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Gender variability in E-learning utility essentials: Evidence from a multi-generational higher education cohort

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ABSTRACT

The paper reports a quantitative investigation into the nuances of gender perspectives of E-Learning utility across the social categorisations of Generation X, Y, and Z in the current phenomena of accelerated usage of e-learning in the emerging multi-generational undergraduate cohorts: using multi-generational undergraduate cohorts (N = 611) taking a mandatory online course in a Business School curricular. Using multi-group partial least-squares analysis, the study shows differences exist in the utility of e-learning within gender and Generations of X, Y, and Z. These differences may not be apparent when examined at only the gender level, which has led other researchers to conclude the gender gap is narrowing. However, we establish that within gender and across generations in a developing country context, the gender divide is not narrowing at the same pace as found in other developed countries. To accelerate the implementation of e-learning in traditional (face-to-face) undergraduate programmes globally, there is the need to contextualise Course Development, Learner Support, Assessment, and User Characteristics factors along with the different genders, and across generations to improve Results Demonstrability and Student Overall Satisfaction of utility of e-learning. In developing countries, there is a need to enhance Institutional factors to strengthen the drive to e-learning.

1. Introduction

The drive for Higher Educations Institutions (HEIs) to employ E-Learning Management Systems due to restrictions of human movement to manage a global pandemic has brought to the fore some critical imperatives. First and foremost is the rapid deployment of these E-Learning systems in traditional face-to-face delivered degree-awarding programmes. This phenomenon has necessitated shortened decision-making times required for deployment of the E-Learning Systems, making it critical to interrogate all the necessary factors of utility essentials by those who are to use these systems to improve satisfaction and success (Al-Fraihat et al., 2020). Secondly, Adamus et al. (2009) have argued that computer culture and the internet have been traditionally associated with men. In line with this argument, Cuadrado-García et al. (2010) has argued that males and females do not make use of technology in the same ways or at the same levels of expertise or experience and that men more likely than women do use online media while women are more likely than men to express a lower overall proficiency with computers. The outcome of this debate has been mixed in the literature (Bruestle et al., 2009; Dorman, 1998; Price, 2006; Ramírez-Correa et al., 2015) with Shaw and Grant (2002) arguing that the gender gap is closing. On the other hand, Kolb and Kolb (2005) and Seters et al. (2012) posit that there are differences in learning styles. Thirdly, is the initial emergence of multiple generations of students in the traditional undergraduate cohort degree-awarding programmes (Giunta, 2017) with known distinct identities (Howe & Strauss, 2003; McCuskey, 2020; Sandeen, 2008) and characteristics (Coomes & DeBard, 2004; Seters et al., 2012) that depicts their learning styles (Williams, Matt & O'Reilly, 2014; Kolb & Kolb, 2005). However, these emerging phenomena and their imperatives have not been studied.

Research on gender and E-Learning has generally been a comparison between males and females as individual groups (Ramirez-Correa et al., 2015; González-Gómez, Guardiola, Rodríguez, & Alonso, 2012; Cuadrado-García et al., 2010; Bruestle et al., 2009; Price, 2006; Rovai & Baker, 2005), whereas literature on birth generations have mainly dealt with student and faculty generational learning (Tisdell et al., 2004). Also, most studies examined generations as a group (Giunta, 2017; Dong & Zhang, 2011; Koutropoulos, 2011; Sandeen, 2008; Howe & Strauss, 2000, 2003). Carpenter et al. (2012) report that the strand of literature comparing multiple generational cohorts is rare. However, these

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segregated lines of inquiry have created a gap in research on how gender issues differ across generations and whether there are differences among the various generations of a particular gender. This study, therefore, explores how the utility of E-Learning differ across gender, generations, and among various generations of a particular gender.

In exploring this gap, we identify that E-Learning literature has a wide agreement that user satisfaction is an attitude held by individual users (Thong & Yap, 1996), for which Remenyi and Money (1991, p.163) defined as "a measure of the discrepancy between a user's expectations about a specific information system compared to the perceived performance of the system". The use of user-satisfaction is recognized by many IT researchers as an appropriate surrogate for IT effectiveness (Remenyi & Money, 1991). Also, the literature on birth generations argues that birth generation is an important variable as a social construct that categorises people into birth cohorts (Howe & Strauss, 1993), with differences in values, needs, preferences, and behaviours among generations (Howe & Strauss, 1993, 2000, 2003; Reeves & Oh, 2008; Strauss & Howe, 1991). Indeed, the birth generations literature argues that this construct is a more embracing one and encapsulates important attributes that socially affect and identifies people, with the ability to determine their learning styles (Williams et al., 2014).

We, therefore, use this construct to pursue our study, noting that the differences in gender across generations and between various generations of gender have not been studied among undergraduates in higher education. The literature of generations in higher education has generally targeted traditional degree-awarding institutions, addressing academic and student affairs issues (Giunta, 2017; Howe & Strauss, 2003; Strauss & Howe, 2007; Dziuban et al., 2005) and continuing higher education (Sandeen, 2008). But none of the extensive body of literature on generations specifically addresses the emergence of the multi-generation cohort students currently found in the undergraduate degree-awarding institutions and their utility of the emerging E-Learning management systems application to education.

The study contributes to the current literature by clarifying the E-Learning utility differences in generations of each gender and elucidates the nuances among various generations of gender in the emerging traditional undergraduate multi-generation cohort degree-awarding programmes. We establish that differences in students' utility of elements of e-learning systems are conditioned by birth generations marked by the social categorisations of Generations X, Y, and Z. We also show that undergraduate multi-generation cohorts contextualise students' utility-satisfaction of e-learning components in their usage of e-learning management systems in undergraduate programmes. Furthermore, we suggest that student utility-satisfaction in e-learning delivered courses is likely to improve when different multi-generational learning environments are contextualised in undergraduate programmes.

The study employs an E-Learning Systems user-satisfaction model to test student utility using partial least squares analysis on a multi-generational birth cohort and the subsamples of gender across generations X, Y, and Z students. A partial least squares multi-group test was utilized to examine differences between groups. The paper is composed of sections on existing literature, research questions, hypotheses, and conceptual development. The study then presents sections on methodology, Results, and discussion. Finally, the study's contributions and implications, limitations, and areas for future research are presented.

2. E-learning in higher education and gender

In the education sector, E-Learning refers to the use of software-based and online learning (Campbell, 2004). It has, however, become increasingly online (internet) and cloud-based due to development in technology (Chaubey & Bhattachary, 2015; Hubackova, 2015). Thus, becoming an internet-enabled learning process with the application of technology in design, delivery, and management of degree programmes (Chaubey & Bhattachary, 2015). Horvat et al. (2015) argued that in Higher Education, the emerging trend of blended learning is the intentional integration of traditional (i.e., face-to-face) and E-Learning to provide educational opportunities that maximize the benefits of each platform to effectively facilitate student learning. This, they suggest, offers students flexibility, as well as convenience, supporting the blending of different times and places for learning. This evolution, however, has been accelerated by current happenings in the global environment, necessitating the evaluation of these systems to ensure successful delivery, effective use, and positive impacts on learners.

The literature, has it that the notion of gender differences has fascinated people for years, and in general, it has been believed that these differences are large and immutable (Bruestle et al., 2009; Cuadrado-García et al., 2010; González-Gómez et al., 2012; Price, 2006; Ramírez-Correa et al., 2015). While gender differences have been reported concerning learning (Williams et al., 2014; Kolb & Kolb, 2005), some studies suggest that these differences remain in other areas of learning (Cuadrado-García et al., 2010; Ramírez-Correa et al., 2015). However, other studies posit that the gap is narrowing (Shaw & Grant, 2002). In Higher Education, Price (2006) challenged the stereotypical view that females are disadvantaged by technology when studying online courses and do not have reduced computer access compared to men. However, Price found out that females, place greater value on the pastoral aspect of tutoring and have different interaction styles compared with men, which may be related to their stronger desire to be academically engaged. These findings contradict the findings of other studies such as Venkatesh and Morris (2000) and Adamus et al. (2009). Cuadrado-García et al., (2010; p.368) posit that in gender studies "*While one position argues that there are gender-specific behaviour patterns that may lead to a discrimination of women using e-learning (*e.g.*,* Astleitner & Steinberg, 2005; McSporran & Young, 2001*), others argue that e-learning, through its flexible and interactive learning approach favours particularly women (*e.g.*,* Bruestle et al., 2009*)".* Besides, literature establishes that men and women express varying degrees of anxiety, acceptance, and interest in new technologies across time, and such differences highly influence learning situations (McCoy & Heafner, 2004; Ramírez-Correa et al., 2015). Therefore, it is necessary to investigate whether there are gender differences in the use of e-learning in this era of an accelerated period of implementation and assess the varied nuances in these differences. Besides, if gender differences exist, it will be necessary to implement integration policies concerning the use of e-learning by Higher Education managers. We, therefore, pose the first research question:

RQ1: Do differences exist in the utility of E-Learning courses in gender across generations?

3. Generations as social category characteristics

The literature on generations studies have conceptualised and classified society from three perspectives genealogical, pedagogical, and historical-sociological (Franz & Scheunpflug, 2016). Within the historical-sociology literature, Strauss and Howe (1991) popularized the generational cohort theory, of which Ryder (1965, p.845) defined a generational cohort as *"the aggregate of individuals (with some population definition) who experienced the same event within the same time interval."* The literature also defined a generational cohort as a cohort of people born within a particular period with an interval of approximately 20 years (Davis, 2004; Strauss & Howe, 1991). Besides, the literature argues that generation cohort as a social categorization is a safer basis for personality generalization than other social categories (Strauss & Howe, 1991) and terms the distinct differences as 'peer personality' (Strauss & Howe, 2000). Peer personality was later termed as 'generational persona' (Howe & Strauss, 2000), and defined as "a distinctly human and variable creation embodying attitudes about family life, gender roles, institutions, politics, religion, culture, lifestyle, and the future" (pp.40–41). The literature acknowledges that it is these distinctions of experiences that students construct knowledge and differ in education (Kerr, Rynearson, & Kerr, 2006; Kolb & Kolb, 2005). However,

generational studies have used different categorisations in different disciplines (i.e., demography, marketing, sociology, and psychology) (Giunta, 2017; Carpenter et al., 2012; Davis, 2004; Howe & Strauss, 2003). To be able to set the markers for the generations and cover the prominent generations currently found in Higher Education undergraduate programmes, this study used the following categorization: Generation X (1965–1979), Generation Y (1980–1995), and Generation Z (1996–2003) (Giunta, 2017; Edelman/StrategyOne, 2010; Wendover, 2002). In the education literature, the current phenomena of accelerated usage of e-learning and the utility nuances of the emerging undergraduate generations' gender differences have sparingly been researched. Besides, we posit that since these differences may exist in a multi-generation undergraduate cohort, the general characteristics visible is an amalgamation of these generations, as they engage in intergender and intergenerational learning (Franz & Scheunpflug, 2016; Corrigan et al., 2013). Besides, the apparent gender differences are overlaid by personal values and characteristics of students derived from their birth generations. The literature on generation studies is dominated by research on cross-cutting generational studies over gender (Ahmad & Tarmudi, 2012; Giunta, 2017; Prensky, 2001; Slavin, 2014). Thus, most studies consider generations as social grouping without considering the gender differences within a generational cohort. Furthermore, Wagner et al. (2010) state that "*When it comes to using computers, older adults have different needs and concerns compared to younger adults resulting from the natural physical and cognitive changes that come with ageing*" (pp.870). Sandeen (2008), therefore, argued that if researchers and educational stakeholders knew more about these differences, they might perform better at developing and delivering effective educational programmes.

In the extant literature, Generation X (1965–1979) is identified as the "latchkey generation" and known for their independent and expected freedom (Selingo, 2018). Sandeen (2008) classified them as the first to grow up with computers, and associated them with the appreciation of feedback and generally want information about their progress. They are also known to look for and appreciate opportunities for professional development. Generation Y (1980–1995) grew up with computers and encountered its use in education. They are highly digitally connected (Frand, 2000; Prensky, 2001) since they experienced the rapid adoption of technology (i.e., internet, cell phones, and other mobile devices) (Monaco & Martin, 2007; Sandeen, 2008). They are also the social media pioneers, prefer learning in groups, and are known to have brought consumer mentality to higher education (McCuskey, 2020; Selingo, 2018). Besides, they are characterised as team-oriented, confident, and highly optimistic, pressured, keen to achieve, and conventional (Howe & Strauss, 2000). Generation Z (1996–2003) has many accolades, as "Digital natives", "iGeneration", "Internet Generation", "Computer Generation", and "Net Natives", due to their dependency on computer technology, as they have no experience of the pre-Internet era (Giunta, 2017; Koutropoulos, 2011; Prensky, 2001; Slavin, 2014). They are focused on value and seek a relevant education they can apply, which has implications on higher education recruitment, pedagogy, and lifestyle (Selingo, 2018).

These characterisations are expected to be evident in males and females, overlaying gender nuances and idiosyncrasies. Thus, it is important to investigate whether these differences affect the use of e-learning in the era of an accelerated period of implementation and what are the nuances in these differences along with the two genders. If these differences exist within the genders, then there can be the contextualisation in integration policies concerning the use of e-learning by Higher Education managers.

We, therefore pose the second and third research questions:

RQ2: Do differences exist in the utility of E-Learning courses within the three generations of males?

RQ3: Do differences exist in the utility of E-Learning courses within the three generations of females?

4. Materials and methods

4.1. Conceptual development

From the literature, Hadullo et al. (2017) developed a model for evaluating e-learning systems quality in higher education in developing countries that takes into consideration the idiosyncrasies of developing countries (Bhuasiri et al., 2012; Mohammadi, 2015). The literature on e-learning in developing countries identifies the impediments found in e-learning are resource availability, accessibility, infrastructure (i.e., the absence of vast communication infrastructure) and the role of social factors (e.g., learner and instructor) remaining dominant (Aung & Khaing, 2016; Bhuasiri et al., 2012; Mohammadi, 2015). These are in contrast to developed countries, where the usefulness of the systems, quality of information, ethical and legal considerations are dominant factors (Al-Fraihat et al., 2020). We, therefore, deem this model an appropriate foundation for the research context. The Hadullo et al. (2017) model conceptualised the e-learning evaluation model as having six constructs of course development, learner support, assessment, user characteristics, institutional factors, and overall performance. The constructs and items were derived from literature adapted from Hadullo et al., (2017, p.190). In this model, Hadullo et al. (2017) posited that the overall performance measures of the E-Learning system quality are affected by course development, learner support, institutional factors, and assessment constructs and overall performance. These relationships are mediated by user characteristics. Since this study is about utility, we propose a new framework by adapting the Hadullo et al. (2017) model. The e-learning literature has established that there is a relationship between perceived usefulness as among the key reasons acting on the disposition of university undergraduates to use e-learning (Raspopovic et al., 2014; Ngai et al., 2007). Besides, the updated Delone and McLean Model (Delone & McLean, 2003) introduce the concepts of intention to use, use, and user satisfaction in the evaluation of information systems. We posit that these constructs be measured not at the macro level but at the micro-level of the individual components of the system. Also, Venkatesh and Bala (2008, p.280), drawing from the work on the determinants of perceived usefulness, introduced the variable Results Demonstrability as having a relationship with perceived use in their TAM 3 (Technology Acceptance Model 3). Results demonstrability is defined as the degree to which an individual believes that the results of using a system are tangible, observable, and communicable (Venkatesh & Bala, 2008, p.277). We, therefore, postulate that the perceived usefulness of the components of the E-Learning System has a relationship with the results demonstrability leading to overall satisfaction. Thus, we argue that a discrete evaluation of usefulness to the user of the various component of the e-learning system will be more beneficial to lecturers and e-learning creators to enable them to modify elements of the e-learning system to contextualise user characteristics to enhance overall satisfaction. This is shown in our model in Fig. 1. Also, each construct and the indicators used to reflect each construct supported by related studies are shown in Appendix 1. Based on the literature reviewed, we proceed to propose the following hypotheses to interrogate the research questions:

H1: Statistically significant differences between males and females exist in the relationships between the variables of the utility of the E-Learning system.

H1$_1$ Statistically significant differences exist between males of generation X and females of generation X in the relationships between the variables of the utility of the E-Learning system components.

H1$_2$ Statistically significant differences exist between males of generation Y and females of generation Y in the relationships between the variables of the utility of the E-Learning system components.

H1$_3$ Statistically significant differences exist between males of generation Z and females of generation Z in the relationships between the variables of the utility of the E-Learning system components.

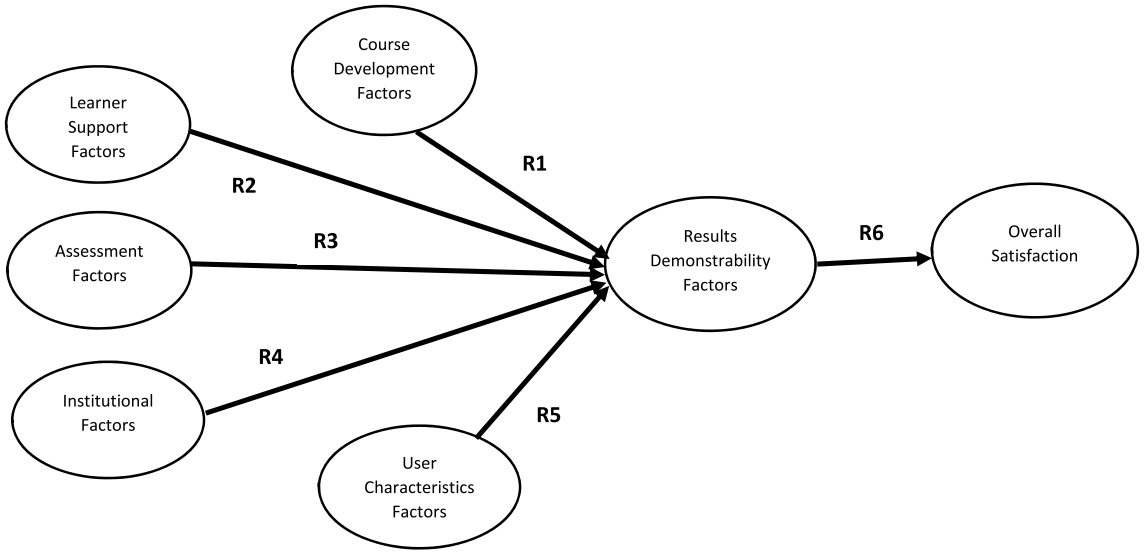

Fig. 1. Research model.

H2: Statistically significant differences exist between males of the three generations in the relationships between the variables of the utility of the E-Learning system.

H 2_1 Statistically significant differences exist between males of generation X and males of generation Y in the relationships between the variables of the utility of the E-Learning system components.

H 2_2 Statistically significant differences exist between males of generation X and males of generation Z in the relationships between the variables of the utility of the E-Learning system components.

H 2_3 Statistically significant differences exist between males of generation Y and males of generation Z in the relationships between the variables of the utility of the E-Learning system components.

H3: Statistically significant differences exist between females of the three generations in the relationships between the variables of the utility of the E-Learning system.

H 3_1 Statistically significant differences exist between females of generation X and females of generation Y in the relationships between the variables of the utility of the E-Learning system components.

H 3_2 Statistically significant differences exist between females of generation X and females of generation Z in the relationships between the variables of the utility of the E-Learning system components.

H 3_3 Statistically significant differences exist between females of generation Y and females of generation Z in the relationships between the variables of the utility of the E-Learning system components.

4.2. Methodology

The research employs the open-source internal network learning management system, Moodle, which is a leading global network used for blended learning, flipped classroom, and distance education in Higher Education globally (Chaubey & Bhattachary, 2015) as the context for the study. This learning system was deployed in a leading business school in Accra, Ghana, to introduce a blended online mandatory course, which was a core course component for all undergraduate business school's four year-programmes in the 2019/2020 academic year. The study used registered students from the first two levels, which totalled 700, with 300 students from year 1, and 400 from year two respectively. From this population, 624 students voluntarily submitted their surveys, out of which 611 responses were useable, resulting in a response rate of 87.2%. Table 1 shows the descriptive statistics and background information of the unique characteristics of the sample and subsamples. Ethical approval was met as per the Institute's ethical guidelines; students' grades were not part of this research, and respondents were informed of the possibility of their data being used for publication. The survey instrument was administered electronically on another platform at the end of the semester for students as a Satisfaction Survey, which made it clear that it was not part of the course assignment to minimize students' perception that they were obliged to complete the questionnaire. Multi-Group partial least squares analysis was then conducted to analyse the differences in the scores of the variables in the model for differences existing in generations of gender in the different constructs of the proposed model. This procedure provides outcomes of three different approaches that are based on bootstrapping Results from every group (e.g., outer weights, outer loadings, and path coefficients) (Hair et al., 2018; Sarstedt et al., 2011). All analysis was done using SPSS 23 and Smartpls 3 (Ringle et al., 2015; Chin, 2010) software.

4.3. Measures

From a comprehensive satisfactory study for evaluating the learning experience and the management system, the study instrument was derived. The study instrument utilized a set of twenty-five items measuring the seven components in the model relevant to participant learning user experience. The instrument measures the six components of the proposed model using items mainly from the Hadullo et al. (2017) model (see Appendix 1). These are: 1) Course Development Factors (Course outline, List of reading materials, List of forum sessions in the course, Current and accurate content in teaching videos/lectures, Easy to use interface (website); 2) Learner Support Factors (Group support work, Feedbacks from Emails, chats, and forum, Support from IT); 3) Institutional Factors (Availability of Internet, Availability of computers, Maintenance of infrastructure (use without any problems)); 4) Assessment Factors (Assignment due dates, None or minimal issue with grades, Feedback on Assignments, Feedback on Examination); 5) User Characteristics Factors (Your belief in your ability to achieve goals (Self--efficacy), Your training on the internet, Your personal motivation, Incentives to take the sessions at your own time, Your experience with the course content); 6) Results Demonstrability Factors (Information quality of the videos, Service quality in the delivery of the course, Better opportunity to getting better grades, Cost-effectiveness of the new delivery system). Participants were asked to rate the usefulness of these items on a seven-point scale of usefulness (Extremely Useful (7) to Totally Useless (1)). An additional item was used to measure overall

Table 1
Descriptive statistics of sample and subsamples.

Descriptive Statistics		Gender By Generation						Total
		Females in Generation Z (FGen Z)	Females in Generation Y (FGen Y)	Females in Generation X (FGen X)	Males in Generation Z (MGen Z)	Males in Generation Y (MGen Y)	Males in Generation X (MGen X)	
Gender	Female	35.1%	58.2%	6.8%	–	–	–	368
	Male	–	–	–	29.6%	60.9%	9.5%	243
Total		21.1%	35.0%	4.1%	11.8%	24.2%	23.8%	611
Generations	Generation Z (IGeneration) (16–23 yrs)	64.2%	–	–	35.8%	–	–	201
	Generation Y (Millennials) (24–39 yrs)	–	59.1%	–	–	40.9%	–	362
	Generation X (40–54 yrs)	–	–	52.1%	–	–	47.9%	48
Total		21.1%	35.0%	4.1%	11.8%	24.2%	3.8%	611
Course of Study	Procurement	16.5%	39.1%	0.0%	9.6%	33.0%	1.7%	115
	Project Management	10.7%	12.5%	1.8%	17.9%	46.4%	10.7%	56
	Hospitality	38.3%	38.3%	8.3%	1.7%	13.3%	0.0%	60
	Accounting	27.7%	14.9%	8.5%	31.9%	17.0%	0.0%	47
	Administration	16.1%	39.7%	3.5%	10.6%	25.1%	5.0%	199
	Finance	14.7%	35.3%	0.0%	14.7%	35.3%	0.0%	34
	Human Resource	36.0%	41.3%	8.0%	5.3%	6.7%	2.7%	75
	Marketing	16.0%	40.0%	8.0%	20.0%	4.0%	12.0%	25
Total		21.1%	35.0%	4.1%	11.8%	24.2%	3.8%	611
Student Status	Full-Time Student	43.3%	18.3%	0.0%	24.7%	12.9%	0.8%	263
	Student Worker	4.3%	47.7%	7.2%	2.0%	32.8%	6.0%	348
Total		21.1%	35.0%	4.1%	11.8%	24.2%	3.8%	611

satisfaction (Cidral et al., 2018) on a 7-point scale (Very Dissatisfied (1) to Very Satisfied (7)). The three main generations were operationalized as Generation X (40–54 years), Generation Y (24–39 years), and Generation Z (16–23 years) (Giunta, 2017; Edelman/StrategyOne, 2010; Wendover, 2002). Whilst gender was included as male and female, and background information on the course of study, student status and students' programme time (Little, 2005).

5. Data analysis and results

5.1. Results of the measurement model

The hypotheses were tested using the research model, using factor analysis and partial least squares approaches where the sample was grouped into gender and by generations. An exploratory factor analysis (using varimax rotation and principal components) was conducted and items loaded on corresponding constructs with an explained total variance of 84.86%. Content validity was achieved with the theoretical and empirical evidence supported by the measurement instrument from the literature reviewed. We then proceeded with the measurement model; indicator reliability was established with measures above 0.7 (Hair et al., 2014). Internal consistency reliability was assessed using the Cronbach's alpha (α), and Composite Reliability (CR) with a cut off value of $\geq$0.70 for both tests (Urbach & Ahlemann, 2010), ensuring internal consistency reliability and validity of the measures for the variables are met. Also, all constructs' AVE exceeded 0.50 with composite reliabilities above 0.70 supporting convergent validity (Hair et al., 2014) and indicators examined for cross-loadings with no evidence of cross-loadings. For discriminant validity, the Average Variance Explained (AVE) values of the constructs were greater than the square of the correlations, hence, satisfying discriminant validity criterion (Fornell & Larcker, 1981; Hair et al., 2014; Urbach & Ahlemann, 2010). To further confirm discriminant validity, the heterotrait-monotrait ratio (HTMT) of the correlations was assessed with a specificity criterion rate of 0.85–1.00 and accepted, using the liberal approach (Gaskin, Godfery & Vance 2018; Henseler et al., 2015). Achieving discriminant validity between constructs indicates their acceptability for hypothesis testing (Mathieu & Taylor, 2006).

5.2. Results of the Structural Model

A complete bootstrapping procedure with 500 bootstrapping samples was performed for all the subsamples using SmartPLS 3 Multi-Group procedure. The measure used for the explained variance of latent dependent variables to the total variance in the model was the coefficient of determination (R^2) (using approximately 0.190 weak; 0.333 moderate; and 0.670 substantial) (Chin, 1998). This also measured the model's predictive accuracy. These Results are presented in Table 2. Course Development, Learner Support, Assessment, Institutional, and User Characteristics factors explained variance in the following samples: 86.3% in the multi-generational sample; 88.3% in Males; 85.2% in Females; 96.8% in Females in Generation X; 85.5% in Females in Generation Y; 84.6% in Females in Generation Z; 81.8% in Males in Generation X; 87.5% in Males in Generation Y; and 91.8% in Males in Generation Z, all with a substantial predictive power of the variance in Results Demonstrability Factors in e-learning utility. Also, Results Demonstrability Factors explained variance in the following samples, 31.1% in the multi-generational sample; 37.4% in Males; 27.0% in Females; 20.9% in Females in Generation X (which did not reach significance); 24.3% in Females in Generation Y; 32.8% in Females in Generation Z; 37.6% in Males in Generation X; 43.6% in Males in Generation Y; and 27.4% in Males in Generation Z all with a moderate predictive power of the variance in Overall Satisfaction in e-learning utility. The predictive relevance of the model was evaluated using cross-validated redundancy (Q^2) with the blindfolding SmartPLS procedure, $Q^2 > 0$ implies the model has predictive relevance whereas $Q^2 < 0$ represents a lack of predictive relevance of the model (Hair et al., 2014). All the relationships were predictive relevant.

The significance levels of the model were assessed with the path coefficients, t-values, and p-values ($p < 0.05$, one-tailed distribution) (Hair et al., 2014). Fig. 2 shows the path coefficients for the multi-generational sample. We then proceed to present the Results in the subsamples (generational cohorts) as indicated in the relationships of the research model in Tables 3 and 4. In Table 3, the results show:

Course Development factors - > Results Demonstrability Factors (R1): In the relationship of Course Development factors with Results Demonstrability, results show that positive significant influence in the multi-

Table 2
Predictive power estimation of the model in groups.

		R^2 VALUES	Predictive Power	Q^2 (=1-SSE/SSO)
Overall Satisfaction	Sample (N = 611)	0.311[c]	Moderate	0.305
	Males	0.374[c]	Moderate	0.348
	Females	0.270[c]	Moderate	0.261
	Females in Generation X (FGen X)	0.209(n. s)	Moderate	0.084
	Females in Generation Y (FGen Y)	0.243[c]	Moderate	0.228
	Females in Generation Z (FGen Z)	0.328[c]	Moderate	0.323
	Males in Generation X (MGen X)	0.376[a]	Moderate	0.297
	Males in Generation Y (MGen Y)	0.436[c]	Moderate	0.430
	Males in Generation Z (MGen Z)	0.274[b]	Moderate	0.239
Results Demonstrability Factors	Sample (N = 611)	0.863[c]	Substantial	0.729
	Males	0.883[c]	Substantial	0.748
	Females	0.852[c]	Substantial	0.712
	Females in Generation X (FGen X)	0.968[c]	Substantial	0.765
	Females in Generation Y (FGen Y)	0.855[c]	Substantial	0.714
	Females in Generation Z (FGen Z)	0.846[c]	Substantial	0.690
	Males in Generation X (MGen X)	0.818[c]	Substantial	0.458
	Males in Generation Y (MGen Y)	0.875[c]	Substantial	0.707
	Males in Generation Z (MGen Z)	0.918[c]	Substantial	0.812

Note: p-values.
[a] $p < 0.05$.
[b] $p < 0.01$.
[c] $p < 0.001$. n. s – non significant; Coefficient of determination (R^2) (with the cut off levels as: 0.190 weak; 0.333 moderate; and 0.670 substantial).

generational cohort ($\gamma = 0.144$, $p = 0.004$); Females ($\gamma = 0.173$, $p = 0.004$); Females in Generation Y ($\gamma = 0.167$, $p = 0.031$); Females in Generation Z ($\gamma = 0.200$, $p = 0.012$) and Males in Generation Y ($\gamma = 0.178$, $p = 0.019$). Thus, in the E-Learning multi-generational cohort environment, the utility of Course Development leads to positive Results Demonstrability with the strongest positive influence in the order of Females in Generation Z, Males in Generation Y, Females and Females in Generation Y respectively. The general positive effect on the multi-generational cohort is the least. The relationship did not reach significance in students in the following subsamples Males, Females in Generation X, Males in Generation X, and Males in Generation Z.

Assessment Factors - > Results Demonstrability Factors (R3): In the relationship of Assessment factors with Results Demonstrability, results show positive significant influence in Males ($\gamma = 0.198$, $p = 0.001$) and Males in Generation Y ($\gamma = 0.216$, $p = 0.001$). Thus, in the E-Learning multi-generational cohort environment, the utility of Assessment Factors leads to positive Results Demonstrability for Male students and have a larger influence in Males in Generation Y. The relationship did not reach significance in students in the multi-generational cohort and the following subsamples Females, Females in Generation X, Females in Generation Y, Females in Generation Z, Males in Generation X, and Males in Generation Z.

Learner Support *Factors - > Results Demonstrability Factors (R2):* In the relationship of Learner Support with Results Demonstrability, results show positive significant influence in the multi-generational cohort ($\gamma = 0.071$, $p = 0.046$), Females ($\gamma = 0.089$, $p = 0.037$) and Males in Generation Z ($\gamma = 0.220$, $p = 0.045$). Thus, in the E-Learning multi-generational cohort environment, the utility of Learner Support leads to positive Results Demonstrability with the strongest positive influence in the order of Males in Generation Z, Females, and the multi-generational cohort respectively. Other subsamples did not reach statistical significance.

Table 4 presents the Results for Institutional factors, User Characteristics, and Results Demonstrability.

Institutional Factors - > Results Demonstrability Factors (R4): In the relationship of Institutional factors with Results Demonstrability, results did not reach significance in the multi-generational cohort and any of the subsample cohort. However, the relationship was generally negative across the subsample cohorts.

User Characteristics Factors - > Results Demonstrability Factors(R5): In the relationship of User Characteristics with Results Demonstrability, results show positive significant influence in the multi-generational cohort ($\gamma = 0.723$), Males ($\gamma = 0.656$); Females ($\gamma = 0.746$); Females in Generation X ($\gamma = 0.916$); Females in Generation Y ($\gamma = 0.712$); Females in Generation Z ($\gamma = 0.729$); Males in Generation Y ($\gamma = 0.619$) and Males in Generation Z ($\gamma = 0.689$) with all of them significant at $p < 0.001$. Thus, in the E-Learning multi-generational cohort environment the utility of User Characteristics lead to positive Results Demonstrability with the strongest positive influence in the order of Females in Generation X; Females; Females in Generation Z; multi-generational cohort; Females in Generation Y; Males in Generation Z; Males; and Males in Generation Y respectively. The relationship did not reach significance in students in the Males in Generation X cohort. Results *Demonstrability Factors - > Overall Satisfaction (R6):* In the relationship of Results Demonstrability with Overall Satisfaction, results show positive significant influence in the multi-generational cohort ($\gamma = 0.558$), Males ($\gamma = 0.612$); Females ($\gamma = 0.519$); Females in Generation X ($\gamma = 0.457$); Females in Generation Y ($\gamma = 0.493$); Females in Generation Z ($\gamma = 0.573$); Males in Generation X ($\gamma = 0.613$); Males in Generation Y ($\gamma = 0.661$) and Males in Generation Z ($\gamma = 0.524$) with all of them significant at $p < 0.001$. Thus, in the E-Learning multi-generational cohort environment the utility of Results Demonstrability lead to positive Overall Satisfaction with the highest positive influence in the order of Males in Generation Y; Males in Generation X; Males; Females in Generation Z; multi-generational cohort; Males in Generation Z; Females; Females in Generation Y and Females in Generation X respectively.

5.3. Results of the Multi-Group Analysis and testing of hypotheses

Using the Multi-Group Analysis in SmartPLS, an initial test was conducted to establish the baseline of the path coefficients differences in the sample on gender. This test on the multi-generational cohort show path coefficient differences in the variables in the utility of e-learning between females and males were not significant and were also not significant from the parametric test. This is shown in Table 5.

To elicit the nuances in the multi-generational cohort, further analysis was conducted on the subsample cohorts to test the hypotheses. The analysis shows differences in path coefficient for the relationship between User Characteristics and Results Demonstrability is statistically significant for Females of Generation X and Males of Generation X (t-value = .1.879, $p = 0.033$) (Shown in Table 6). Hence, we partially accept hypothesis $\mathbf{H1_1}$, Also, the results show differences in path coefficient for the relationship between Assessment Factors and Results Demonstrability is statistically significant for Females of Generation Y and Males of Generation Y (t-value = .1.892, $p = 0.030$) (Shown in Table 7). Hence, we partially accept hypothesis $\mathbf{H1_2}$. Additional analysis

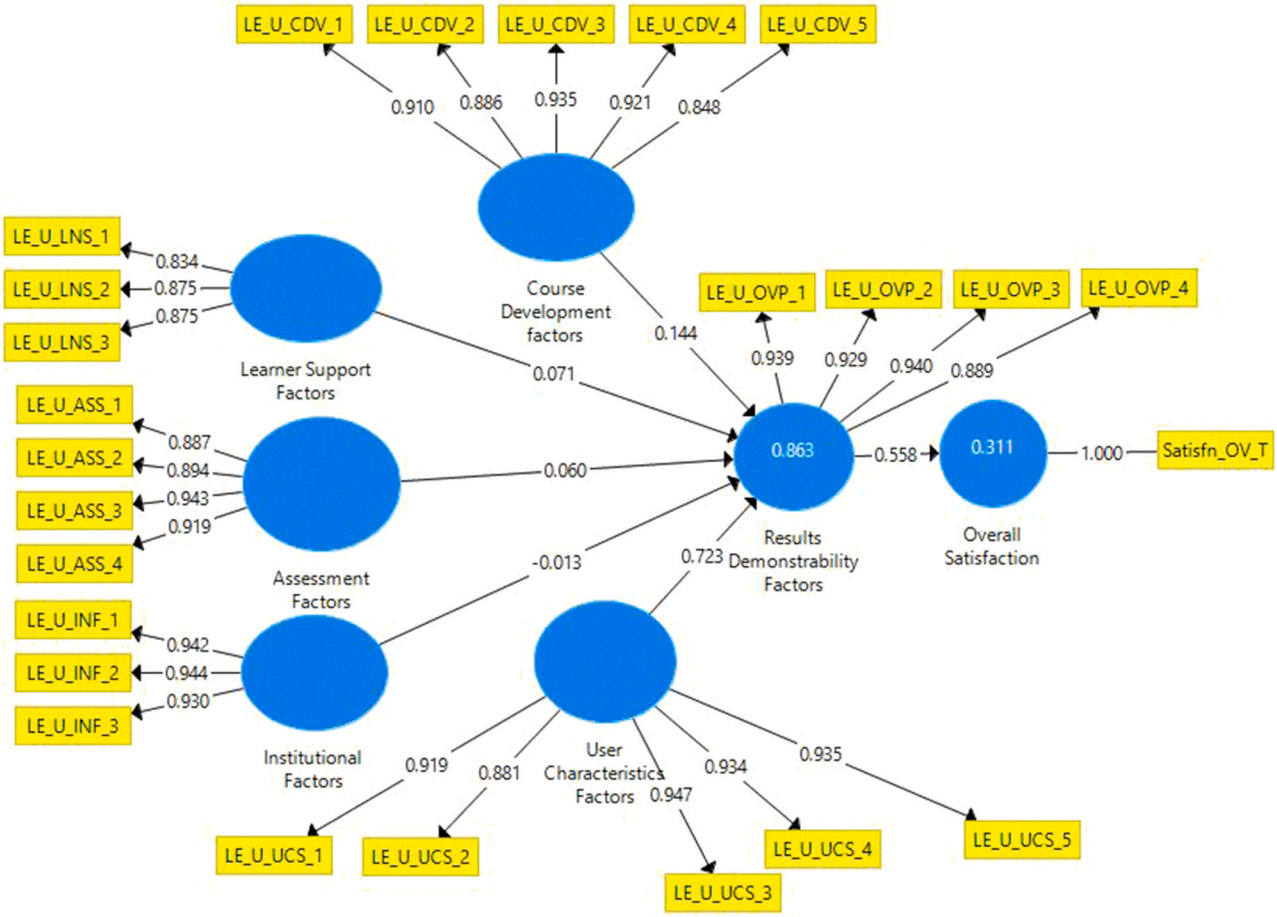

Fig. 2. Structural model for multi-generation sample with path coefficients.

shows the differences in path coefficient for the relationship between Course Development Factors and Results Demonstrability is statistically significant for Females of Generation Z and Males of Generation Z (t-value = 2.415, p = 0.008) (Shown in Table 8). Hence, we partially accept hypothesis **$H1_3$**

The Results for the test for hypothesis H2 are presented in Tables 9–11 show the differences in path coefficient for the relationship between Institutional Factors and Results Demonstrability is statistically significant for Males of Generation X and Males of Generation Y (t-value = 1.662, p = 0.049) (Shown in Table 9). Hence, we partially accept hypothesis **$H2_1$** Also, the results show the differences in path coefficient for the relationship between Course Development Factors and Results Demonstrability is statistically significant for Males of Generation X and Males of Generation Z (t-value = 2.111, p = 0.019) (Shown in Table 10). Hence, we partially accept hypothesis **$H2_2$**. Furthermore, the results show the differences in path coefficient for the relationship between Course Development Factors and Results Demonstrability is statistically significant for Males of Generation Y and Males of Generation Z (t-value = 2.169, p = 0.016) (Shown in Table 11). Hence, we partially accept hypothesis **$H2_3$**.

The Results for the test for hypothesis H3 as presented in Tables 12–14, the differences in path coefficient for the relationship between Learner Support Factors and Results Demonstrability, for Females of Generation X and Females of Generation Y (t-value = 1.665, p = 0.123) (Shown in Table 12). However, it did not reach statistical significance. We, therefore, reject hypothesis **$H3_1$**. The results also show the differences in path coefficient for the relationship between Institutional Factors and Results Demonstrability is statistically significant for Females of Generation X and Females of Generation Z (t-value = 1.772, p = 0.039) (Shown in Table 13). Hence, we partially accept hypothesis **$H3_2$**. Furthermore, the results show no statistical differences in path coefficients for the relationships in the model, and none did not reach statistically significant for Females of Generation Y and Females of Generation Z, as shown in Table 14. Hence, we reject hypothesis **$H3_3$**.

6. Discussion

The Results validated an e-learning utility model in a multi-generational cohort with statistically significant variables of Course Development, Learner Support, and User Characteristics having a positive substantial predictive relationship with Results Demonstrability, which leads to a statistically significant positive moderately predictive relationship with Overall Satisfaction. Thus, these factors are the predictors of student utility satisfaction in e-learning in a multi-generational undergraduate cohort.

However, in the gender Results, males had statistically significant variables of Assessment and User Characteristics having a positive substantial predictive relationship with Results Demonstrability, leading to a statistically significant positive moderately predictive relationship with Overall Satisfaction. On the contrary, Females were influenced by Course Development, Learner Support, and User Characteristics having a positive substantial predictive relationship with Results Demonstrability, which leads to a statistically significant positive moderately predictive relationship with Overall Satisfaction. Therefore, the perspectives of males and females in the utility of e-learning have underlying nuances. However, these differences may be obscured by their representative numbers in the multi-generational cohort.

The Results also show that within the multi-generational cohort, in

Table 3
Path estimates for the model for various groups.

PATH	GROUPS	Coefficients (γ)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)
Assessment Factors - > Results Demonstrability Factors	Sample (N = 611)	0.060(n.s)	0.060	0.041	1.461
	Males	0.198[c]	0.187	0.064	3.102
	Females	−0.014(n.s)	−0.008	0.052	0.264
	Females in Generation X (FGen X)	−0.083(n.s)	−0.083	0.091	0.919
	Females in Generation Y (FGen Y)	0.002(n.s)	0.007	0.080	0.024
	Females in Generation Z (FGen Z)	0.016(n.s)	0.012	0.063	0.263
	Males in Generation X (MGen X)	0.212(n.s)	0.183	0.201	1.052
	Males in Generation Y (MGen Y)	0.216[c]	0.201	0.072	3.018
	Males in Generation Z (MGen Z)	0.237(n.s)	0.232	0.176	1.348
Course Development factors - > Results Demonstrability Factors	Sample (N = 611)	0.144[b]	0.138	0.053	2.706
	Males	0.111(n.s)	0.106	0.077	1.451
	Females	0.173[b]	0.175	0.064	2.680
	Females in Generation X (FGen X)	0.133(n.s)	0.197	0.183	0.726
	Females in Generation Y (FGen Y)	0.167[a]	0.176	0.089	1.868
	Females in Generation Z (FGen Z)	0.200[a]	0.209	0.088	2.275
	Males in Generation X (MGen X)	0.432(n.s)	0.355	0.316	1.370
	Males in Generation Y (MGen Y)	0.178[a]	0.176	0.085	2.087
	Males in Generation Z (MGen Z)	−0.151(n.s)	−0.166	0.126	1.197
Learner Support Factors - > Results Demonstrability Factors	Sample (N = 611)	0.071[a]	0.071	0.042	1.684
	Males	0.041(n.s)	0.049	0.058	0.705
	Females	0.089[a]	0.086	0.050	1.792
	Females in Generation X (FGen X)	−0.163(n.s)	−0.150	0.104	1.568
	Females in Generation Y (FGen Y)	0.106(n.s)	0.100	0.075	1.421
	Females in Generation Z (FGen Z)	0.098(n.s)	0.111	0.077	1.280
	Males in Generation X (MGen X)	0.059(n.s)	−0.041	0.196	0.302
	Males in Generation Y (MGen Y)	0.009(n.s)	0.019	0.082	0.113
	Males in Generation Z (MGen Z)	0.220[a]	0.207	0.130	1.698

Note: Standardized path coefficient.
[a] $p < 0.05$.
[b] $p < 0.01$.
[c] $p < 0.001$, n. s – non significant.

the utility of Course Development to positively influence Results Demonstrability relationship, the highest positive groups influenced are in the order of Females in Generation Z, Males in Generation Y, Females and Females in Generation Y respectively. The general positive effect on the multi-generational cohort is the least. In the utility of Learner Support to positive influence Results Demonstrability relationship, the highest positive groups influenced are in the order of Males in Generation Z, Females, and the multi-generational cohort, respectively. Also, the utility of User Characteristics leading to positive influence on Results Demonstrability is categorised with the highest positive groups influenced in the order of Females in Generation X; Females; Females in Generation Z; multi-generational cohort; Females in Generation Y; Males in Generation Z; Males; and Males in Generation Y respectively. Furthermore, in the utility of Results Demonstrability leading to a positive influence in Overall Satisfaction relationship, the highest positive groups influenced are in the order of Males in Generation Y; Males in Generation X; Males; Females in Generation Z; multi-generational cohort; Males in Generation Z; Females; Females in Generation Y and Females in Generation X respectively. However, in the relationship of Institutional factors with Results Demonstrability, results did not reach significance in the multi-generational cohort and were generally negative across the subsample cohorts. Therefore, the perspectives of the various subsample cohorts for the utility of e-learning have underlying differences that are not apparent when examined firstly, from only the perspective of gender or generational studies. Secondly, these results establish the existence of differences due to gender and generations. Thirdly the appearance in the multi-generational cohort obfuscates the different utility perspectives in the utility of e-learning.

To further compare these influences on the utility of the e-learning variables in our model, although there was evidence to show that the differences between males and females did not reach statistical significance, the analysis of the differences in the subsample cohorts are contrary. The analysis shows differences in path coefficient for the relationship between User Characteristics and Results Demonstrability is statistically significant for Females of Generation X and Males of Generation X. We therefore partially accept significant differences exist between males of generation X and females of generation X in the utility of the E-Learning system components. Also, the results show differences

Table 4
Path estimates for the model for various groups.

PATH	GROUPS	Coefficients (γ)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)
Institutional Factors - > Results Demonstrability Factors	Sample (N = 611)	−0.013(n.s)	−0.012	0.027	0.478
	Males	−0.026(n.s)	−0.025	0.030	0.867
	Females	−0.009(n.s)	−0.008	0.039	0.234
	Females in Generation X (FGen X)	0.166(n.s)	0.159	0.132	1.262
	Females in Generation Y (FGen Y)	0.015(n.s)	0.013	0.051	0.294
	Females in Generation Z (FGen Z)	−0.085(n.s)	−0.081	0.056	1.522
	Males in Generation X (MGen X)	−0.247(n.s)	−0.126	0.194	1.274
	Males in Generation Y (MGen Y)	−0.041(n.s)	−0.039	0.036	1.144
	Males in Generation Z (MGen Z)	−0.020(n.s)	−0.014	0.062	0.322
User Characteristics Factors - > Results Demonstrability Factors	Sample (N = 611)	0.723***	0.728	0.044	16.469
	Males	0.656***	0.664	0.078	8.467
	Females	0.746***	0.742	0.051	14.515
	Females in Generation X (FGen X)	0.916***	0.857	0.131	7.011
	Females in Generation Y (FGen Y)	0.712***	0.706	0.074	9.592
	Females in Generation Z (FGen Z)	0.729***	0.711	0.091	8.051
	Males in Generation X (MGen X)	0.400(n.s)	0.470	0.270	1.478
	Males in Generation Y (MGen Y)	0.619***	0.628	0.085	7.320
	Males in Generation Z (MGen Z)	0.689***	0.716	0.165	4.163
Results Demonstrability Factors - > Overall Satisfaction	Sample (N = 611)	0.558***	0.558	0.042	13.280
	Males	0.612***	0.611	0.067	9.188
	Females	0.519***	0.522	0.052	9.983
	Females in Generation X (FGen X)	0.457**	0.456	0.182	2.517
	Females in Generation Y (FGen Y)	0.493***	0.499	0.074	6.632
	Females in Generation Z (FGen Z)	0.573***	0.575	0.061	9.422
	Males in Generation X (MGen X)	0.613***	0.588	0.160	3.825
	Males in Generation Y (MGen Y)	0.661***	0.661	0.075	8.830
	Males in Generation Z (MGen Z)	0.524***	0.523	0.111	4.736

Note: Standardized path coefficient; *p < 0.05, **p < 0.01, ***p < 0.001, n.s – non significant.

in path coefficient for the relationship between Assessment Factors and Results Demonstrability is statistically significant for Females of Generation Y and Males of Generation Y. Hence, we partially accept that statistically significant differences exist between males of generation Y and females of generation Y in the utility of the E-Learning system components. Besides, the differences in path coefficient for the relationship between Course Development Factors and Results Demonstrability was statistically significant for Females of Generation Z and Males of Generation Z. We, therefore, partially accept differences exist between males of generation Z and females of generation Z in the relationships between the variables of the utility of the E-Learning system components.

Within the male gender, statistically significant relationships exist for Institutional Factors and Results Demonstrability in Males of Generation X and Males of Generation Y. Also, a statistically significant relationship exists for Course Development Factors and Results Demonstrability for Males of Generation X and Males of Generation Z. Furthermore, the results show statistically significant differences for Course Development Factors and Results Demonstrability for Males of Generation Y and Males of Generation Z for the utility of the E-Learning system components.

These Results show these differences exist but may be obscured by their representative numbers in the multi-generational cohort. Therefore, in the accelerated implementation of e-learning for traditional undergraduate business school courses, there is the need to contextualise learners by gender and generation to optimise overall satisfaction for students. This contextualisation may be through changes in design, pedagogy, delivery, and assessment that will impact Course Development, Learner Support, Assessment, and User Characteristics Factors. It is important to also note that there is a need to improve Institutional Factors to modify its apparent negative relationship with Results Demonstrability in e-learning utility.

6.1. New contributions to practice

The study notes that the digital divide may have narrowed in some developed countries as argued by Shaw and Grant (2002) in the literature. However, this study shows there are nuances in the utility of E-Learning by undergraduates in our developing country case study, which is contrary to the literature. Also, there is the need to contextualise the design and implementation of e-learning courses by gender and generations to ensure the maximisation of student Overall Satisfaction of the utility of e-learning. Secondly, the study provides a validated e-learning user-satisfaction utility model with a moderate

Table 5
Results of multi-group analysis of female and male students.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (Female - Male)	p-Value new (Female vs Male)	t-Value (| Female vs Male|)	p-Value (Female vs Male)
Assessment Factors - > Results Demonstrability Factors	−0.131	**0.082**	1.827	**0.068**
Course Development factors - > Results Demonstrability Factors	0.045	**0.662**	0.449	**0.654**
Institutional Factors - > Results Demonstrability Factors	0.001	**0.992**	0.011	**0.991**
Learner Support Factors - > Results Demonstrability Factors	0.028	**0.702**	0.389	**0.697**
Results Demonstrability Factors - > Overall Satisfaction	−0.094	**0.243**	1.191	**0.234**
User Characteristics Factors - > Results Demonstrability Factors	0.062	**0.498**	0.699	**0.485**

Table 6
Results of multi-group analysis for females of generations X and males of generation X.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (FGen X - MGen X)	p-Value new (FGen X vs MGen X)	t-Value(| FGen X vs MGen X|)	p-Value (FGen X vs MGen X)
Assessment Factors - > Results Demonstrability Factors	−0.295	**0.096**	1.393	**0.085**
Course Development factors - > Results Demonstrability Factors	−0.299	**0.178**	0.866	**0.195**
Institutional Factors - > Results Demonstrability Factors	0.414	**0.062**	1.616	**0.056**
Learner Support Factors - > Results Demonstrability Factors	−0.222	**0.158**	1.061	**0.147**
Results Demonstrability Factors - > Overall Satisfaction	−0.156	**0.250**	0.652	**0.259**
User Characteristics Factors - > Results Demonstrability Factors	0.516	**0.058**	1.879	**0.033**

number of items that can be used in an iterative evaluation of e-learning in traditional undergraduate business school programmes.

6.2. Implications for research

First, the study conceptualised and validated a user-satisfaction utility model for e-learning, which takes into consideration the imperatives of developing countries. Secondly, the study also adds to the sparse number of research work that considers the gender and the three social categorical generations of X, Y, and Z. Thirdly, the study also adds

Table 7
Results of multi-group analysis for females of generation Y and males of generation Y.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (FGen Y - MGen Y)	p-Value new (FGen Y vs MGen Y)	t-Value(| FGen Y vs MGen Y|)	p-Value (FGen Y vs MGen Y)
Assessment Factors - > Results Demonstrability Factors	−0.214	**0.023**	1.892	**0.030**
Course Development factors - > Results Demonstrability Factors	−0.011	**0.465**	0.088	**0.465**
Institutional Factors - > Results Demonstrability Factors	0.056	**0.183**	0.838	**0.201**
Learner Support Factors - > Results Demonstrability Factors	0.097	**0.193**	0.849	**0.198**
Results Demonstrability Factors - > Overall Satisfaction	−0.167	**0.055**	1.599	**0.055**
User Characteristics Factors - > Results Demonstrability Factors	0.093	**0.203**	0.818	**0.207**

Table 8
Results of mult-group analysis for females of generation Z and males of generation Z.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (FGen Z - MGen Z)	p-Value new (FGen Z vs MGen Z)	t-Value(| FGen Z vs MGen Z|)	p-Value (FGen Z vs MGen Z)
Assessment Factors - > Results Demonstrability Factors	−0.220	**0.106**	1.501	**0.067**
Course Development factors - > Results Demonstrability Factors	0.351	**0.011**	2.415	**0.008**
Institutional Factors - > Results Demonstrability Factors	−0.065	**0.216**	0.726	**0.234**
Learner Support Factors - > Results Demonstrability Factors	−0.122	**0.198**	0.881	**0.190**
Results Demonstrability Factors - > Overall Satisfaction	0.049	**0.344**	0.438	**0.331**
User Characteristics Factors - > Results Demonstrability Factors	0.040	**0.414**	0.235	**0.407**

Table 9
Results of multi-group analysis for males of generation X and males of generation Y.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (MGen X - MGen Y)	p-Value new (MGen X vs MGen Y)	t-Value (| MGen X vs MGen Y|)	p-Value (MGen X vs MGen Y)
Assessment Factors - > Results Demonstrability Factors	−0.005	**0.488**	0.023	**0.491**
Course Development factors - > Results Demonstrability Factors	0.254	**0.167**	1.004	**0.158**
Institutional Factors - > Results Demonstrability Factors	−0.207	**0.174**	1.662	**0.049**
Learner Support Factors - > Results Demonstrability Factors	0.050	**0.405**	0.237	**0.407**
Results Demonstrability Factors - > Overall Satisfaction	−0.047	**0.433**	0.245	**0.403**
User Characteristics Factors - > Results Demonstrability Factors	−0.219	**0.168**	0.924	**0.178**

Table 10
Results of multi-group analysis for males of generation X and males for generation Z.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (MGen X - MGen Z)	p-Value new (MGen X vs MGen Z)	t-Value(| MGen X vs MGen Z|)	p-Value (MGen X vs MGen Z)
Assessment Factors - > Results Demonstrability Factors	−0.025	**0.472**	0.079	**0.469**
Course Development factors - > Results Demonstrability Factors	0.584	**0.061**	2.111	**0.019**
Institutional Factors - > Results Demonstrability Factors	−0.227	**0.158**	1.361	**0.088**
Learner Support Factors - > Results Demonstrability Factors	−0.161	**0.247**	0.657	**0.256**
Results Demonstrability Factors - > Overall Satisfaction	0.090	**0.291**	0.421	**0.338**
User Characteristics Factors - > Results Demonstrability Factors	−0.289	**0.155**	0.879	**0.191**

Table 11
Results of multi-group analysis for males of generation Y and males of generation Z.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (MGen Y - MGen Z)	p-Value new (MGen Y vs MGen Z)	t-Value(| MGen Y vs MGen Z|)	p-Value (MGen Y vs MGen Z)
Assessment Factors - > Results Demonstrability Factors	−0.021	**0.454**	0.131	**0.448**
Course Development factors - > Results Demonstrability Factors	0.330	**0.017**	2.169	**0.016**
Institutional Factors - > Results Demonstrability Factors	−0.021	**0.398**	0.306	**0.380**
Learner Support Factors - > Results Demonstrability Factors	−0.211	**0.077**	1.489	**0.069**
Results Demonstrability Factors - > Overall Satisfaction	0.137	**0.149**	1.066	**0.144**
User Characteristics Factors - > Results Demonstrability Factors	−0.070	**0.368**	0.413	**0.340**

Table 12
Results of multi-group for females of generation X and females of generation Y.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (FGen X - FGen Y)	p-Value new (FGen X vs FGen Y)	t-Value(| FGen X vs FGen Y|)	p-Value (FGen X vs FGen Y)
Assessment Factors - > Results Demonstrability Factors	−0.085	**0.228**	0.361	**0.359**
Course Development factors - > Results Demonstrability Factors	−0.034	**0.365**	0.131	**0.448**
Institutional Factors - > Results Demonstrability Factors	0.151	**0.139**	0.992	**0.161**
Learner Support Factors - > Results Demonstrability Factors	−0.269	**0.011**	1.165	**0.123**
Results Demonstrability Factors - > Overall Satisfaction	−0.036	**0.423**	0.167	**0.434**
User Characteristics Factors - > Results Demonstrability Factors	0.204	**0.104**	0.926	**0.178**

to the literature that studies all three generations in one study. Fourth, the study responds to the call by Wagner et al. (2010; p. 879), to re-conceptualise age in computer use studies, as we conceptualise age by generations to appropriately explore cohort effects. This study uses generations to overcome the limitations of cross-sectional studies to properly determine Results due to age and cohort effects. Fifth, in studying a multi-generational cohort, the study validates a model for e-learning with students from the three social categorical generations of X, Y, and Z to respond to the literature on the need for the use of older

Table 13
Results of multi-group analysis for females of generation X and females of generation Z.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (FGen X - FGen Z)	p-Value new (FGen X vs FGen Z)	t-Value(| FGen X vs FGen Z|)	p-Value (FGen X vs FGen Z)
Assessment Factors - > Results Demonstrability Factors	−0.100	**0.165**	0.732	**0.233**
Course Development factors - > Results Demonstrability Factors	−0.067	**0.304**	0.324	**0.373**
Institutional Factors - > Results Demonstrability Factors	0.251	**0.039**	1.772	**0.039**
Learner Support Factors - > Results Demonstrability Factors	−0.261	**0.012**	1.450	**0.075**
Results Demonstrability Factors - > Overall Satisfaction	−0.116	**0.263**	0.766	**0.222**
User Characteristics Factors - > Results Demonstrability Factors	0.187	**0.124**	0.909	**0.182**

Table 14
Results of multi-group analysis for females of generation Y and females of generation Z.

PLS-MGA PATH COEFFICIENTS			PARAMETRIC TEST	
PATH	Path Coefficients-diff (FGen Y - FGen Z)	p-Value new (FGen Y vs FGen Z)	t-Value(| FGen Y vs FGen Z|)	p-Value (FGen Y vs FGen Z)
Assessment Factors - > Results Demonstrability Factors	−0.015	**0.439**	0.130	**0.448**
Course Development factors - > Results Demonstrability Factors	−0.033	**0.396**	0.256	**0.399**
Institutional Factors - > Results Demonstrability Factors	0.100	**0.086**	1.291	**0.099**
Learner Support Factors - > Results Demonstrability Factors	0.008	**0.470**	0.067	**0.473**
Results Demonstrability Factors - > Overall Satisfaction	−0.079	**0.196**	0.778	**0.219**
User Characteristics Factors - > Results Demonstrability Factors	−0.017	**0.436**	0.146	**0.442**

adults to develop and validated constructs for research on computer use.

6.3. Limitations and boundary conditions

The main limitation of the study is that the responses were all from one tertiary institution in a developing country. The validity and reliability of the model and the generalisability of the Results would be improved if respondents will be extended to other universities and tertiary institutions. Also, responses from different stakeholders in undergraduate e-learning programme implementation could add more to the understanding of the nuances of the utility of e-learning.

7. Conclusion

From the study on the utility of e-learning system in a multi-generational undergraduate cohort, male students may generally be influenced by the Assessment and User Characteristics factors which generally agrees with the notion of male self-efficacy, whereas females emphasize Course Development, Learner Support and User Characteristics which agrees with the notion that they place greater value on the pastoral aspect of tutoring and interaction styles, needing more support. This does not feed into the stereotypical view that females are disadvantaged by technology. However, it presents a view that the gender gap may not be narrowing at the same pace globally. Thus, there are nuances in the differences in learning using e-learning by gender and generations X, Y, and Z.

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Declaration of competing interest

No interest

Appendix A. Instrument

MEASURE	ASPECT	CODE	RELATED STUDIES
1. Your Gender?	Female	X_F	Ramírez-Correa et al. (2015)
	Male	X_M	
2. Your Age Group?	16–23yrs (Generation Z)	Gen_Z	Giunta, 2017; Edelman/StrategyOne, 2010; Wendover, 2002).
	24–39yrs (Generation Y)	Gen_Y	
	40–54yrs (Generation Z)	Gen_X	
	Above 55yrs (Baby Boomers)	Bbom	
3. Course of Study?	Procurement	GBSPLS	Little (2005)
	Project Management	GBSPM	
	Hospitality	GBSTH	
	Accounting	GBSAC	
	Administration	GBSBA	
	Finance	GBSFI	
	Human Resource	GBSHR	
	Marketing	GBSMK	
4. Your Programme Time?	Day	Day	Little (2005)
	Evening	Even	
5. Your Student Status?	Full-Time Student	F_T	Little (2005)
	Student Worker	St_W	
18a_1 Indicate the usefulness of the following to the practitioners' forum course you had this semester?	**Course Development**	**LE_U_CDV_T**	QM Higher Education Rubrics (2014), Wright (2014), Makokha and Mutisya (2016), Tarus (2015) **In:** Hadullo et al. (2017)
	[Course Outline]	LE_U_CDV_1	
	[List of reading materials]	LE_U_CDV_2	
	[List of forum sessions]	LE_U_CDV_3	
	[Current and accurate content in videos/Lectures]	LE_U_CDV_4	
	[Easy to use interface (website)]	LE_U_CDV_5	
18a._2 Indicate the usefulness of the following to the practitioners' forum course you had this semester?	**Learner Support**	**LE_U_LNS_T**	Baloyi (2014), Muuro et al., (2014), Baloyi (2013), Queiros and de Villiers (2016) **In:** Hadullo et al. (2017)
	[Group support work]	LE_U_LNS_1	
	[Feedbacks from Emails, chats, and forum]	LE_U_LNS_2	
	[Support from IT]	LE_U_LNS_3	
18 b._1 Indicate the usefulness of the following to the practitioners' forum course you had this semester?	**Institutional Factors**	**LE_U_INF_T**	Kashorda and Waema (2014), Ssekakubo et al., (2011), Tarus et al., (2015), Matipa and Brown (2015) **In:** Hadullo et al. (2017)
	[Availability of Internet]	LE_U_INF_1	
	[Availability of computers]	LE_U_INF_2	
	[Maintenance of infrastructure (use without any problems)]	LE_U_INF_3	
18 b._2 Indicate the usefulness of the following to the practitioners' forum course you had this semester?	**Assessment**	**LE_U_ASS_T**	Chawinga and Zozie (2016), Arinto (2016), Makokha and Mutisya (2016), Wright (2014) **In:** Hadullo et al. (2017)
	[Assignment due dates]	LE_U_ASS_1	
	[None or minimal issue with grades]	LE_U_ASS_2	
	[Feedback on Assignments]	LE_U_ASS_3	
	[Feedback on Examination]	LE_U_ASS_4	
18c._1 Indicate the usefulness of the following to the practitioners' forum course you had this semester?	**User Characteristics**	**LE_U_UCS_T**	Azawei et al., (2016), Makokha and Mutisya (2016), Mayoka and Kyeyune (2012), Kisanga (2016) **In:** Hadullo et al. (2017)
	[Your belief in your ability to achieve goals (Self-efficacy)]	LE_U_UCS_1	
	[Your training on the internet]	LE_U_UCS_2	
	[Your personal motivation]	LE_U_UCS_3	
	[Incentives to take the sessions at your own time.]	LE_U_UCS_4	
	[Your experience with the course content]	LE_U_UCS_5	
18c_ 2 Indicate the usefulness of the following to the practitioners' forum course you had this semester?	**Results Demonstrability**	**LE_U_OVP_T**	Venkatesh and Bala (2008)
	[Information quality of the videos/ Lectures]	LE_U_OVP_1	Hadullo et al. (2017)
	[Service quality in the delivery of the course]	LE_U_OVP_2	
	[Better opportunity to getting better grades]	LE_U_OVP_3	
	[Cost effectiveness of the new delivery system]	LE_U_OVP_4	
19. What is your overall satisfaction level of the practitioner's forum course?	**Rating of Total Satisfaction (Overall Satisfaction)**	**Satisfn_OV_T**	Cidral et al. (2018)

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