



Student readiness for e-learning co-production in developing countries higher education institutions

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Abstract

This study set out to conceptualize and empirically establish the determinants and consequences of student readiness for e-learning co-production in the context of higher education institutions in developing countries. Using an online systematized questionnaire and structural equation modeling, data were collected and analyzed from 317 university students in Ghana. The analysis of the findings identified firm resource commitment, student resource commitment, task socialization, self-efficacy, motivation, and effective communication as the determinants of student readiness for e-learning co-production and student satisfaction as its consequence. The findings provide higher education managers with the critical factors for enhancing students' readiness for e-learning co-production. It also provides higher education policymakers with the strategic factors when assessing institutions as well as developing and implementing national policies on higher education e-learning. For academic researchers, this study was limited to the Ghanaian context, thus, limiting the robustness of the conceptual model and the ability to generalize the findings to another cultural context. Thus, future studies should undertake a cross-national comparison between developed and developing countries.

Keywords E-learning co-production · Student readiness for co-production · Student satisfaction · Developing countries

1 Introduction

Higher Education Institutions (henceforth, HEI's) in Ghana and other developing countries contribute significantly to their national wealth and health, and as a result, governments in developing countries as well as other international organizations, and stakeholders in their bid to attain the maximum benefits of HE similar to their

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counterparts in developed countries have jumped on the bandwagon of making HE accessible to all, regardless of culture, race, and gender. This has, thus, transformed HE from “elite education” to “mass education” and resulted in an upsurge of student enrolment numbers. For instance, in Ghana and India, between the period 2005 and 2019, overall enrollment increased by about 410% and 270% respectively (Agarwal, 2006; Umarji, 2021; Statista, 2021).

The paradigm shifts from “elite education” to “mass education” have led to several innovative strategies in making HE accessible to all. Prominent amongst these innovations is the adoption of e-learning technologies as a means for reaching out to a wider audience, enriching teaching and learning, enhancing students’ achievements, and satisfaction as well as empowering students (Noble, 1998; Rogers, 2000). More significantly, the emergence of the Covid-19 pandemic and its accompanying restrictions has seen a radical shift towards the adoption of e-learning technologies such as augmented and virtual reality and AI technologies as well as other platforms including Moodle, Google Classroom, Google Workspace for Education, Microsoft Teams, and Zoom for Education by traditional HEI’s in enhancing the co-production of teaching and learning through the blended learning approach. Thus, e-learning technologies have become a popular, essential, flexible, safer, and accessible medium for the co-production of teaching and learning. In addition, e-learning technologies have become a competitive tool amongst HEI’s in attracting and retaining students, enhancing teaching and learning as well as placing students at the center stage in the delivery of teaching and learning (Hanna, 1998; Gumpert and Chun, 1998). These transformations resonate with the future of HE as envisioned by Benno Schmidt and Janet Beer; the former President of Yale University and former Vice-Chancellor of the University of Liverpool respectively (Robinson, 1998; Beer, 2009).

Notwithstanding the benefits of e-learning technologies to HEI’s, its adoption has been a developed country phenomenon with developing countries still in its infantry stage (Noble, 1998; Gumpert and Chun, 1998; Rogers, 2000; Valdez et al., 2002). As explained, developing countries’ HEI’s lag behind e-learning technologies as a result of several challenges including access to electricity, high cost and poor technological infrastructure, high ICT illiteracy, and societal undesirable attitude toward technological change (Subedi et al., 2020). Subsequently, some initiatives have been adopted by governments and HEI’s in addressing the aforementioned challenges including the provision of improved technological infrastructure, reduction of internet data costs for e-learning platforms, an extension of the power grid, and the provision of enhanced e-learning platforms (Adarkwah, 2021; Singh et al., 2021).

Despite these initiatives, some researchers have raised concerns about the readiness of students` to co-produce teaching and learning on e-learning platforms in developing countries (e.g., Bubou & Job, 2020; Mutisya & Makokha, 2016; Yalley, 2020).). This has been attributed to students’ reluctance to co-produce (e.g., Cavallone et al., 2020) as well as the inadequacy of empirical studies on the determinants of students’ readiness for e-learning co-production (Yalley, 2020). Consequently, student participation on e-learning platforms has become a topical discussion amongst developing countries’ HEI’s, vice chancellors`, academics, students, funders, and other HE stakeholders. This motivated Bazana and Nabo-Bazana

(2020) in emphasizing the importance of students' preparedness in the introduction of e-learning technologies in HEI's and, thus, the call for HEI's in developing countries to understand the factors that can enhance and engage students in co-producing teaching and learning when implementing e-learning technologies (Yalley, 2020).

Whilst some scholarly work has been done in contributing to the adoption and use of e-learning technologies in HEI's (e.g., Dos Santos & Okazaki, 2016; Hanchache-Heurteloup & Moustaghfir, 2020), these have focused on the Theory of Planned Behavior and Technology Acceptance Model and failed to recognize the co-production nature of e-learning. For instance, though students may adopt and accept e-learning technologies, this does not necessarily translate into students' ability and willingness to co-produce teaching and learning efficiently and effectively on e-learning platforms. E-learning co-production differs from e-learning acceptance as the former relates to the actual usage of the technology in performing the mandatory, transactional, and facilitating activities during teaching and learning (Yalley, 2021a), whilst the latter relates to people's adoption of new technologies, thus, intention to use e-learning technologies (Noble et al., 2022).

In recognizing the co-production nature of teaching and learning on e-learning platforms, several prominent scholars have advocated for further empirical work on students' readiness for co-production in terms of its determinants and consequences (e.g., Chan et al., 2010; Sekhon et al., 2016; Shanmugam & Durugbo, 2015; Tam & Oliveira, 2017; Yalley, 2021a). For instance, Skulimowski (2019) in his work on AI-based learning platforms emphasized the importance of identifying the factors influencing its social acceptance, and user engagement and ensuring its sustainability. This, thus, call for empirical research on the determinants of students' readiness to engage in e-learning co-production and its outcome on HEI's. This understanding is imperative taking into consideration the trend toward e-learning co-production by HEI's, particularly in the Covid-19 pandemic era, and the importance of e-learning in terms of accessibility, ranking, funding, and student satisfaction.

In acknowledging this gap in research, this work set out to identify and explore the antecedents and consequences of e-learning co-production in developing countries' HEI's. In addressing this over-reaching research objective, this paper is organized as follows: first, the conceptual model and hypotheses relating to this study are discussed, and following that, the research methodology and empirical results are presented and discussed. And finally, this work is consummated with a discussion on its contribution and limitations.

2 Conceptualization

2.1 Co-production of teaching and learning through e-learning

HE services like any other knowledge-intensive services are highly inseparable and require higher student participation. This is consistent with the service-dominant logic, which recognizes students as operant resources and active participants in the value creation of teaching and learning with the value being co-produced by HEI's and students through resource integration (Vargo & Lusch, 2008). Ehlers

(2007) relates e-learning as a co-production process involving students and other actors including teachers. The increasing prevalence of e-learning technologies in HEI's implies that higher student participation and involvement would be required as teaching and learning take place remotely with or without the presence of lecturers or facilitators.

This, thus, has contributed to the popularization of phrases such as “collaboration learning” “technology-based learning” “e-learning” “online learning” “crowd-based learning” and blended learning in HE pedagogy research and dialogue (e.g., Nachmias et al., 2004; Laurillard, 2005), with services marketing scholars popularizing this with the concept of co-production (e.g., Dollinger et al., 2018; Sekhon et al., 2016; Yalley, 2020, 2021a). Co-production refers to situations where customers/students¹ and organization/HEI's² collaborate to produce value (Humphreys & Grayson, 2008) or in situations whereby students substitute and complement HEI's in their teaching and learning processes (Fragidis et al., 2014). In understanding co-production, some scholars have related it to transactional and facilitating activities in services that a customer performs in supporting and enhancing the service provider and achieving personal objectives (e.g., Yalley, 2021a).

Within HEI's, e-learning co-production entails students' registration and enrolment, logging in, complying with pre-set instructions/procedures, participation in e-learning activities, and writing of examination (Yalley, 2020). These activities are mandatory and transactional and may be transferred to students through e-learning platforms, thus, corresponding with the opinion that co-production permits organizations to assign service-related activities to customers (Fragidis et al., 2014; Prahalad & Ramaswamy, 2000). The importance of co-production in services particularly HEI's includes improved performance and quality, students' satisfaction, and ultimately sustained competitive advantage (Ehlers, 2007; Prahalad & Ramaswamy, 2004; Sekhon et al., 2016).

2.2 Student as a co-producer

Consumer involvement and participation in the operational activities of service firms are well documented (e.g., Ajitha et al., 2019; Vargo & Lusch, 2008) and within HEI's, this has been recognized as paramount taking into consideration the inseparability characteristics and sensitive nature of services (McCulloch, 2009; Yalley and Sekhon, 2014; Yalley, 2020). Customer participation refers to the extent of customer involvement in the service production process (Chan et al., 2010; Yalley, 2021a) and is in parallel with the service-dominant logic, thus, acknowledging the resources and specialized skills, knowledge, and competencies students bring on board during e-learning co-production (Vargo & Lusch, 2008). These resources include time, psychological, cognitive, monetary, and tangible resources.

¹ Customer(s) and student(s) will be used interchangeably.

² Organizations and HEI's will be used interchangeably.

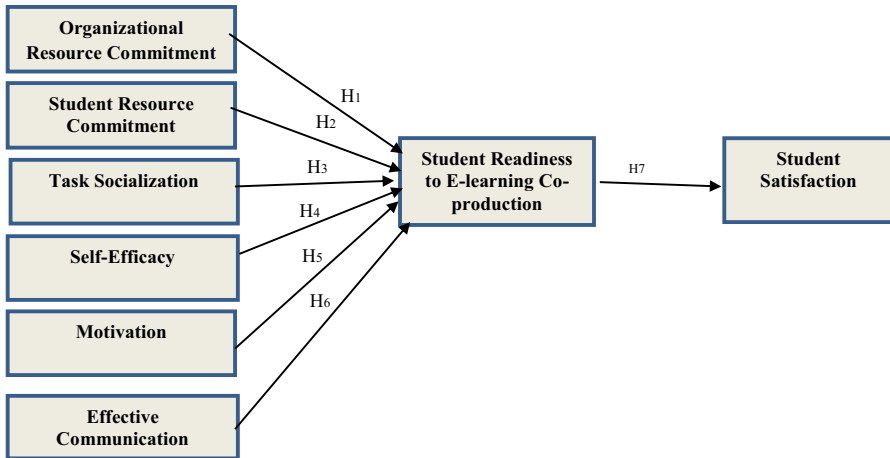


Fig. 1 Research Model

In recognizing students` as co-producers during e-learning co-production, extant research has focused on students` influence on service quality, satisfaction, productivity, and relational and economic value (e.g., Tombs and McColl-Kennedy, 2010; Sekhon et al., 2016; Ajitha et al., 2019; Yalley, 2021b). Other scholars have also recognized students as operant resources and enhancers or detractors of service value (Lusch et al., 2007; Sekhon et al., 2016; Spohrer & Maglio, 2010; Yalley, 2021a) whilst others have recommended strategies for improving student`s roles during co-production (e.g. Lengnick-Hall, 1996; Vargo & Lusch, 2008; Yalley, 2012, 2020).

2.3 Conceptual model and hypothesis

The multidisciplinary review of relevant literature led to the conceptualization of students` readiness for e-learning co-production and the development of a conceptual model linking its determinants and consequence (See Fig. 1). The accompanying seven hypotheses in the conceptual model are discussed and proposed.

2.3.1 Student readiness for e-learning co-production

HEI`s depends highly on students` active participation during the production and consumption of teaching and learning. Accordingly, students, as customers and co-producers in the production of e-learning collaborate with HEI`s through their human and technological resources in co-producing value (McCulloch, 2009). For e-learning in HE to be effective, students` readiness for e-learning is imperative, notwithstanding, the level of readiness has been relatively high in developed countries compared to that of developing countries (Omoda-Onyait & Lubega, 2011; Sae-kow & Samson, 2011). Subsequently, several studies have been undertaken across different cultures in understanding the factors influencing HE students` e-learning readiness. For instance, Omoda-Onyait and Lubega (2011) in a study in Uganda

identified awareness, culture, and content as the key factors influencing e-learning readiness, whilst in Turkey, e-learning training was identified (Akaslan & Law, 2011). In Egypt, technical and learning skills, as well as time management behaviors, were identified as the key factors (Hussein, 2010) whilst in Saudi Arabia, motivation for learning, online communication, self-efficacy, and perceived facilitators were identified (Fageeh, 2011).

Further, a study in Thailand identified access to technology, online skill, and motivation (Wattakiecharoen & Nilsook, 2013), whilst in Malaysia, content, technical, environmental, cultural, and financial readiness were identified as influencing e-learning readiness amongst students and lecturers (Kaur & Zoraini Wati, 2004). Finally, in a cross-comparative study between a low e-learning readiness culture (Thailand) and a high e-learning readiness culture (USA), Saekow and Samson (2011) identified policy, technology, financial, human resources, and infrastructure as the differentiating factors influencing the level of e-learning readiness in different cultures.

Whilst these studies make a significant leap in the understanding of student readiness for e-learning, the co-production nature of e-learning readiness is neglected among these studies. Thus, a co-production-focused students e-learning readiness conceptualization is imperative. This has been referred to in service marketing literature as “customer willingness to participate in value co-creation” (Opatá et al., 2019) and “Willingness of a Customer to Co-create (WCC)”, which relates to customer’s preparedness to create value with a firm through the active engagement in the firm’s production and consumption process (Heidenreich & Handrich, 2015). In contextualizing it within the co-production domain, some scholars have referred to it as “customer readiness to co-production” (Sekhon et al., 2016; Yalley, 2021a) and defined it as “a customer’s preparedness to perform their co-production role successfully” (Yalley, 2021a, p. 4).

Within the HE e-learning context, this has been conceptualized as student readiness for e-learning co-production and refers to a student’s preparedness to engage and perform his/her e-learning co-production role successfully. The importance of student readiness for e-learning co-production includes the attainment of service outcomes and expectations including student satisfaction, service quality, and productivity (Alzaydi et al., 2018; Sekhon et al., 2016; Yalley, 2021b). In recognizing the importance of student readiness for e-learning co-production, some scholars have called for a comprehensive understanding of the factors (antecedents) for enhancing and engaging students in co-producing teaching and learning through e-learning as well as the corollary of co-production (Bazana & Nabo-Bazana, 2020; Yalley, 2021a, 2021b).

2.3.2 Resource commitment

Organizational and customer resources are vital for effective co-production and the commitment of these resources to an organizational co-production process affects its customers’ attitudinal and behavioral responses during co-production (Yalley, 2020). This is in sync with the propositions of the service-dominant logic, which recognizes that firm and customer resources and specialized skills,

knowledge, and competencies influence both the firm and customer during co-production (Vargo & Lusch, 2008). Resource commitment refers to the commitment of intangible and intangible resources to the co-production process (Richey et al., 2005) and entails both organizational and customer/student resources (Yalley, 2020). Organizational resources include both human, financial, and technological resources (Daugherty et al., 2005; Richey et al., 2005). It also includes the procedures an organization adopts in attaining effective and efficient service operations (Morgan & Hunt, 1999). Student resources, on the other hand, refer to the intangible and tangible resources students bring on board during co-production, and this includes time, psychological, cognitive, monetary, and tangible resources and within the context of e-learning co-production, it may entail the commitment of students' mental and technological resources (eg. knowledge, internet, and digital skills, and technological devices) during co-production (Kim et al., 2019; Yalley, 2020).

Some scholars have identified organizational resource commitment as positively influencing the readiness of customers to co-produce (Sekhon et al., 2016; Yalley, 2012, 2021a) whilst others have conceptualized and empirically identified a customer resources commitment as positively influencing customer co-production readiness (Vargo & Lusch, 2008; Yalley, 2021a). Therefore, students' readiness to engage in e-learning co-production requires the commitment of appropriate and adequate resources of the organization and the customer. Based on the foregoing arguments, the following hypotheses are proposed:

H1: Organizational resource commitment is positively correlated with students' readiness for e-learning co-production

H2: Student resource commitment is positively correlated with students' readiness for e-learning co-production.

2.3.3 Task socialization

Socialization refers to the process a person goes through in securing the relevant knowledge and skills in the workplace (Taormina, 2004), and as explained, new employees are often unfamiliar with their job role, and socialization set out to address that (Madlock & Chory, 2014). Amongst HEI's, the recognition of students as part-time employees and co-producers implies that students should be socialized particularly when introducing e-learning technologies. Students' active involvement during e-learning co-production implies equipping students with the necessary knowledge and skills to perform their e-learning co-production role successfully through the prescribed training and orientations. Haueter and colleagues relate to this as task socialization, which refers to the understanding of the tasks for which one has been hired and may entail knowledge and role aspect (Haueter et al., 2003).

Various researchers have identified task socialization as a critical factor in enhancing customer willingness to co-produce and in minimizing role ambiguity during co-production (e.g.; Govender, 1998; Meuter et al., 2005; Saks & Gruman, 2014). Therefore, it can be concluded that socializing students on the task required

during e-learning co-production influences their readiness to participate in e-learning co-production. This suggests that:

H3: Task socialization is positively correlated with students' readiness for e-learning co-production.

2.3.4 Student self-efficacy

Participation in e-learning co-production requires a positive student's attitude toward his/her capability to perform the required co-production roles successfully, hence, emphasizing the importance of students' self-efficacy. Contextualizing self-efficacy within the customer co-production domain, Yalley, related it to a student's ability to perform his/her expected roles successfully during e-learning co-production (Yalley, 2020). As further explained, self-efficacy minimizes students' role ambiguity, thus, influencing their readiness to perform their prescribed co-production role effectively (Yalley, 2020). Also, students' self-efficacy in information and digital literacy is vital for the effective and efficient use of e-learning technologies (Nikou & Aavakare, 2021). Various scholars have identified self-efficacy as positively influencing the successful execution of an individual's co-production role (Lehman et al., 2002; Rafferty & Simons, 2006; Yalley, 2021a) and the higher a student's self-efficacy; the more likely he/she is prepared to perform his/her e-learning co-production role and vice versa (Locke et al., 1984). Based on this, the following hypothesis is proposed:

H4: Student self-efficacy is positively correlated with students' readiness for e-learning co-production.

2.3.5 Student motivation

Motivation refers to "a person's active participation in and commitment to achieving the prescribed results" (Conroy, 1994, p. 14). Contextualizing this within the customer co-production domain, Alford, related this to "clients' motivation" which refers to customers' engagement and attention in the service delivery process (Alford, 2014). Within the context of e-learning co-production, this refers to a student's active involvement and commitment to engage in e-learning co-production in achieving service outcomes and this is influenced intrinsically by the excitement, fun, and engaging aspect of e-learning platforms as well as extrinsically by the cost-effectiveness and convenience of using e-learning platforms (Yalley, 2020, 2021a) and as explained, the effective students' usage of e-learning technologies require some effortful involvement of students (Kim et al., 2019). Several researchers have empirically identified customer motivation positively influencing customers' readiness to partake in co-production (Cepiku & Giordano, 2014; Sekhon et al., 2016; Yalley, 2021a, 2021b), thus, suggesting the following hypothesis:

H5: Student motivation is positively correlated with students' readiness for e-learning co-production.

2.3.6 Effective communication

Communication plays a significant role in every organizational production process, particularly during e-learning co-production. Effective communication as explained refers to the informal and formal exchange of meaningful and timely information between an employee and a customer to educate and keep the customer informed about the service, including its processes and outcomes (Sharma & Patterson, 1999). To engage and enhance students' active participation during e-learning co-production, effective communication between HEI's (lecturers) and students becomes paramount. As articulated by Hinson (2020), the success of HEI's students' experience depends on the quality of communication, which should be clear, accurate, and reliable. Researchers have identified effective communication as positively influencing customer performance and co-production (Alzaydi et al., 2018; Sorrentino et al., 2018). Based on the foregoing argument, the following hypothesis is proposed:

H6: Effective communication is positively correlated with students' readiness for e-learning co-production.

2.3.7 Student satisfaction

Service outcomes have become an important parameter for assessing the performance of services due to the limitations associated with output measures (Yalley, 2012, 2010; Parasuraman, 2002; Sekhon et al., 2016), and within the customer co-production domain, various scholars have linked customer co-production role in services as influencing service outcomes positively and negatively (Ojasalo, 2003; Sekhon et al., 2016; Zeithaml & Bitner, 2000). For an effective measure of service outcome, several scholars have positioned customer satisfaction as its proxy (e.g., Danaher & Mattsson, 1994; Gill & White, 2009; Yalley, 2012, 2010; Sekhon et al., 2016). Customer satisfaction in its simplest form refers to how happy and satisfied a customer is with the services provided by a firm (Gonzalez, 2019), and in the context of HEI's, this may be referred to as student satisfaction and relates to how satisfied a student is with the e-learning co-production process.

In recognizing student satisfaction as a service outcome during e-learning co-production, several scholars have related the outcome of technology-based services and e-learning technologies to customer/student satisfaction (e.g. Anitsal & Schumann, 2007; Pham et al., 2019; Yalley, 2021b). For instance, Yalley (2021b) proposed students' satisfaction as a superior outcome indicator for HEI's during e-learning co-production. The foregoing discussion, thus, supports the logic that customers' readiness to co-produce value impacts on customer satisfaction (Grönroos, 2008; Yalley, 2012; Sekhon et al., 2016). It is, therefore, argued that:

Table 1 Scale Items Description, Source and Reliability

Construct	Definition	Scale Source & Cronbach Alpha
Student Readiness for E-learning Co-Production	A student's preparedness to engage and perform his/her e-learning co-production role successfully (Yalley, 2021a, 2021b)	3-item customer readiness scale, $\alpha = .94$ (Sekhon et al., 2016)
Organizational Resource Commitment	The commitment of intangible and intangible resources of the firm to the co-production process (Richey et al., 2005)	3-item resource commitment scale, $\alpha = .94$ (Sekhon et al., 2016)
Student's Resource Commitment	The commitment of intangible and intangible resources of the student to the co-production process (adapted from: Richey et al., 2005)	3-item resource commitment scale, $\alpha = .94$ (Sekhon et al., 2016)
Task Socialization	The process an individual goes through to secure appropriate skills and knowledge in changing his/her attitudinal and behavioral outcomes (Taormina, 1997)	11-item task socialization scale, $\alpha = .91$ (Haueter et al., 2003)
Self-Efficacy	An individual's assessment of his/her capability to execute courses of action required to attain designated types of performances (Bandura, 1982)	8-item New General Self-Efficacy Scale (NGSS), $\alpha = .87$ (Chen et al., 2001)
Motivation	A person's active involvement and commitment to achieving the prescribed results (Conroy, 1994)	6-item intrinsic and extrinsic motivation sub-scale from the Motivation at Work Scale (MAWS), $\alpha = .86$ (Gagné et al., 2010)
Effective Communication	The exchange of meaningful and timely information between an employee and a customer with the purpose of educating and informing the customer about the service, its processes and outcomes (Sharma & Patterson, 1999)	4 item communication effectiveness scale, $\alpha = .86$ (Sharma & Patterson, 1999)
Student Satisfaction	A customer's summary evaluation of his/her prior feelings and actual consumption experience (Oliver, 1981)	3-item overall satisfaction scale, $\alpha = .90$ (Bodet, 2008)

H7: Students' readiness for e-learning co-production is positively correlated with students' satisfaction.

3 Methods

3.1 Sampling and questionnaire design and administration

The 41-scale item structured questionnaire was developed using existing scales and rated on a five-point Likert scale ranging from strongly disagree to strongly agree with a mid-point labeled neither agree nor disagree. Table 1 presents each scale item source and reliability. To minimize common method bias, some items on the questionnaire were reversed scored and others were also randomly placed on the questionnaire. The target population consisted of students in Ghana's HEI's. Ghana as a developing country represented an appropriate geographical context taking into consideration its digitalization efforts over a decade and having almost all HEI's recently adopting e-learning platforms as a blended learning approach. The initial questionnaire was pilot tested for its lucidity, ease, appropriateness, and grammatical and presentation errors and subsequently refined using the responses from the pilot study.

The final questionnaire was administered using snowball sampling with an initial 126 HE students who were contacted using the researcher's network. Students were contacted through Email, WhatsApp, and Facebook with the survey link entreating its completion and onward distribution of the survey link to their network. A web-based survey approach through the "allcounted.com" platform provided the optimum approach in collecting data taking into consideration its acceptability amongst students and the risk of Covid-19 using paper-based questionnaires. To qualify as a respondent, an individual needs to be 18 years and above and a student in an HEI in Ghana that has adopted an e-learning platform. Appropriate ethical protocols were observed in administering the questionnaires.

Overall, 432 qualifying respondents participated in the study, however, about 115 (26.6%) participants failed to complete some sections of the questionnaire. In dealing with the problem of missing data, a listwise deletion strategy was used and this resulted in 317 usable questionnaires. The high response rate might be attributed to three factors. First, the timing of the study, which coincided with the period in which most HE institutions in Ghana were adopting e-learning as a blended learning approach. Second, the timing of the study coincided with the time students were home under Covid-19 restrictions and when internet adoption and usage rate also stood high, thus, higher likelihood of students completing online questionnaires. Third and finally, the use of the snowballing sampling approach influenced the likelihood of students completing the questionnaire online as the survey link was received from a trusted source.

Amongst the qualified respondents, 56%, 21%, 14%, and 9% were between the ages of 18–23, 24–29, 30–35, and 36 and above respectively and males and females were 56% and 44% respectively as well as 63% and 37% were pursuing undergraduate and postgraduate courses respectively. When asked about

Table 2 Final Scale Items and Communitality

Construct /Item	Code	Communitality
Student Readiness to E-learning Co-production (SREC)		
• I am highly motivated when using my university's e-learning platform	SREC1	.93
• I cooperate with my universities and lecturers when using their e-learning platform	SREC2	.92
• I prepare before using my universities e-learning platform	SREC3	.96
Organizational Resource Commitment (ORC)		
• My university is committed to providing the necessary technological resources during e-learning co-production	ORC1	.88
• My university is committed to providing the necessary human resources during e-learning co-production	ORC2	.92
• My university commits adequate resources during e-learning co-production	ORC3	.93
Student's Resource Commitment (SRC)		
• I am committed to providing the necessary technological resources during e-learning co-production	SRC1	.90
• I am committed in dedicating my time during e-learning co-production	SRC2	.91
• I commit adequate resources during e-learning co-production	SRC3	.92
Task Socialization (TS)		
• When using e-learning technologies, I know the responsibilities and tasks expected	TS1	.86
• When using e-learning technologies, I understand how to perform the tasks expected	TS2	.88
• When using e-learning technologies, I understand which tasks and responsibilities have priority	TS3	.85
• When using e-learning technologies, I understand how to operate the tools and links on the platform	TS4	.82
• When using e-learning technologies, I know who to ask for support when I need help	TS6	.84
• When using e-learning technologies, I know who my lecturers are	TS7	.62
• When using e-learning technologies, I know how to meet my lecturer's/university's needs	TS8	.82
• When using e-learning technologies, I know when to inform my lecturer's/university's about my work	TS9	.80
• When using e-learning technologies, I know what constitutes acceptable behaviour and responsibilities	TS10	.75
• When using e-learning technologies, in the course of performing my role, I understand how to complete the necessary task (e.g., signing in, downloading materials, communicating with lecturers)	TS11	.79

Table 2 (continued)

Construct /Item	Code	Communality
Self-Efficacy (SE)		
• I will be able to achieve most of my learning goals that I have set for myself through my university's e-learning platform	SE1	.81
• I believe I can succeed at most endeavour to which I set my mind	SE3	.84
• When facing challenges using my university's e-learning platform, I am certain that I will overcome it	SE4	.77
• I believe I will be able to use my university's e-learning platform to study	SE5	.94
• I am confident that I can perform effectively when using my university's e-learning platform	SE7	.94
• Compared to other students, I can navigate very well on my university's e-learning platform	SE8	.97
Motivation (M)		
• I use my university's e-learning platform because I enjoy using it	M1	.91
• I use my university's e-learning platform because it's convenient	M2	.92
• I use my university's e-learning platform because it's enjoyable	M3	.84
• I use my university's e-learning platform because of the pleasure it brings to me	M5	.93
• I use my university's e-learning platform because it saves me money	M6	.92
Effective Communication (EC)		
• My university keeps me very well informed about their e-learning platform	EC1	.78
• My university explains how the e-learning platform works in a meaningful way	EC2	.94
• My university never hesitates to give me as much information as I like to have on their e-learning platform	EC3	.93
• My university does not hesitate to explain to me the pros and cons of using their e-learning platform	EC4	.97
Student's Satisfaction (SS)		
• I am satisfied with my decision to use my university's e-learning platform	SS1	.89
• I think that I did the right thing by deciding to use my university's e-learning platform	SS2	.88
• My choice to use my university's e-learning platform was a wise one	SS3	.89

ownership of technological devices, 24%, 80%, 43%, and 46% owned analog phones, smartphones, tablets, and laptops respectively and 78% owned multiple devices whilst 22% owned a single device.

3.2 Data Analysis

Table 2 presents the contents and communalities of the scale items. The initial 41 items were evaluated for any abnormality using the univariate normality test and the data were normally distributed with kurtosis ranging from 0.08 and 1.10 and skewness ranging from 0.78 and 1.20, thus, within the acceptable threshold of ≤ 10 and ≤ 3 respectively (Kline, 2016). Also, all inter-construct correlations and VIF were < 0.85 and < 5.0 respectively and tolerance values were between 0.19–0.41, thus, indicating no multicollinearity issues (Hair et al., 2006). Having validated the data as normally distributed, Gerbing and Anderson (1988) two-step approach was adopted in validating the proposed model and testing the proposed hypotheses. Structural Equation Modeling (SEM) facilitated by AMOS 26 (maximum likelihood) was utilized to assess and validate the measurement and structural model. SEM was chosen because of its ability to analyze interrelated research questions simultaneously, its ability to deal with measurement error, and the ability to handle large data sets (Hair et al., 2006; Sarstedt et al., 2014; Yalley, 2012). Also, AMOS 26 was chosen as a result of its ability simplicity and graphical interface. The following fit indices (TLI, CFI, and RMSEA) as recommended by Hu and Bentler (1999) were used in assessing the model's fit and the seven hypotheses were assessed using the standardized path coefficients of the structural model.

3.3 Results

3.3.1 Measurement model results

The measurement model initial evaluation identified a weak fit, which was attributed to some items relating to self-efficacy (SE2 and SE6); task socialization (T5), and motivation (M4) having standardized factor loadings and Squared Multiple Correlation values lower than the suggested threshold of ≥ 0.70 and ≥ 0.50 respectively (Hair et al., 2006). Subsequently these 4 items were deleted and the measurement model was re-specified and re-evaluated with the remaining 37 scale items and resulted in a good fit ($\chi^2 = 296.21$; $df = 165$; $\chi^2/df = 1.80$; TLI = 0.96; CFI = 0.95; RMSEA = 0.06).

Subsequently, the measurement model's validity and reliability were assessed and per Table 3, it demonstrated discriminant validity with none of the items cross-loading (Kline, 2016). Also, convergent validity was demonstrated with standardized factor loadings values being between 0.72 to 0.96 along with its Composite Reliability and AVE values being higher than 0.70 and 0.50 respectively (Hair et al., 2006). Further, overall reliability was 0.93 and each construct with its accompanying scale items was highly reliable, thus, demonstrating the measurement model's

Table 3 Construct Related Indices

Construct	Item	Standardized Factor Loading	SMC	SMC-1(Error variance)	R-Square	AVE	Composite Reliability
Student Readiness for E-learning Co-production	SREC1	.95	.90	.09	.90	.88	.96
	SREC2	.91	.83	.17	.83		
	SREC3	.96	.92	.08	.92		
Organizational Resource Commitment	ORC1	.84	.71	.29	.71	.66	.85
	ORC2	.81	.66	.34	.66		
	ORC3	.78	.61	.39	.61		
Students Resource Commitment	SRC1	.74	.55	.45	.71	.59	.81
	SRC2	.72	.52	.48	.66		
	SRC3	.83	.69	.31	.61		
Motivation	M1	.85	.72	.28	.72	.74	.94
	M2	.82	.67	.33	.67		
	M3	.83	.69	.31	.69		
	M5	.90	.81	.19	.81		
	M6	.91	.83	.17	.83		
	SE1	.88	.77	.23	.77	.77	.95
	SE3	.85	.72	.28	.72		
	SE4	.91	.83	.17	.83		
Self-Efficacy	SE5	.87	.76	.24	.76		
	SE7	.88	.77	.23	.77		
	SE8	.87	.76	.24	.76		

Table 3 (continued)

Construct	Item	Standardized Factor Loading	SMC	SMC-1(Error variance)	R-Square	AVE	Composite Reliability
Task Socialization	TS1	.92	.85	.15	.85	.81	.98
	TS2	.91	.83	.17	.83		
	TS3	.94	.88	.12	.84		
	TS4	.90	.81	.19	.81		
	TS6	.91	.83	.17	.83		
	TS7	.88	.77	.23	.77		
	TS8	.86	.74	.26	.74		
	TS9	.92	.85	.15	.85		
	TS10	.88	.77	.23	.77		
	TS11	.86	.74	.26	.74		
Student Satisfaction	SS1	.93	.87	.14	.87	.89	.96
	SS2	.95	.90	.09	.90		
	SS3	.95	.90	.09	.90		
	EC1	.89	.79	.21	.79	.82	.95
Effective Communication	EC2	.91	.83	.17	.83		
	EC3	.92	.85	.15	.85		
	EC4	.91	.83	.17	.83		

construct reliability (See Table 3). Furthermore, the use of validated scales (See Table 1) and the pilot study provides evidence of the face and content validity of the measurement model. Lastly, in accounting for common method bias, the Common Latent Factor (CLF) method was used and from the results, the difference between the standardized regression values of the model with and without CLF was < 0.2 , therefore, demonstrating the absence of external factors influencing the findings of this work.

3.3.2 Structural model and hypothesis results

The testing of the proposed structural model resulted in a very good fit ($\chi^2 = 326.43$; $df = 164$; $\chi^2/df = 1.99$; $TLI = 0.98$; $CFI = 0.98$; $RMSEA = 0.06$) and also the alteration of the measurement model to a structural model did not result in any major parameter estimates differences ≤ 0.05 , thus, demonstrating the stability of the proposed model (Hair et al., 2006). Further, the proposed theoretical model was robust with a substantial portion of its variances R^2 (0.58 and 0.54) being attributed to the following dependent variables (students' readiness for e-learning co-production and student satisfaction) in the model. Finally, from Table 4, the proposed hypotheses were all significant, positive, and supported ($p < 0.001$ and $p < 0.01$).

4 Discussion

Students' unwillingness to co-produce e-learning with HEI's paralleled with the limited empirical work on the factors influencing students' readiness for e-learning co-production stimulated the proposition and empirical evaluation of the proposed research model.

The findings of this work provide evidence of a positive and strong relationship between organizational resource commitment and students' readiness for e-learning co-production. This implies that when HEI's commitment to appropriate resources before and during e-learning co-production, it influences student's readiness to co-produce e-learning. This runs in parallel with the findings of Sekhon and colleagues, who identified a similar finding between resources commitment and customer readiness to co-production (Sekhon et al., 2016) and concur with the theories relating to the norm of reciprocity and social exchange (e.g., Blau, 1964) on the give-and-take nature of organizational and customer exchanges. Several other scholars have identified resource commitment as a key factor in customer co-production initiatives (e.g. Yang et al., 2014; Yi et al., 2011). Also, a positive and strong relationship was identified between students' resource commitment and students' readiness for e-learning co-production. This is consistent with the work of Kaur and Zoraini Wati (2004) on the identification of financial resource commitment of Malaysian students on e-learning readiness. This demonstrates the importance of students' operant and operand resources during e-learning co-production, thus, supporting the call by several scholars on integrating customer resources in the service production process (e.g. Lovelock & Young, 1979; Mills et al., 1983; Gummesson, 1998; Grönroos &

Table 4 Hypothesis Results

Hypotheses	Path	t value	Results/interpretation
H1: Organizational resource commitment \Rightarrow Students' readiness to co-production	.72	8.23***	Supported
H2: Student's resource commitment \Rightarrow Students' readiness to co-production	.54	6.43***	Supported
H3: Task socialisation \Rightarrow Students' readiness to co-production	.61	5.32***	Supported
H4: Self-efficacy \Rightarrow students' readiness to co-production	.73	6.31***	Supported
H5: Motivation \Rightarrow Students' readiness to co-production	.65	5.43***	Supported
H6: Effective communication \Rightarrow Students' readiness to co-production	.57	7.60**	Supported
H7: Students' readiness to co-production \Rightarrow Student satisfaction	.82	8.33***	Supported

*** significant at .001 (two-tailed)

** significant at .01 (two-tailed)

Ojasalo, 2004, Yalley, 2012). Thus, the foregoing findings on resource commitment affirm the proposition of the service-dominant logic on the importance of firm and customer's operant and operand resources in the service delivery process (Vargo & Lusch, 2008).

On the connection between task socialization and students' readiness for e-learning co-production, the findings of this work demonstrated a strong positive relationship between them, thus, implying that when HEI's induct and educate students with the appropriate knowledge and skills on their e-learning co-production role, this enhances their student's readiness when co-producing on e-learning platforms. This corresponds with the theorization and empirical results of several researchers (e.g., Kotzé & Plessis, 2003; Saks & Gruman, 2014; Yalley, 2021a). Also, a positive and strong association was detected between students' self-efficacy and their readiness for e-learning co-production, thus, the higher a student's self-efficacy; the higher his/her preparedness to co-produce e-learning and vice versa (Randhawa, 2004). This is consistent with similar findings on e-learning readiness amongst HE students in Saudi Arabia (Fageeh, 2011).

Therefore, a student's positive attitude towards his/her role during e-learning co-production enhances his/her preparedness to co-produce teaching and learning technologically. This is consonant with the work of several researchers on the nexus between self-efficacy and employee/customer behavior (Zhihong et al., 2015; Hong et al., 2020; Vitapamoorthy et al., 2021).

The empirical findings further support the relationship between motivation and students' readiness for e-learning co-production. Thus, intrinsic and extrinsic motivation influences students' likelihood of co-producing e-learning effectively with HEI's. This runs in parallel with the work of several scholars on customer motivation and co-production (e.g. Lengnick-Hall, 1996; Naar-King et al., 2010; Sekhon et al., 2016; Yalley, 2021a, 2021b) and student motivation and e-learning readiness in Saudi Arabia and Thailand (Fageeh, 2011; Wattakiecharoen & Nilsook, 2013). On the relationship between effective communication and students' readiness for e-learning co-production, a strong positive relationship was observed, thus, when HEI's communicate clearly, reliably, and accurately with its student before and during e-learning co-production, this enhances students' readiness to co-produce. This is in tune with the findings of other scholars on the role of effective communication including marketing communication on consumer behavior in services, particularly on co-production behavior (e.g., Bacile et al., 2014; Zephaniah et al., 2020) and on the role of e-learning communication and content on e-learning readiness among HE students in Malaysia, Uganda, and Saudi Arabia (Kaur & Zoraini Wati, 2004); Omoda-Onyait & Lubega, 2011; Fageeh, 2011). This also concurs with the view of Hinson (2020) on the need for HEI's to communicate consistent, precise, and clear information to students in their attempt to influence students' behavior and experience.

Finally, from the outcome perspective, a strong positive relationship was observed between students' readiness for e-learning co-production and students' satisfaction, thus, emphasizing the importance of customer impact on service outcome and affirming the findings of other scholars that customers are

contributors to service value and outcomes including their satisfaction (Bendapudi & Leone, 2003; Wind & Rangaswamy, 2001; Yalley, 2012).

5 Managerial and theoretical implications

For HEIs managers, the findings of this work demonstrate the importance of managing students' resources strategically during e-learning co-production for a successful service outcome. This implies managing the determinants factors strategically as follows: First, HEI managers in their recruitment and selection of students should admit students with higher self-efficacy scores or aptitude in information and communication technologies, particularly e-learning technologies. Second, HEI managers should provide necessary training and developmental opportunities for students on the task required during e-learning co-production. This may involve educating and training students on the e-learning platform as well as inducting students on their input, roles, and expectations during co-production.

Third, HEI managers should motivate and engage their students intrinsically and extrinsically when co-producing teaching and learning through the development of e-learning technologies and platforms that are user-friendly, enjoyable, engaging, rewarding, convenience, secure, and cost-effective for students. This may entail the development of e-learning platforms, tools, and content that assure students of the aforementioned intrinsic and extrinsic motivational cues. It may also entail developing and delivering e-learning platforms and content that are rich, engaging, user-friendly, interactive, navigable, and secure. It may further entail involving and engaging students in the production and co-creation of e-learning materials.

Fourth, HEI managers should provide the appropriate resources including technological resources (i.e., e-learning platforms, laptops, tablets, antivirus, internet access), high-quality technical support, and technologically inclined lecturers in ensuring an efficient and effective e-learning co-production. This may entail providing incentives for lecturers through remuneration and awards for best e-learning content as well as the provision of e-learning training for lecturers in enhancing their engagement with students. This also requires the commitment of students' intellectual and technological resources including knowledge and skills in information and communication technology particularly e-learning technologies as well as the accessibility of laptops, tablets, antivirus, and internet access. Students' commitment of resources may also be extended to the co-creation of e-learning materials through their engagement in the production of e-learning materials.

Fifth, HEI managers, administrators, and lecturers should communicate effectively with students before and during e-learning co-production. Before students' enrolment on e-learning platforms, HEI's managers and administrators should communicate persuasively to students using different marketing communication tools and platforms in promoting the benefits associated with e-learning technologies and the process of enrolling on the institution's e-learning platform. During e-learning co-production, lecturers should communicate accurately and ardently

with students. This should be supported with the use of real-time and two-way interactive communication as well as the use of multimedia content including animations, videos, competitions, and SMS capabilities in engaging, motivating, and educating students during e-learning co-production. Also, the use of social media and video conference technologies including Google Hangout, Zoom, WhatsApp, and Facebook can be used as complements to other e-learning platforms to provide real-time two-way communication in engaging and enhancing students' active participation. By adhering to the aforementioned strategies, HEI's may develop their student's readiness to co-produce e-learning and subsequently influence students' satisfaction ratings.

For scholars, this research conceptualizes "students' readiness for e-learning co-production". This conceptualization complements extant theories on technology readiness and adoption in providing a holistic perspective on theories relating to consumer co-production of e-learning technologies. It also extends the empirical outcomes of several researchers (e.g. Sekhon et al., 2016; Vaittinen et al., 2018; Cruz-Cárdenas et al., 2021; Yalley, 2020; 2021a, b) by proposing "students' readiness to e-learning co-production" as a construct within the HE context and by establishing exploring its determinants and consequence.

Secondly, the findings expand the conceptualization basis of the service-dominant logic by contextualizing it within the HE e-learning context and by identifying the factors for improving students' operant resources during e-learning co-production. Finally, the identification of a strong and positive relationship between students' readiness for e-learning co-production and student satisfaction provides empirical support on customer impact on service outcome (student satisfaction) and adds value to the conceptualization of the resource-based theory by recognizing students'/customers' as valuable resources service firms can co-opt in their co-production processes.

6 Limitations and further research suggestions

Despite the compelling theoretical and managerial contribution of this work; some limitations were spotted. Firstly, this study was limited to e-learning despite the co-production of teaching and learning within most HEI's being delivered as a blended learning approach; future studies can look into students' co-production readiness from a face-face co-production perspective as well as holistically from a blended learning perspective. Secondly, data collection was limited to Ghana as a geographical context, thus, limiting the robustness of the conceptual model and impeding the ability to generalize the findings to another cultural context; future studies should undertake a cross-national comparison in developing countries as well as between the developed and developing economies. Thirdly, considering the variations among the different types of HE institutions and the different e-learning platforms each institution has adopted: future research should undertake a comparative analysis of the proposed model among the different categories of HEI's and the different types of e-learning platforms they have adopted in validating the robustness of the

proposed model across the different HEI's and e-learning platforms and in providing insights on the readiness of students across different e-learning platforms.

Fourthly, as this study focused on co-production, future studies can focus on the co-creation aspect of e-learning, particularly the engagement of students in the production of e-learning materials. Finally, the high rating of the scale items resulting in the strong and positive relationships between the constructs may be attributed to the timing of the study; which was at a time when most HEI's in Ghana were embracing e-learning as a blended learning approach as they deal with the realities of Covid-19, thus, a high commitment on both students and HEI's. For future studies, a follow-up study is required at an appropriate time when e-learning normalizes amongst students to ascertain if there are any differences between the introduction stage and the normalization stage of e-learning technologies in HEI's. Also, future qualitative research is required in exploring the high positive relationships between the constructs.

7 Conclusions

To conclude, this study conceptualized and empirically identified the determinants and consequences of student readiness for e-learning co-production in the HE context. The empirical findings revealed that the commitment to resources by HEI's as well as the effectiveness of HEI's communication and socializing strategies toward students are important in influencing students' readiness for e-learning co-production. In addition, the motivation and self-efficacy of students as well as students' resource commitment toward e-learning, are important determinants of students' readiness for e-learning co-production. The aforementioned determinants offer scholars and practitioners several insights into resolving the challenges of students' unwillingness to co-produce e-learning with HEI's. What was more interesting was the influence of students' readiness for e-learning co-production on student satisfaction, thus, demonstrating the return on investment when HEI's embrace and implement the findings of this work.

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Data availability Available upon reasonable request.

Declarations

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