From Co-Creation in E-learning to Student Achievement: An Ultimate Solution to Covid 19 Findings

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ABSTRACT

Countries established emergency strategies in response to the COVID-19 outbreak to guard against potential disruptions to university attendance. Although this put a lot of pressure on educational systems, it also provided a chance to create alternative educational opportunities. It also made it easier to incorporate different learning tools into online learning platforms, which allows teachers, students, and other teaching-learning staff to share resources, co-create their own value, and contribute to resolving the COVID-19 crisis. The objectives of the study were to evaluate the impact of value co-creation on student accomplishment in a higher education setting and to develop a theoretical framework for a value co-creation process based on Service Dominant logic. This study employed quantitative research, which was carried out using a random sample technique on a semi-structured online survey. Results revealed that e-learning is the future of education, can make this model more useful by including learner experience on continuous basis. This study examined a model based on explanatory study about customer participation in value co-creation of private Universities of Spain. According to this model, self-driven learners prefer e-learning due to many benefits in the presence of important determinants as collaboration/communication, learner technical skill, faculty e-readiness, personalization and perceived instructional design of prospective learners with value co-creation. This study has also proposed that value can be co-created through student participation at multiple points during phases of the service exchange process. As theoretical contributions, this study fills the gap in the literature in digital learning which is a new and underexplored study area. Further, it broadens the understanding of both the concepts of value co-creation and online education.

Key Words: E-learning Communication/Collaboration, Perceived Faculty e-readiness, e-learner technical skill, Personalization, Perceived Instructional Design, Value Co-creation and Student Achievement

1 Introduction

The e-learning delivery system is continuously evolving (Khalaf et al., 2022); with the advancement of information technology (IT) (Delungahawatta et al., 2022), new scientific and practical innovations are incorporated into the e-learning model (Ramadhhan et al., 2022). For this purpose, the role of consumer involvement in the value creation process is important.

The term ‘service’ means all those activities and elements that contribute to e-learners’ perceived value, where value is perceived by the consumer alone (Seo and Um, 2022). In contrast with the perspective underlying conventional goods-dominant logic, perceived value is considered not to be the value embedded in the service.
products which customers buy, rather it is the value-in-use, which customers determine in the usage phase, as defined by the service logic philosophy (Shamim et al., 2022). The center of discussion is the issue of value co-creation vis-à-vis the notion of value-in-use (Williams, 2022); hence, it is arguably solely created and perceived by the customer, seemingly independently from the business (Ogunbodede et al., 2022). Value co-creation is a value building system which ensures the existence of different economic actors and resource escalators (service providers: administration, different stakeholders as business partners, followers, and users), these service providers put effort into combining efforts to co-produce value (Zhou et al., 2022).

The process of value creation comprises service providers and consumers (Vargas et al., 2022). Service providers create value for consumers by including customer preferences in the design of ‘service systems,’ which is known as ‘customer participation (Solakis et al., 2022).’ That is why service providers and customers are known as
‘creators of value.’ The same participation is expected from consumers of e-learning. Related to service product creation, production, and consumption, customer participation is defined as the particular attitude, and the level of customer’s effort and association, whether intellectual, material, or emotional, that relate to the creation and delivery of service (Sorkun et al., 2022). Arguably, the consumers always try to customize their service environment (Erragcha and Babay, 2023), such that co-creation of value is an essential issue for businesses because understanding consumers’ state of mind and identifying their requirements relating to their needs and wants may give businesses a competitive advantage (Coulianos et al., 2023).

Participation includes controlled measures on the part of customers to make sure that service is not only provided in a manner that fulfills their requirements, but also enhances the quality of the service delivery process and ensures value for them (Dangaiso et al., 2022). Similarly, businesses can also control their customers by providing them with the opportunity to access and participate in their customer participation model or it can take initiatives to bring customers into direct interaction with them. In the same way, online educational institutes can also involve their e-learners in value co-creation (Mahecha-Duarte et al., 2022).

Online students’ achievement is related to online institutional services (Yalley, 2022), such as a user-friendly portal (Gerhardt et al., 2022), detailed study plan on learning management system (LMS), proper academic calendar (semester activities), an immediate reply to students’ grievances, timely results declaration (Yeboah, 2022), and career counseling, which can also improve the students’ academic experience regarding online education (Batoool et al., 2022). In attempting to examine quality enhancement in the context of the quality aspect of e-learners’ learning experience, online institutional services can be considered the core service product, while student involvement refer to connecting activities that can enhance students’ experience.

The quality of the value proposition creation process can be enhanced by motivating and encouraging consumers through participation (Huang et al., 2022). The participation determinants which may encourage or discourage e-learners to participate in the process of the service offering need to be explored (Banerjee and Das, 2022).

The COVID-19 outbreaks pushed the globe to make a significant leap toward technology-based learning and teaching and underlined the necessity and difficulty of updating universities to offer online instruction (Eton and Chance, 2022). As a result, combining information and communication technology with cutting-edge pedagogical approaches has gained momentum as a solution to the current problems brought on by university closures and closures in general (Singh et al., 2022). Over 91% of the world’s students were affected by the widespread shutdown. The pandemic’s timing has presented another problem for the history of online education, which has been expanding gradually around the world (Broo et al., 2022). Educational Institutions have been in the forefront of reducing the gap between the closure scenario and the educational system, and now online education is truly on pace to become the dominant form of education and instruction (Poroçani and Zaçellari, 2022).

Nowadays, the biggest challenge for educational planners is the continuous improvement in the quality of online education after COVID-19. There is also a rise in student demand for higher education because of their professional requirements; this continuous increase in demand has opened the world for e-learning institutions. However, unfortunately, developing countries are still facing many hindrances in the execution of e-learning programs due to technological and awareness issues, along with less market acceptability from employers. Researcher adopted a philosophy consistent with service logic, also referred to as co-creation, which examines whether and how e-learners participate in decision making, the aim is to better understand the role and importance of e-learners’ involvement in the value creation process, which ultimately affects customers’ perception of their quality enhancement process, in the context of e-learners in Spain (Yalley, 2022). This study will help to identify the significance of co-creation in e-learning, in terms of value outcome, through student involvement in e-learning in the context of online education service provision. Here, it is important to make clear that, contrary to the position taken by many analysts in this area, the theoretical premise espoused in the research is that all value-in-use is created solely by the consumer.

2 E-Learner Communication and Value Co-Creation
The process of developing shared values involves active user involvement, and the effectiveness of such contact is crucial to the development of shared values among users (Cooshna-Naik, 2012). Interaction and cooperation between players in co-creation are made possible through online platforms like e-learning. S-D Logic views users as co-creators of values and drivers of integration who can contribute depending on the level of exposure, experience, and expertise (Wu et al., 2022). Students now have access to a variety of resources to deepen their understanding
and improve collaboration during the learning process. Additionally, students are more likely to look for information and no longer only rely on the source; they want their opinions to be heard (Sabahi & Heydari, 2022). An integrated learning environment is created in an e-learning platform by interaction, allowing professors and students to communicate virtually while producing content or learning materials based on tacit knowledge of the subject matter. Students' sense of belonging and influence are considerably strengthened through meaningful connection among teachers, students, and the institution.

**E-Learner Technical Support and Value Co-Creation**

Tech support is described as people who provide assistance to customers of software applications, including but not limited to help line assistance, logic support bases, fax, automated voice message, response systems, remotely controlled software and other services. Technical support significantly affects perceived usefulness, according to several e-learning studies (Batool et al., 2022). To further elaborate, e-learning research has shown that technical support is significantly correlated with the perceived usefulness and ease of use (Wu et al., 2022). Technical support is the intervention of technical professionals to help students use the platform in the co-creation process efficiently. Because it is connected to the co-creation process of e-learning, the quality of technical support affects students' motivation in embracing the technology.

**Perceived Faculty E-Readiness and Value Co-Creation**

Technically the word readiness means, being completely ready for a situation or action. 'E-learning readiness' is defined as an institution's systematic and physical preparation for an e-teaching experience or activity that will ultimately have a substantial impact on the e-learning process' value co-creation. According to Yalley (2022), e-Learning Readiness is implementing aids of institutions in developing e-teaching methods and successfully achieving their ICT objectives. One of the most critical components for the success of integrating e-learning programmes in higher education is e-readiness (Kopackova et al., 2022). According to Muwani et al. (2022) e-readiness can indicate learning institution's deficiencies and strengths in technological upgradation and preparation to reassure policy changes, to place the educational establishment digitally in the global competitive economy, and also to apply available resources prudently across institutional boundaries. One of the main reasons why e-learning frequently fails is that teachers attempt to adapt traditional classroom pedagogies to new media rather than constructing innovative pedagogies that would make the best use of new technologies (Montiel & Gomez-Zermeño, 2022). The term "teacher e-readiness" in the context of this study indicates their commitment, their preparation for fundamental technical and communication skills, and their training to innovative teaching methodologies for e-learning, which serve as crucial pillars in the co-creation process of e-learning.

**Personalization and Value Co-Creation**

In recent years, the subject of personalization in e-learning has grown in importance (Tran et al., 2022). The development of Digital learning platforms has made it feasible to make content accessible to a larger learner population and opening the doors of opportunities to learn for those who traditionally cannot pursue formal education (Gao et al., 2022). However, as Web-based learning systems typically did not adjust content to fit individual learner needs, such expanded access has presented difficulties with respect to providing adequate educational experience to different learners (Wang et al., 2022). In order to avoid this dilemma, research on customization explored for identifying learner requirements and tailoring content to meet those needs so that it may serve as the basis for the co-creation process (Ramaswamy and Narayanan, 2022). In this research, the author discussed personalization in the context of online learning and offers a method for tailoring learning scenarios in line with popular personalization criteria (Alimamy and Gnoth, 2022). A personalization parameter describes the unique traits and requirements of learners, including theirpast knowledge, motivation, and learning preferences. For achieving its objectives, we need to devise strategy. Personalization strategy is a component of the co-creation process in e-learning, is the collection of personalized attributes for personalizing of learning situations (Sheng et al., 2022). The major goal of this effort is to give teachers the freedom to select and use a personalization technique that fits the needs of the students and the course requirements. This goal was focused on by the researcher using a strategy based on two complementing forms of personalization: the first one enables the tailoring of learning materials and course structure. The second is a strategy, which enables specifying the approach's flexibility. By selecting a subset of personalization characteristics, this degree of customization enables teachers to choose the learning context and to determine the personalization technique (to be implemented on the available learning scenario). The acquisition of learner profiles at the time of enrollment for learning particular specified
concepts is based solely on the personalization boundaries set forth in the strategy framework for that specific learning scenario, and the first type of personalization heavily depends on the second. This makes sure that every learner will get the learning materials that are appropriate for their profiles.

**Perceived Instructional Design and Value Co-Creation**

Early research examining the use of curriculum development for eLearning claimed that programmes of instructional design had forged a connection between the creation of instructional materials grounded in educational psychology (Rengasamy & Cole, 2022), the wise decision and application of technology (Goi et al., 2022). A team of experienced professionals are essential for the facilitation of good e--Learning, according to more current eLearning research by Thangiaih et al. (For instance, given the abundance of social applications and Internet communication tools available (such as peer-to-peer channels, non-immersive virtual reality, teleconferences, podcasting, blog posts, learning management systems, playback technologies, e - mails, instant messaging, social bookmarking, etc.), most academic institutions will need to consult with instructional developers to ensure that the tools they select and use will teach the concepts clearly and effectively. Additionally, collaborating with a group of instructional design experts can help to address many of the issues and problems that have been mentioned in the literature linked to eLearning, such as low participation rates, learner reaction, high non-completion rates, and poor learner achievement (Miles, 2022). Additional benefits of good technology applications and excellent instructional design are provided by latest research (Dua’M et al., 2022). Although professions in curriculum strategies are not brand-new, higher education institutions are increasingly using instructional designers with knowledge of pedagogical techniques and technology. However, instructional design services evolved along with computer technology. Application developers have played a crucial role in the expansion and success of eLearning courses for higher education as part of the co-creation process (Zamora-Ramos et al., 2023). Needs analysis, learning outcomes, activity analysis, entry abilities and attributes, instructional practices, media selection, and evaluation and assessment have been the main areas of theoretical development and study in the field of instructional design. This has resulted in more informed and efficient design and development practices for online learning and value co creation.

**Value Co-Creation and Student Achievement**

The knowledge, abilities, and conduct that students acquire in educational settings determine student achievement (Raccanello et al., 2022), which is also reflected in their academic achievement. In contrast, it may be said that there are a lot of elements that will affect student accomplishment in online learning settings created with technology support (Schwerter et al., 2022). For instance, Younas et al. (2022) claimed that students' ability to self-regulate in online educational settings and value co-creation had an impact on their academic performance.

Additionally, research demonstrates that effective e-learning environments improve student performance (Almasri, 2022). In addition, according to Snelling et al. (2019), while communication issues and technical difficulties are challenges for students, curriculum design and time - management skills are crucial elements of great e-learning and value co-creation processes.

**Mediating Impact of Value Co-Creation between E-Learning Determinants and Student Achievement.**

According to the service-centered perspective, services are primarily distinguished by being customer-centric and focused on engaged customer participation. As a result, the phrase “value co-creation” is frequently used to refer to customer involvement and participation, and it suggests that clients are active instead of passive. Co-creation of value is higher in services, particularly, in ‘high involvement’ services where customer and the service provider need to interact with each other to develop a mutually valued outcome. Being a prominent service, education requires quality interactions between service provider (teacher) and the customer (student) to enhance the ‘enjoyment of work’ as well as ‘value-in-use’ which is the outcome of collaborative learning. Value co-creation revolves around the integration of resources, and "Operand resources" (skills and knowledge) are the "basic source of strategic gain." Operand resources, which are often physical resources like raw materials or finished goods, are the tools on which an activity or act is carried out to achieve a result. According to Krishnamurti et al. (2022) the interactions between service providers’ and customers’ resources are essential in creating value. In the education sector, both operand (books, notes, assignments etc.) and operant resources (skills, knowledge, abilities, ideas) belong to both parties (student and the teacher). Both parties should collaborate in the forms of interactions to create effective learning outcomes. However, it is needed to make sure whether the participants are enjoying the process (process enjoyment) of value co-creation (Dudung et al., 2022). Service environment is another determinant of the quality-of-service delivery. It facilitates interactions by sharing resources that actors have with each other.
These interactions can be direct (e.g., person-to-person interactions) or indirect (e.g., interactions via appliances such as technology). Therefore, this concept is applicable to study the online education context too. Value co-creation provides a personalized experience to a customer which is termed as ‘value in-use’. In value co-creation service providers become ‘value facilitators’ who provide ‘value propositions’ to customers for their co-creation process. Here, the academics’ (university teachers) role is to facilitate students’ learning process by providing needed resources. Customers are more active and need to collaborate in the value creation process. Thus, students’ active engagement is expected to collectively increase value in education. Collaboration between the teacher and the student decides the level of value creation as the outcome of education. However, scholarly work which recognized co-creation in teaching, particularly online education is very rare.

H1-E-learner Communication has positive relationship with Co-Creation.
H2-E-learner Technical Support has positive relationship with Co-Creation.
H3-Perceived Faculty e-Readiness has positive relationship with Co-Creation.
H4-Personalization has positive relationship with Co-Creation.
H5-Perceived Instructional Design has positive relationship with Co-Creation.
H6-Value Co-Creation has positive relationship with Student Achievement.

H7-Value Co-Creation mediates the positive relationships between e-learning determinants: E-Learner Communication/Collaboration (H1a), E-Learner Technical Support (H1b), Perceived Faculty E-Readiness (H1c), Personalization (H1d), Perceived Instructional design (H1e) and Student Achievement.

Figure 1: Theoretical Model

3 Research Methodology

This section of the research describes the methodology, the instrument, the collection of data tool, and the sampling strategies utilized in the study to examine the relationship between critical factors, value co-creation, and students’ academic achievement as they relate to e-learning determinants in the context of Private Universities of Spain. The study used a positivist research approach to address difficulties with research objectivity, as advised by experts. Since the current study is realistic and practical in nature, the quantitative research approach is considered to be the best approach for achieving the goals of the research (Leavy, 2022). Additionally, the deductive approach works best for reaching the generalization objective. Because of this, the current study is open and affirms positivism as the best strategy for continuing the collection of data and sampling.

Instrument

The instrument used to obtain the data is one of the study's most vital and important elements. The study guide was divided into five main sections: The first section of the survey asks about the respondents’ demographic
characteristics, such as their year, gender, and academic year. Section 2 Elaborates the e-learning factors in COVID context a. e-Learning technical skills (Veeramanickam and Ramesh, 2022, Kulikowski et al., 2022) b. Communication and Collaboration (D’Aniello et al., 2022, Coulianos et al., 2023) c. Perceived faculty e-readiness (Çebi, 2022, Blacer-Bacolod) d. Personalization (Joy and Pillai, 2022, Dhiauir et al., 2022) and e. perceived instructional design (Dua’M et al., 2022, Lenane, 2022) 3. Value Co-creation(Zamora-Ramos et al., 2023, Wang et al., 2022) and Section 4 explains Student Achievement (Raccanello et al., 2022, Schwerter et al., 2022). To ensure participants’ objectivity, the closed-ended questionnaire was developed with the research approach in mind. The poll makes use of a five-point Likert scale, where 1 is the least significant and 5 is the most, with a value obtained of strongly disagree to strongly agree. Empirical data were used to develop the instrument. The survey was contextually changed and adjusted as a consequence of expert advice and the results of the pilot study. A pilot study involving 50 individuals was done to ensure that the instrument was appropriate. The varimax rotation from principal component analysis and confirmatory factor analysis were used to remove extraneous factors while keeping important drivers. The reliability test was used to further validate the instrument's dependability.

**Sampling**

Five top reputed and structured Spanish Universities were selected for this study. Purposive sampling method was espoused to grasp a relevant sample of the population from private universities of Spain. The students having minimum of three to four Semesters’ learning experience were selected as respondents for this study. The sample size was calculated through Rao-soft software, which suggests the sufficiency of respondents as Equations. Thirty five percent of the entire number of questionnaires were forwarded to senior semester, while 65 percent were sent to initial and middle semester students. A total of 350 students in total filled out the questionnaire completely or returned it. Incomplete questionnaires were not included in the analysis. The respondents’ knowledge with the instrument’s concepts was confirmed; either they were in-depth students of similar systems or have the cognitive capacity to understand and utilise the tool.

**Analysis:**

In order to apply the structural equation modelling, this study used the Smart-PLS-3 structural modelling programme. Through structural equation modelling, the statistical method and structural model can be evaluated using algorithms and bootstrapping. The use of SMART-PLS has its own advantages over other software, such as its effectiveness for complex models, ability to perform better with small amounts of data, and lack of a normalcy requirement. Most researchers favour Smart-PLS over other software because it is user-friendly and convenient. These researchers either had prior experience with similar systems directly or had the cognitive capacity to understand and utilise the instrument.

**Demographic Statistics of Respondents**

The demographic information for the respondents including gender, age, educational level, degree level and learning experience in online mode is shown in Table 1.

<table>
<thead>
<tr>
<th>Head</th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male.</td>
<td>55%</td>
</tr>
<tr>
<td></td>
<td>Female.</td>
<td>45%</td>
</tr>
<tr>
<td>Age</td>
<td>Less than 20</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Above 30</td>
<td>15%</td>
</tr>
<tr>
<td>Education Level</td>
<td>Under Graduate.</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>Graduate.</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>Post Graduate.</td>
<td>20%</td>
</tr>
<tr>
<td>Degree Level</td>
<td>1st Semester.</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>4th Semester.</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>7th Semester.</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>8th Semester.</td>
<td>20%</td>
</tr>
<tr>
<td>Learning Experience in Online</td>
<td>Less than 6 Months.</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td>7 Months to 1 Years.</td>
<td>36%</td>
</tr>
</tbody>
</table>
Estimation of Measurement Model

The measuring model's validity and reliability, convergent and discriminant, were all examined to ensure its authenticity. To determine whether the tools accurately measured the variables, they were put to the test. Statistics including convergent validity, Average Variance Extracted (AVE), and outer loadings were taken into account to guarantee convergent dependability. Factor loadings are also the key sign of validity, according to many experts, notably by (Hair & Alamer, 2022). Data is stored for items with values larger than 0.50. Secondly, the composite reliability (CR) scores are substantially greater than the acceptable cut-off value of 0.70. Third, AVE values more than 0.50 are considered acceptable (Hair et al., 2016). This is the third sign of convergent validity. The details of convergent validity are shown in Table 2.

Table 2: Reliability and Convergent Validity.

<table>
<thead>
<tr>
<th></th>
<th>Cronbach's Alpha</th>
<th>rhino</th>
<th>Composite Reliability</th>
<th>Average Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional design</td>
<td>0.943</td>
<td>0.945</td>
<td>0.949</td>
<td>0.554</td>
</tr>
<tr>
<td>Online collaboration</td>
<td>0.781</td>
<td>0.799</td>
<td>0.851</td>
<td>0.536</td>
</tr>
<tr>
<td>Faculty Readiness</td>
<td>0.881</td>
<td>0.882</td>
<td>0.908</td>
<td>0.584</td>
</tr>
<tr>
<td>Personalization</td>
<td>0.856</td>
<td>0.860</td>
<td>0.890</td>
<td>0.537</td>
</tr>
<tr>
<td>Student achievement</td>
<td>0.849</td>
<td>0.849</td>
<td>0.899</td>
<td>0.689</td>
</tr>
<tr>
<td>Technical skills</td>
<td>0.871</td>
<td>0.878</td>
<td>0.907</td>
<td>0.660</td>
</tr>
<tr>
<td>Value co-creation</td>
<td>0.932</td>
<td>0.933</td>
<td>0.941</td>
<td>0.550</td>
</tr>
</tbody>
</table>

Factor Loadings

Table in appendix-1 indicates the values of outer factor loadings. The values show the contribution of construct into the main variables. All the values in the factor loadings must be greater than or equal to 0.60. The values depict that all values are greater than the threshold value of 0.60. The minimum value in variable ‘e-learner communication and collaboration with value co-creation during Covid-19’ is 0.621 and maximum value is 0.854. Similarly, the maximum value of ‘Personalization’ 0.831 and minimum value is 0.672. Moreover, the values of ‘Perceived Faculty E-readness’ fall between 0.710 to 0.831. Alike, the values of ‘student achievement’ are between 0.788 to 0.854. Furthermore, the values of ‘technical skills’ fall between 0.757 to 0.836.

Discriminant Validity:

The two methods that were most frequently employed in assessing discriminant reliability were the Fornel-Larcker criterion and the cross-loading assessment. As the Fornel-Larcker method did not adequately evaluate discriminant validity so alternative methods, including the multitrait multi-method matrix, were employed study to test the discriminant validity. The Heterotrait-Monotrait correlation ratio was additionally used. According to Ringle and Wende, the HTMT, or heterotrait-to-monotrait ratio, needs to be less than 0.85 to show discriminant-validity in an assessment of discriminant validity. Table 2's values are all less than 0.85, hence discriminant validity is not a problem. Determining the size of the evaluating inaccuracy requires consideration of discriminant reliability. In order to identify whether two concepts are linked or unrelated, it is necessary to adjust for attenuation in the audio signal in table3.

Table 3: Fornell-Larcker Criterion

<table>
<thead>
<tr>
<th></th>
<th>Instructional design</th>
<th>online communication and collaboration</th>
<th>perceived faculty E-readness</th>
<th>personalization</th>
<th>student achievement</th>
<th>technical skills</th>
<th>value co-creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional design</td>
<td>0.744</td>
<td>0.732</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online collaboration</td>
<td>0.674</td>
<td>0.732</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Readiness</td>
<td>0.819</td>
<td>0.704</td>
<td>0.764</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personalization</td>
<td>0.720</td>
<td>0.504</td>
<td>0.605</td>
<td>0.732</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Achievement</td>
<td>0.687</td>
<td>0.519</td>
<td>0.608</td>
<td>0.537</td>
<td>0.830</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The HTMT ratio was employed in this study in addition to the Fornel-Larcker criterion to determine the discriminant validity. The numbers should be smaller than 1 according (Becker et al.). This study meets the criterion for utilising less than 1, even though some writers also advocate using values lower than 0.90. The HTMT values are displayed in Table 4.

### Table 4. HTMT Ratios.

<table>
<thead>
<tr>
<th></th>
<th>instructional design of course</th>
<th>online communication and collaboration</th>
<th>perceived faculty E-readiness</th>
<th>personalization</th>
<th>student achievement</th>
<th>technical skills</th>
<th>value co-creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Communication</td>
<td>0.647</td>
<td>0.723</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Faculty E</td>
<td>0.821</td>
<td>0.740</td>
<td>0.766</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-Readiness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personalization</td>
<td>0.732</td>
<td>0.540</td>
<td>0.655</td>
<td>0.755</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Achievement</td>
<td>0.688</td>
<td>0.591</td>
<td>0.688</td>
<td>0.577</td>
<td>0.876</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Skills</td>
<td>0.623</td>
<td>0.507</td>
<td>0.663</td>
<td>0.578</td>
<td>0.499</td>
<td>0.845</td>
<td></td>
</tr>
<tr>
<td>Value Co-Creation</td>
<td>0.776</td>
<td>0.587</td>
<td>0.698</td>
<td>0.767</td>
<td>0.788</td>
<td>0.467</td>
<td>0.756</td>
</tr>
</tbody>
</table>

**Model Fit Indices**

The values of the SRMR, NFI, d-ULS, and chi-square are used in smart-PLS to determine fit measure. Inferential statistics have used to analyse d-ULS by indicating SRMR values that are less than 0.08.

### Table 5: Model Fit Indices

<table>
<thead>
<tr>
<th></th>
<th>Saturated Model</th>
<th>Estimated Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRMR</td>
<td>0.073</td>
<td>0.073</td>
</tr>
<tr>
<td>d_ULS</td>
<td>4.750</td>
<td>4.750</td>
</tr>
<tr>
<td>d_G</td>
<td>3.123</td>
<td>3.123</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>1,761.112</td>
<td>1,761.112</td>
</tr>
<tr>
<td>NFI</td>
<td>0.622</td>
<td>0.622</td>
</tr>
</tbody>
</table>

**Regression Analysis**

The study's structural equation assessment (SEM) was evaluated using path coefficients and t-statistics (table 6). As mentioned earlier, the bootstrapping approach was employed to achieve this objective. Each of the study's two-tailed hypotheses requires a t-value of larger than 1.96 to be considered significant at the 5% level, as recommended by Hair et al., (2019). The greater the path coefficient -value, the more significant the projected impact on endogenous (dependent) variables will be. The findings of the boot-strapping procedure are shown in detail in Table 4. Given that 'Instructional design of Course -> value co-creation' has been demonstrated to be accepted (p = 0.002, t = 3.047), hence, H1 is considered accepted. The values of second variable, 'Online communication and collaboration -> value co-creation' are as (p= 0.843, t = .198), which states that Online communication and collaboration is not associated with value co-creation. The third variable, 'Decisive Trait -> Employee job retention', is not supported by the data. Furthermore, the third variable, which examines the relationship between Perceived faculty E-readiness -> value co-creation, demonstrates a statistically significant relationship, (p = 0.16, t = 2.426). According to 'Personalization -> value co-creation' (p= 0.000, t = 3.636). The values of ‘Technical skills -> value co-creation’ (p= 0.349, t =.938), so, the contribution of technical skills on value co-creation was not found. Furthermore, the values of ‘Value co-creation -> student achievement’ depicts that there is a relationship between Value co-creation and student achievement. So, the hypothesis is rejected as per the values (p=0.000, t =21.297).
Table 6. Mean, STDEV, T-Values, and P-Values.

<table>
<thead>
<tr>
<th></th>
<th>Original Sample (O)</th>
<th>Standard Deviation (STDEV)</th>
<th>T Statistics (O/STDEV)</th>
<th>P Values</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional design of Course -&gt; Value Co-Creation</td>
<td>0.374</td>
<td>0.123</td>
<td>3.047</td>
<td>0.002</td>
<td>Accepted</td>
</tr>
<tr>
<td>Online communication and collaboration -&gt; Value Co-Creation</td>
<td>0.016</td>
<td>0.078</td>
<td>0.198</td>
<td>0.843</td>
<td>Rejected</td>
</tr>
<tr>
<td>Perceived faculty E-readiness -&gt; Value Co-Creation</td>
<td>0.199</td>
<td>0.082</td>
<td>2.426</td>
<td>0.016</td>
<td>Accepted</td>
</tr>
<tr>
<td>Personalization -&gt; Value Co-Creation</td>
<td>0.345</td>
<td>0.095</td>
<td>3.636</td>
<td>0.000</td>
<td>Accepted</td>
</tr>
<tr>
<td>Technical skills -&gt; Value Co-Creation</td>
<td>-0.059</td>
<td>0.063</td>
<td>0.938</td>
<td>0.349</td>
<td>Rejected</td>
</tr>
<tr>
<td>Value Co-Creation -&gt; Student achievement</td>
<td>0.738</td>
<td>0.035</td>
<td>21.297</td>
<td>0.000</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Table 7 indicates the mediating effect of variables. In this study value co-creation is mediating variable between e-learning determinants and student achievement. The existence of mediation explains the relationship of other variables. The table 6 indicates the indirect effect in three variables; Instructional design of course -> value co-creation -> student achievement $t=2.904$ $p=0.004$, perceived faculty E-readiness -> value co-creation -> student achievement $t=2.453$ $p=0.015$ and personalization -> value co-creation -> student achievement $t=3.681$ $p=0.000$ as their values are significant. Additionally, the variables; online communication and collaboration -> value co-creation -> student achievement $t=1.96$ $p=0.844$ and technical skills -> value co-creation -> student achievement $t=0.930$ $p=0.353$ explains no mediation effect as their values are above the significant values. Figure 3 also explains the relationship of mediators along their values of significance.

Table 7: Mediation Effect

<table>
<thead>
<tr>
<th></th>
<th>Original Sample</th>
<th>Standard Deviation (STDEV)</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional design of course -&gt; value co-creation -&gt; student achievement</td>
<td>0.276</td>
<td>0.095</td>
<td>2.904</td>
</tr>
<tr>
<td>online communication and collaboration -&gt; value co-creation -&gt; student achievement</td>
<td>0.011</td>
<td>0.058</td>
<td>0.196</td>
</tr>
<tr>
<td>Perceived faculty E-readiness -&gt; value co-creation -&gt; student achievement</td>
<td>0.147</td>
<td>0.050</td>
<td>2.453</td>
</tr>
<tr>
<td>Personalization -&gt; value co-creation -&gt; student achievement</td>
<td>0.254</td>
<td>0.059</td>
<td>3.681</td>
</tr>
<tr>
<td>Technical skills -&gt; value co-creation -&gt; student achievement</td>
<td>-0.043</td>
<td>0.047</td>
<td>0.930</td>
</tr>
</tbody>
</table>

Figure 2: Model Analysis
4 Discussion of Results:

Since everyone is required to use online mode of learning, the transition took some time for everyone. The usefulness to the customer and institutions was not given as much thought as it should have during the process of developing e-learning systems, which were primarily focused on tangible objects. As it was already mentioned, S-D Logic has yet to be well used, particularly in the educational system. It would therefore offer a fresh insight in S-D Logic since this paper's researcher investigated an e-learning platform that provides services in educational instruction during Covid. The development of S-D Logic and value co-creation has flourished in the exploration of the research community to handle research concepts, theory, and co-creation procedures. Due to this purpose, we have examined the notion of the value that users derive from utilising e-learning services and looked for a suitable value proposition on the platform as well as core competencies for and from customers that contribute the core of value.

Therefore, it is claimed in this article that S-D Logic makes it easier for teachers and students to collaborate to create value in academic virtual environments for learning by inspiring social and personal engagement. By providing the resources necessary for high-quality services, assisting students in developing their own competencies, developing organisational capabilities and building components along with flexible blended learning, and taking into account various design criteria when creating these learning environments for institutions, the idea of value co-creation can revolutionise the way that learning takes place. The aforementioned objective would possibly not be fully achieved without necessary aspects and components. Additionally, professionals at the university's virtual centres should be in charge of assisting and directing students in various fields by taking into account that a requirement for partnerships is the cornerstone of value co-creation. In this study, the co-creation of value is used to investigate the quality mechanisms of online learning. Student achievement is significantly impacted by this quality mechanism. In the framework of service logic, we examine the model involving co-creation (Osorno-Hinojosa et al., 2022), student achievement (Zamora-Ramos et al., 2023), and e-learning determinants. Our first conclusion is that communication and collaboration (Wang et al., 2023), as reported by educational institutions (H1), are positively associated with co-creation. This is because, during Covid, when the world suddenly went online, "Communication & Collaboration" was the most critical link to be have connected with the students (Wang et al., 2023). Only a few options for communication with the students appear to be available (Wu and Tsai, 2022), including Google Meet, email, WhatsApp, and Zoom. Due to these methods, engagement time became limitless (Wu and Tsai, 2022). Teachers were both unaccustomed to it and ready for it. There is proof that professors claimed to be available to their students around-the-clock. Students could only use mobile phones since they had not been taught or were not accustomed to using other technology-mediated means. Interaction with the university during COVID was made feasible by collaboration and communication. This demonstrates how "Communication and Collaboration" may be a motivating factor for student progress as well as a key element of value co-creation. The association between value
co-creation and learner technical proficiency is supported by our second hypothesis, which is likewise a success. No learner can profit from the e-learning approach without technological proficiency (H2). Even while our students are familiar with social media and mobile devices, they lack the technical proficiency required for online learning (Batool et al., 2022). In order to make successful use of technology-mediated means, these technical abilities require additional training and student engagement to get skilled (Wu et al., 2022). The student should be able to use the necessary software to operate securely on his own system and LMS (Bai et al., 2022), manage his time effectively, complete tasks on time, and integrate into this dynamic environment to get a competitive edge. When we looked at our third hypothesis (H3), which is also supported by the evidence, the world came to the conclusion that this is the practical approach for obtaining the greatest possible benefits from e-learning. Faculty e-readiness requires that all e-learning service providers understand that value co-creation is essentially a system that participates from two sides (Saeedi, 2022), and that fault is the primary issue from the perspective of all service providers. Because teaching online is far more challenging than in a traditional classroom, institute faculty members are required to possess not just specialised knowledge but also to be familiar with various instructional methods (Yalley, 2022). Technology-assisted instructional design (Weinert et al., 2022), which is our (H5), is one of the most crucial aids that teachers can use to effectively disseminate the curriculum. One of the most significant jobs in digital learning is to communicate effectively (Wang and Sun, 2022). To effectively communicate, each lecture must contain components such as slides, pictorial material related to the presentation, word documents pertinent to the lecture, and assignments (Gachago and Hörfurter, 2022). Software that is pertinent and supportive is required for the effective instructional design. Definitely, the tutor or online facilitator is responsible for delivering and communicating this. Our fourth (H4) hypothesis, personalisation (LIN, 2022), is likewise supported by the evidence. This is because online education is not constrained by factors such as time, demography, or learner characteristics (Gremyr et al., 2022). If a person wants to learn, anyone can become a learner. Service providers need in-depth knowledge of participants in order to care for participants as they like due to participants’ varied qualities and make pupils happy (personalization) (Laurisz, 2022). It is the responsibility of the teacher to comprehend this factor and act appropriately because there could be thousands of pupils in a single course, all of whom will undoubtedly have different mental capacities and will require tutoring at various levels. Our H6 is important as well.

Policy Implications:

The quick adoption of online learning during the COVID-19 pandemic has left students, instructors, education experts, and policy officials with some unanswered problems. The study's recommendations for instruction and teacher preparation include the following.

- The country has incidentally experienced the emergence of e-learning during Covid and has ample understanding which model of e-learning will be most suitable keeping in view the context of phenomena. It is really very important to know that the application of e-learning is very strongly depend upon the participant characteristics with their previous learning experiences and vision and quality inclusion from service providers.
- The core contribution of this study is that it will bring improvement to value co-creation theory regarding e-learning, as discussed by (Ehlers, 2004), and it introduced a new co-created process model for e-learner participation in service exchange. This study has also proposed that value can be co-created through student participation at multiple points during phases of the service exchange process.
- Certain post-pandemic reports revealed that majority of students and teachers have poor digital skills. Hence, the concerned colleges and universities must conduct certain plans to fulfill this gap for students in the process of online learning. Mostly students and teachers must be made familiar with different online learning trainings especially by using personalization and technical support determinant to make them better for e-learning.
- There are structural and general reasons to include the learner perspective in the process of service delivery apart from previous recommendations. In the area of service delivery, specifically in learning quality, it is now considered and believed that it is a co-production process between learner and learning environment. The learning environment contents are considered the responsibility of the student. The learning process does not mean that it has to be fully provided by the e-learning provider, it induces a student to become part of it through the process of co-creation among all the stakeholders of that environment. The outcome of this co-creation process is not the same as the production outcome from production processes. The
value co-creation process does not only include students in the process of service delivery, other factors, such as resources, are also important, like finance, institute, and legislative requirements.

- This study paved the way for teachers’ community, administrative authority and educationists to take further course of action to continue teaching learning activities through online mode with efficiency. The efficiency can be enhanced by inculcating some of important elearning determinants like instructional design, communication and collaboration and faculty e-readiness because majority of student teachers expressed in favour of online learning and they want to continue learning in online mode.

- Majority faculty members of educational institutes do not possess e-readiness determinant, which is an important factor of online learning. Therefore, all faculty members may be oriented in the techno-pedagogical by working on so that they can take online classes effectively.

- The constraints of online learning addressed by this study and can be considered to be of great importance for government and educational institutes for bringing improvement to promote online learning in long run.

5 Conclusion:

The utilisation of co-creation aspects, which entail collaboration between the two stakeholders and offer sustainable advantages, is crucial for businesses and stakeholders in the modern economy to advance from traditional approaches. A similar technique can be applied to co-creation in the field of education. Educational institutions often work closely with students to co-create, bringing them close to advantages and turning them into knowledge and economic stakeholders. Since interaction is a crucial component of the education sector, it follows that such platforms are learner-centered and encourage students to actively participate in all areas of study to enhance their learning. Students' learning is also influenced by other elements like peers and teachers. Co-creation enables educational institutions to concentrate on learning and creativity while maximising the positive experience of students, enhancing their innovative abilities. An educational institution also takes into account the opinions of other interested parties. Additionally, educators are able to profit from internal and external elements, such as organisational strength, during the co-creation process. The development of online education has also had an impact on academic institutions. Co-creation kickstarts the cross-pollination of innovative technology-based learning and teaching paradigms.

The Covid-19 pandemic has changed the education system abruptly without becoming it as complete system with KPIs. This is a new phenomenon that the Polish higher education sector is experiencing from the recent past due to Covid 19 pandemic. Therefore, scholarly attention is very rare in this context. Due to the urgent adoption of online mode student and teachers left psychology, socially, technically unprepared even highly qualified faculty faced difficulty in adopting techno pedagogical approaches. This study revealed that there is an urgent need to make digital education policy and its actions plans complete as soon as possible by inclusion of its important determinants leading to student achievement. The continuous improvement in system and processes will keep on strengthening it without encountering any challenge in future. Development at faculty level in improving pedagogical approaches for online delivery of lessons, faculty e-readiness, technical support, communication and collaboration and perceived instructional design will decrease students’ anxiety and in allaying students. At institute level, there is a need to work on designing useful and applicable personalization system so elearners problems can be sought at micro level. Through communication and collaboration, e-learners will encourage and motivate to become useful part of online learning. No doubt, collective effort will make the dream of digitalization of education true.

References


58. THANGAIAH, E. A., JENAL, R. & YAHAYA, J. Determining The Values and Attributes of e-Learning From Vocational Students’ Perspectives.


