.000					
Percentage of variance explained = 71.716%					
	Items retained	Extraction	Eigenvalues	Components	α Cronbach's
Co-production	COPRO1	0.811	2.333	0.901	0.8554
	COPRO2	0.749		0.865	
	COPRO3	0.772		0.879	
KMO = 0.727, Meaning of Bartlett = 0.000					
Percentage of variance explained = 77.753%					

In addition, the examination of internal coherence at the exploratory level shows that Cronbach's Alpha coefficients are reliable for each of the variables of the model (perceived quality, satisfaction and co-production).

B. Confirmatory Analysis

We carried out a confirmatory analysis to ensure the reliability and the convergent and discriminating validity of the constructs by following the procedures of [87]. The measurement model showed good fit quality (Table II).

TABLE II: ADJUSTMNT OF MEASUREMENT MODEL

Index	χ2 /DF	GFI	AGFI	RMR	RMSEA	CFI
Value	2.814	0.95	0.915	0.033	0.073	0.966

Table III and Table IV presents the results on the reliability, convergent validity and discriminant validity of latent variables.

TABLE III: RELIABILITY AND CONVERGENT VALIDITY

Dimensions	Composite Reliability	convergent validity
PQ	0.865	0.616
SAT	0.804	0.578
COPRO	0.858	0.669

TABLE IV: DISCRIMINANT VALIDITY

	PQ	SAT	COPRO
PQ	**0.616**		
SAT	0.3881	**0.578**	
COPRO	0.3124	0.4928	**0.669**

Based on these tables, Jöreskog Rhô values are greater than 0.7 for all variables. In addition, the Rhô values of convergent validity exceed the minimum threshold of 0.5. Similarly, the discriminant validity conditions are met by verifying the superiority of the mean variance extracted from the variables on the square of the relationship between the two-to-two dimensions of the model. Therefore, we can infer that the variables in the measurement models are reliable and valid.

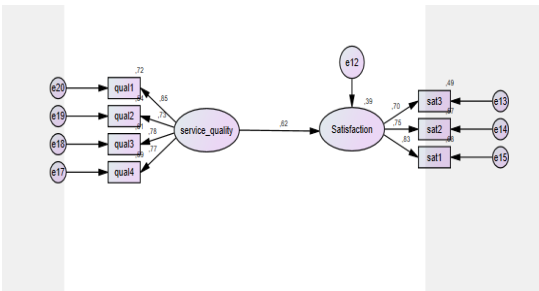

Fig. 2. Structural model estimates.

We also check the fit quality of the structural model. Table V shows that the causal model has a good fit. Indeed, the absolute, incremental and parsimony indices indicated check the empirical conditions often recommended when validating causal models.

TABLE V: GLOBAL ADJUSTEMENT INDICATORS

Index	χ2 /DF	GFI	AGFI	RMR	RMSEA	CFI
Value	2.357	0.976	0.948	0.020	0.063	0.983

Based on hypothesis 1, the results show that quality of service has a positive and significant effect on satisfaction (Coeff standardized = 0.621; CR = 8.608/ P = 0.000). The H1 hypothesis is therefore verified. The most satisfied students are those who perceive a good quality of the learning service. Quality of service is thus an essential variable in determining satisfaction with the e-Learning service.

C. Moderating Effect

To test the role of co-production moderator on the relationship between perceived quality and satisfaction with the e-Learning service, we chose to go through the Hayes process [88]. The significance of the moderating effects is estimated on the basis of a 95% confidence interval (corresponding to a $p<0.05$ value). When the confidence interval does not contain the zero, the moderating effect is considered to be significant and it is then appropriate to interpret the direction of moderation caused by co-production as well as to grasp the intensity of that moderation at each estimated level of co-production (Table VI).

As For our case, the results showed a positive and significant effect of co-production on the perceived quality-satisfaction relationship (Coeff. = 0.0861; t=2.2584; p = 0.0246; IC= 0.0111; 0.1611).

TABLE VI: VALUES OF THE MODERATOR

	B	SE	T	P	LLCI	ULCI
Low level	0.2502	0.0672	3.7205	0.0002	0.1179	0.3824
High level	0.4223	0.0887	4.7602	0.0000	0.2478	0.5969

Moderation is also mapped in the chart below:

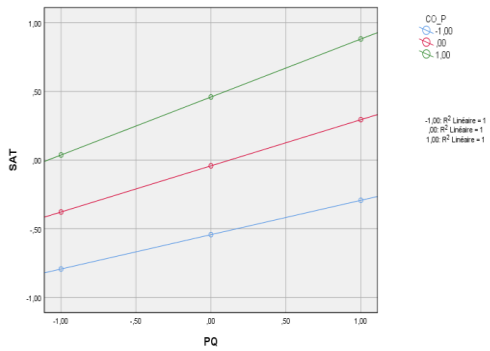

Fig. 3. Moderating effect of co-production.

As reflected by the results of the Table VI and the graph above we find that the effect of perceived quality on satisfaction is statistically and positively significant, relative to the two levels of the moderator variable, that is, when the production is low and when it is high. However, this effect increases and becomes more important when student co-production is stronger. Thus, we can conclude that co-production positively moderates the impact of quality of service on satisfaction with web-based learning. This means that the H2 research hypothesis is retained.

VI. DISCUSSION AND IMPLICATIONS

The finding indicate that learners' satisfaction is strongly induced by perceived quality (62%). This result is consistent with past work by confirming the positive effect of perceived

quality on the satisfaction of learners using the e-Learning service [73]-[75], [87], particularly in a pandemic situation [71]. Thus, we can say that the quality of the e-Learning service is essential to promote user satisfaction and that the effect of the quality of the service on satisfaction is not situational. Online learners have no intention of conceding to demand quality service, not even in unusual situations. Therefore, e-Learning service providers must be concerned about the quality of the service provided, in all situations, in order to promote the satisfaction of the beneficiaries of this service.

In addition, in order to improve e-Learning experience and promote its desired adoption, it is also recommended to encourage the participation of these learners in the production of this service [89], [90]. Indeed, giving learners an active role in the delivery of an online course promotes the perception of the quality of this service [91], [92] as well as the commitment of learners to online learning [15].

This research has also shown that co-production positively moderates the effect of perceived quality on learner satisfaction. In other words, it has been shown that a high level of co-production reinforces the positive effect of perceived quality on learner satisfaction in the context of e-Learning (H2 is confirmed). This outcome is relevant in that it provides additional insight into the role of learner participation in the proliferation of satisfaction with the e-Learning service, particularly in the context of the health crisis. In this case, we can say active participation allows learners to overcome the consequences of physical distancing measures when they reconnect with their peers and tutors, regain the self-confidence and motivation to become more engaged in the learning activity, which could enable them to achieve their academic goals. Thus, the quality of the e-Learning service is perceived as superior and generating a higher level of satisfaction.

With this in mind, we recommend that teachers who intend to provide on-line courses design activities that promote the active participation of learners and avoid treating learners as passive receivers of an on-line course. For example, they can propose problematic situations and encourage learners to participate in their resolution, frequently perform synchronous activities to allow the learner to intervene in different moments of the learning activity, give learners a greater margin of intervention during synchronous or asynchronous activities by encouraging them to further develop certain topics in relation to the course, to provide examples or illustrations in relation to certain concepts and phenomena, to conduct lectures, etc. As such, the experiences of teachers - Having created interactive groups, especially on Facebook, and encouraging their students to post statutes to enrich the knowledge that occurs when teaching certain modules – are inspiring and promising.

E-Learning is a highly participatory service. Its success would therefore largely depend on the level of participation of learners. Indeed, when learners choose to be active co-producers of a learning activity, they would be willing to devote more effort and time to contributing ideas, sharing information and co-producing the services they consume [9].

Active participation in an online course is also likely to improve knowledge acquisition and skills development [93]. For example, to further encourage this participation, it is strongly recommended to use interactive platforms that learners are familiar with, such as social media [94]. The use of these media could contribute to the development of a favorable collaborative learning where the learner is likely to be both producer and consumer of the learning service. It can also act as a prescriber of certain activities.

This study is thus consistent with the Service-Dominant Logic approach, which considers that the beneficiaries of a service constitute resources and collaborating partners who can co-create value with the service provider[94], [95]. Thus, promoting distance education will no longer be in the logic of “consumer-oriented marketing” but in the logic of “consumer-driven marketing”.

Similarity to all researches, this study has certain limitations and promising paths. Indeed, despite the interest of the results obtained here, a limit can be assigned to this research, especially around the choice of a convenience's sample, which prevent us from generalizing the results of the study. This choice was related to the limited resources of the investigators as well as the specific conditions under which the study was conducted.

In terms of future research, we recommend testing the effect of learner participation on their engagement with e-Learning activities and their performance in learning. Secondly, it would be useful to explore the expectations of the upstream learners and to gather their assessments around their level of participation in the learning activities both at the middle and at the end of the course to improve their level of participation in the design and delivery of the course. It would also be very interesting to test the relationships of this model in different cultural contexts with a view to deciding on the effect of culture on the role of co-production of an e-Learning service.

VII. Conclusion

The use of distance learning during the lockdown revealed several challenges and implementation constraints. Nevertheless, it emphasized more than ever the virtues of this mode of teaching. Indeed, in a pandemic situation, as usual, distance learning is likely to be at the service of learning and skills acquisition. The pandemic had to reveal the need to create the right conditions for this mode of education to take full advantage of these virtues. It also drew attention to the interest in improving the success of this teaching by pushing it to be adopted deliberately and not inevitably. Indeed, it is all the more interesting to make the use of this type of teaching desired by learners. To do this, it is necessary to multiply the level of satisfaction felt by learners during its use, acting both on the perceived quality of the service provided and on the level of participation of learners in the production of this service. Indeed, this research confirmed the results of past work around the positive effect of perceived quality on learner satisfaction. Nevertheless, for the first time, it tested the moderating effect of co-production of the learning service on the relationship between perceived quality and learner satisfaction.

Thus, this research has shed additional light on the role of co-production in the context of e-Learning in the era of the

pandemic. Indeed, it has been shown that the positive relationship between perceived quality and learner satisfaction is moderated by the co-production of the service so that this positive relationship becomes stronger at a high level of co-production. Thus, the quality of the service provided is all the more satisfying when this service is co-produced. This finding confirms the importance given to this variable in the literature, according to which co-production has a positive effect on the perception of service delivery.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

NE conducted the research; HB analyzed the data; NE and HB wrote and approved the final version of the paper.

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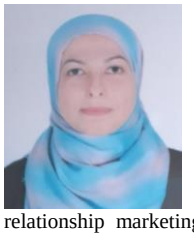
Nozha Erragcha holds a Ph. D and a master's degree in marketing from the Faculty of Economics and Management of Tunis. She is currently an assistant professor at Faculty of Economic Legal Sciences and Management of Jendouba-Tunisia. Her areas of research interest are in digital marketing, marketing and NTIC, consumer behavior, e-commerce, service marketing, etc. Her area of expertise is e-learning.

She is an expert in pedagogical breakdown and scripting of online courses. She is also the author / co-author of several marketing research works, particularly around social network marketing, marketing, e-learning, etc.



Hanène Babay holds a Ph.D. and a master's degree in marketing from the Faculty of Economics and Management of Tunis. She is currently professor of marketing at the Fashion Institute of Monastir, Tunisia. She is also the author / co-author of several marketing research works, particularly around social network marketing, consumer-brand relationship, e-learning, etc. Her areas of research interest are in relationship marketing, brand management, digital marketing, consumer behavior, e-commerce, e-learning, etc. She is also a trainer and marketing consultant for Tunisian companies.