A Review of UTAUT and Extended Model as a Conceptual Framework in Education Research

Michelle Lock Sow Yee, Mai Shihah Abdullah
Department of Biology, Faculty of Science and Mathematics, Sultan Idris Education University, 35900 Tanjong Malim, Perak, Malaysia

**Corresponding author: michelledajie@gmail.com*

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ABSTRACT

The main focus of the paper is to probe and to profile the trend of progression of the unified Theory of Acceptance and Use of Technology (UTAUT) studies, UTAUT 2 with the expanded models on educational field to gain the scientific body of knowledge. Eventually, help to bridge the research gap on the science teachers' acceptance on Google Classroom amid Covid-19 global pandemic. Out of the 39 studies gleaned, 14 were on teachers' acceptance of ICTs, 2 were studies on teachers' acceptance of Google Classroom, and 23 studies were on students' acceptance of using the ICT. This paper tabulates the works of literature into several themes in chronological order where the UTAUT, UTAUT 2 and their extensions were applied. The country, researcher, research scope, selected group, methodology, models used, constructs, analysis of data methods and outcomes were reviewed. Up to date, studies on science teachers' acceptance on Google Classroom amid Covid-19 global pandemic is yet to be conducted. Acquisition of sound scientific knowledge from this literature review is to justify the feasibility to study the science teachers' acceptance of Google Classroom in teaching Science amid Covid-19 pandemic by using an extended UTAUT 2 model with a right combination of variables: Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, habit, Price Value, Hedonic Motivation and Perceived Compatibility as independent variables, behaviour intention and the user behaviour as dependent variables and moderator variables: age, gender, experiences and educational level. PLS-SEM is identified as the most common and current administered research tool for data analysis.

Keywords: Google Classroom, Covid-19 pandemic, Science Teachers, Education

INTRODUCTION

The emergence of the Novel Corona Virus is causing an extraordinary ripple effect on the economic, health and education sectors throughout the world. In term of social costs, the global Covid-19 pandemic had crippled the education of 1.6 billion learners, that is, every 9 out of 10 students affected where schools are shutting down and quarantine methods are still being enforced since March 2020. Similarly, the Malaysian Education System is also facing the predicament to confront the issue promptly to ensure continual opportunity to help students learn, cultivate compassion and resilience. The Global education system has reinforced plan for continuity of teaching and learning, which include online/E-learning strategies such as uploading teaching and learning materials, assigning exercises for home study and assessments. With that, adequate literature on issues and challenges related to ICTs/Google Classroom in the Malaysian education system has identified issues such as limited accessibility, network connection, novice and lack of support system among students and teachers (Ghavifekr et al., 2020). Therefore, the researchers review extensive technology acceptance studies which can provide enrichment of scientific knowledge to help bridge the research gap on the Science teachers accepting the E-learning platform (Google Classroom) amid Covid-19 pandemic.

Technology acceptance studies had been conducted extensively by researchers worldwide for more than two decades already. The studies conducted were applying theories and models in different contexts to achieve identified objectives with varying results too. The eight theories and models in UTAUT and UTAUT 2 models are by Fishbein and Ajzen (1975), Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM) (Davis, 1989), Motivational Model (MM) (Davis, Bagozzi, and Warshaw, 1992), Model of PC Utilization (MPCU) (Thompson, Higgins, and Howell, 1991), Theory of Planned Behaviour (TPB) (Ajzen, 1991), Combined TAM and TPB (C-TAM-TPB) (Taylor and Todd, 1995), Social Cognitive Theory (SCT) (Bandura, 1986) and Innovation Diffusion Theory (IDT) (Rogers, 1995).

Venkatesh et al., 2003 developed a model named, the Unified Theory of Acceptance and Use of Technology (UTAUT) in "User acceptance of information technology: Toward a unified view" as in Figure 1. This model focuses on explaining users' intentions to use an information system and following usage behaviour. There are four main constructs integrated into this theory, namely: performance expectancy, effort expectancy, social influence and facilitating conditions. The first three constructs are a significant determinant of users' purpose and behaviour, while facilitating conditions is a significant implication of utilization behaviour. The moderators used to influence the key independent variables on behaviour intention and uses of information technology are gender, age, experience, and voluntariness.

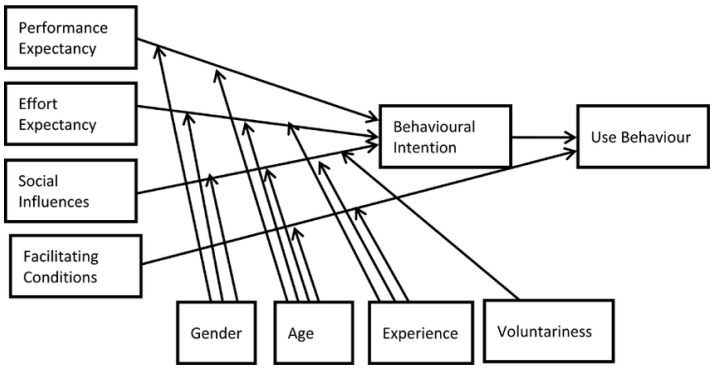

Figure 1: The Unification of Theory of Acceptance of the Use of Technology (UTAUT) model by Venkatesh et al. (2003)

Despite the great popularity of UTAUT, there is the emergence of UTAUT 2 incorporating three additional variables into UTAUT namely: habits, hedonic motivation, price value and users' characteristics: age, gender and experiences as moderator variables to influence their effects between the independent variables and the behaviour intention and utilization of ICTs as in Figure 2 (Venkatesh et al., 2012). According to Chang et al. (2019) performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit influence the behaviour intention, while behaviour intention, facilitating condition, and habit influence the user behaviour of adopting a technology. The extension proposed model of UTAUT 2 yield improvement in the variance explained in behavioural intention (56% to 74%) and use of technology (40% to 52%).

Performance Expectancy (PE) is defined as the level in which utilizing technology can give advantages to end-users in carrying out specific pursuit. Effort Expectancy (EE) is the level of comfort/effort related to the customers' utilization of technology. Meanwhile. Social Influence (SI) is the level to which end users viewed significant others (e.g., family and friends) think that they should utilize a specific technology. Moreover, Facilitating Conditions (FC) is the level of end-user's discernment of the availability of assets and help to carry out a task (Venkatesh et al., 2003). Meanwhile, Hedonic Motivation (HM) is the degree of end-users delight or amusement obtained from utilizing a technology. Price Value (PV) is the end-user's cognitive agreement between the perceived

gains of the Applications and the financial value of utilizing them. Habit (H) is the degree to which consumers tend to carry out conduct spontaneously due to learning (Venkatesh et al., 2012).

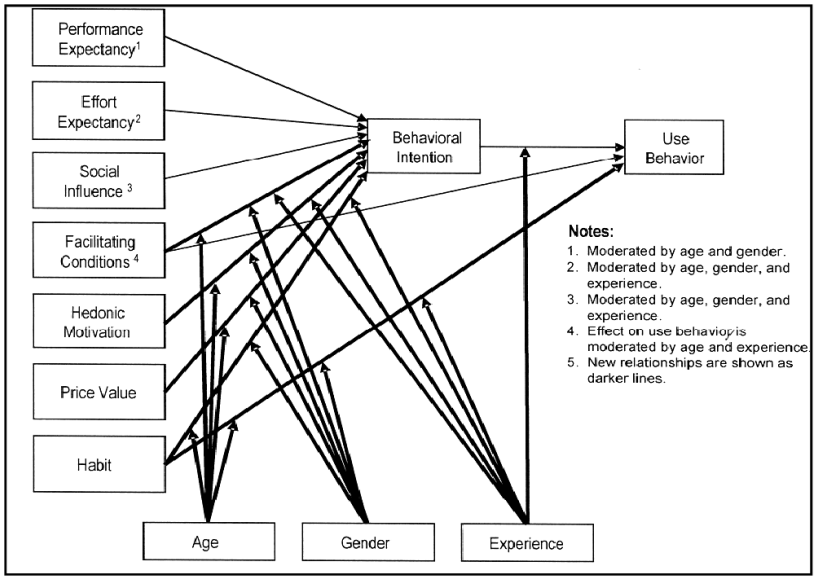

Figure 2: UTAUT 2 model showing the relationships within the conceptual framework of the study (Venkatesh et al., 2012)

METHODOLOGY

The researchers' selection to review the UTAUT, extended UTAUT, UTAUT 2 and extended UTAUT models for this paper is validated by their global and collaborative approaches, integrating a diversified explanatory variable within the theoretical models which were developed to describe technology acknowledgement and employment in the field of education. Hence, the researchers reviewed a detailed list of 39 pieces of research carried out under various contexts and respondents from the year 2007 to 2020 (Table 1). For each study, information of the researchers, country, research area, focused group, the methodology used, the model of the study with the identified constructs, method of analysis and the outcomes were examined. Then they were arranged chronologically and thematically into three clusters namely the teachers' acceptance of ICTs (items 1 to 14), teachers' acceptance of Google Classroom (items 15 to 16), and students' acceptance on the use of ICTs (items 17 to 39).

Table 1: Researches utilizing UTAUT, UTAUT 2 and their Expansion in the field of Education.

Teachers' Acceptance of ICTs							
Item	**Researchers**	**Country**	**Research**	**Focus group/ methodology**	**Models with specific constructs**	**Method of analysing data**	**Findings**
1	Tseng, Lin, Wong, and Liu (2019)	Taiwan	Teachers' acceptance of online courses.	166 University teachers. Random sampling method Deductive method Quantitative 5-point Likert scale items	UTAUT 2 PE, EE, SI, FC, HM, PV, H, BI and UB	SEM-PLS using Smart-PLS 3.0	● PE, EE, FC and PV had a direct influence on BI. ● UB was influenced by BI.
2	Gunasinghe, Ab Hamid, Khatibi, and Ferdono Azam (2019)	Sri Lanka	Academician acquiring E-learning.	441 academicians in Sri Lankan Higher Education Deductive method Random Sampling Quantitative methodology 7-point Likert Scale items	UTAUT-3 UTAUT 2 PE, EE, SI, FC, HM, HT, BI, UB and Personal Innovativeness (PI)	PLS-SEM using Smart-PLS 3.0	● PE, EE, FC and HM had a direct influence on BI.
3	Omar, Ismail, and Kasim (2019)	Malaysia	Teachers' acceptance of Mobile Technology (TBIMT) through the UTAUT 2 model.	422 Secondary School teachers in Kedah. Random Sampling Deductive Cross-sectional quantitative survey. 5-point Likert scale items	UTAUT 2 PE, EE, SI, FC, HM, HT, BI and UB	PLS-SEM using Smart-PLS 3.0	● EE, HM and H influenced teachers' BI of using Mobile Technology.
4	Raman and Rathakrishan (2018)	Malaysia	Acceptance of Frog VLE among secondary school teachers.	281 Secondary School teacher Deductive method, Cross-sectional, Random Sampling, Quantitative. Likert scale	UTAUT PE, EE, SI, FC, BI and UB	IBM SPSS Smart-PLS 3.0	● PE, SI and FC influenced BI.
5	Radovan and Kristl (2017)	Turkey	Teachers' acceptance of Virtual Classroom.	326 teachers from University of Ljubljana Random Sampling Deductive method Cross-sectional Quantitative 5-point Likert scale items	UTAUT PE, EE, SI, FC, BI and UB	SPSS: Descriptive analysis to measure demographic data of respondents through frequency and percentage. SEM through IBM SPSS AMOS	● PE and SI influenced BI. ● BI influenced UB of Virtual Classroom among teachers.
6	Alharbi, Alotebi, Masmali, and Alreshidi (2017)	Sri Lanka	Instructors' acceptance of Mobile Learning.	80 instructors from Universities of Sri Lanka. Convenience Sampling Cross-sectional quantitative survey.	UTAUT PE, EE, SI, FC, BI, and AU	SPSS: Descriptive statistical analysis to analyse the demographic profile of respondents	● PE, EE, SI and FC influenced Mobile Learning.

				5-points Likert Scale items		through frequency and percentage. Inferential statistic: Multiple regression	
7	Oudhuis (2017)	Netherlands	Teachers' acceptance of technology.	100 Teachers Convenience Sampling Deductive method Cross-sectional Quantitative 5-point Likert scale items	UTAUT 2 constructs + PE, EE, SI, FC, HM, H, BI, and UB The proximity of Support (POS) + age, gender as a moderator.	SPSS: Descriptive Statistical Analysis to analyse the teachers' profiles through frequency and percentage. Inferential Statistic: Pearson's Correlations Multiple Hierarchical Linear Regression	● PE, HM and H had a direct effect on BI. ● BI had a direct effect on UB of teachers. ● Males have a moderating effect on the relationship between H and BI. ● There were also results of Perceived Ease of Use (PEOU) of educational Technology being not easy with low usage.
8	Ghavifekr, Kumjappan, Ramasamy, and Anthony (2016)	Malaysia	To explore issues and challenges of ICT usage among secondary school teachers.	100 secondary school teachers Quantitative Simple random sampling method Modified survey questionnaire	Unclear, not based on the model	SPSS Version 22 Descriptive statistical analysis to analyse the teachers' demographic data and survey responses through frequency, percentage, mean and standard deviation. Inferential statistic Independent t-test to compare between the female and male teachers.	● There was a lack of assistance technically, limited time and training. ● Male teachers used ICT to more than female teachers.
9	Saleem, Al-Saqri, and Ahmad (2016)	Saudi Arabia	University staff acceptance of Moodle.	9 faculty staff with interview method. Inductive method Interpretive description methodology	UTAUT constructs with moderators. PE, EE, SI, FC, BI and UB.	Interpretive description methodology to describe facts and characteristics of the staff. The coded data from the interview is displayed in tables quantitatively as frequencies.	● PE, EE, SI, FC had a significant and direct effect on BI. ● All moderators have moderating effects on four constructs.
10	Alabi (2016)	South-West	Academicians	267 academicians from	Combination of UTAUT	SPSS version 21	● FC and EE

		Nigeria, Africa	acceptance of electronic media.	selected Universities in Nigeria. Deductive and Inductive Methods. Quantitative and Qualitative approaches. Random Sampling. 5- point Likert scales items. Interview.	constructs and Diffusion of Innovation constructs: Perceived Compatibility (PC) Observability Trialability Media literacy skills PE, EE, SI, FC, BI, and AU.	Descriptive statistic to analyse the frequency, percentage, mean, standard deviation of respondents' demographic profiles and survey responses. Inferential statistic: ANOVA and Multiple Regression Analysis. NVivo 10 to code and analysed the thematic content of the qualitative data into diagrams and quotes.	● influenced BI and AU. ● E-learning platform not extensively utilized by academicians.
11	Raman, Don, Khalid, Hussin, Omar, and Ghani (2014)	Malaysia	School teachers' utilization of Smart Board.	68 Primary School teachers Random Sampling Deductive method Cross-sectional Quantitative Likert Scale items.	UTAUT PE, EE, SI, FC, BI, and AU.	SPSS: Descriptive analysis to analyse the demographic data of the teachers through frequency and percentage. PLS-SEM using Smart -PLS 3.0	● PE and FC influenced BI among the teachers.
12	Oye, Jahad, and Rahim (2012)	Nigeria, Africa	Academicians acceptance of ICT.	100 University staff Random Sampling Deductive approach Cross-sectional Quantitative	UTAUT, + Anxiety + SE + ATUT	Regression analysis	● PE, EE and attitude influenced BI.
13	Pynoo, Devolde, Tondeur, Braak, Duyck, and Duyck (2011)	Belgium	Predictions of teachers' electronic learning acceptance.	72 teachers from secondary schools. Random Sampling Deductive method Quantitative cross-sectional Study.	UTAUT PE, EE, SI, FC, BI, and AU.	Descriptive statistics: to analyse the teachers' demographic data through frequency and percentage. Least-squares regression. Path analysis	● PE and SI had a significant influence on BI.
14	Birch & Irvine (2009)	Canada	ICTs usage among teachers.	82 Pre-Service teachers. Convenience Sampling Deductive method Cross-sectional Quantitative	UTAUT constructs with moderators. PE, EE, SI, FC, BI, and AU.	SPSS Descriptive analysis was done to analyse the demographic data	● EE has the key predictor influence on BI. ● Moderator: ● As age increases, BI

				7-point Likert Scale		of respondents through frequency and percentage. Multiple regression to analyse the correlations between independent and dependent variables.	decreases.
● **Teachers' Acceptance of Google Classroom**							
	Researchers	**Country**	**Research area**	**Focus group/ methodology**	**Model/ constructs**	**Method of analysis**	● **Outcomes**
15	Amadin, Obienu, and Osaseri (2018)	Nigeria, Africa	University lecturers' acceptance of Google Apps.	200 Faculty staff members Random Sampling Deductive method Cross-sectional Quantitative 5-point Likert Scale	UTAUT 2 constructs + Technology Awareness (TA) Attitude (A) PE, EE, SI, FC, HM, HT, BI, and UB.	SPSS Descriptive analysis to analyse the frequency and percentage of the demographic data. Mean To measure the mean rating of the valid constructs. Correlation Analysis SEM AMOS	● FC influenced BI ● (Most important construct) ● PE, EE, SI, HM, TA, A also influence BI. ● H does not influence BI.
16	Nayab and Kaukab (2018)	Pakistan	Effectiveness of Google Classroom.	12 teachers. Inductive method Qualitative research design Semi-structured Interview	Semi structure interview	Data analysis of coding and categorizing through NVivo Version 10. NVivo 10 to code and analysed the thematic content of the qualitative data into diagrams and quotes.	● It is good for storing and handling faculty document and fundamental teaching and learning process. ● It lacks users' friendly interface.
● **Student's Acceptance of ICTs**							
	Researchers	**Country**	**Research area**	**Focus group/ methodology**	**Models/ constructs**	**Method of analysis**	● **Outcomes**

17	Rahmaningtys ,Mulyono, Widhiastuti, Fidhyallah, and Faslah (2020)	Indonesia	Exploring usage with Computer-Supported Strategy.	201 University students. Random Sampling Deductive method Quantitative 5- points Likert Scale	UTAUT constructs + Personal Expectancy PE, EE, SI, FC, BI, and AU.	PLS-SEM using WARP-PLS 6.0	● PE, EE and SI influenced BI. ● Personal Expectancy, SI, FC and BI influence UB.
18	Nor Zanira Abd Manan and Hafizul Fahri Hanafi (2019)	Malaysia	Acquiring teaching and learning via Google Classroom.	40 form four students Deductive method Cross-sectional quantitative approach Convenience Sampling 5-point Likert Scale items	UTAUT PE, EE, SI, FC, BI, and AU.	SPSS for descriptive data: To analyse the demographic data through frequency and percentage. To analyse the attitude towards the use of Google Classroom using frequency, percentage, mean and standard deviation.	● There was readiness in the integration of Google Classroom to ensure productive and significant schooling.
19	Dajani and Hegleh (2019)	Jordan, Saudi Arabia	University students' behaviour intention to use animation	370 higher education University students Random Sampling Deductive method Quantitative 5-point Likert scale	UTAUT 2 constructs + Learning Value (LV) Students' Innovativeness (SIN) PE, EE, SI, FC, HM, HM HT, BI, and UB.	PLS-SEM via Smart-PLS	● HM, PE, SI, Learning Value and EE influenced BI among students.
20	Alshehri, Rutter, and Smith (2019)	Saudi Arabia	To examine the students' perceptions regarding the utilisation of the Blackboard System.	171 students from Saudi Arabian Universities. Random Sampling Deductive method Cross-sectional Quantitative Survey. 5-point Likert Scale	Modified UTAUT constructs + Technical support (TS) PE, EE, SI, FC BI, and AU.	SPSS 23.0 Descriptive analysis to measure the demographic data of the respondents through frequency and percentage. PLS-SEM using Smart-PLS 3.0	● FC and technical availability had greatly influenced on BI. ● PE and SI also influenced BI. ● FC, TS and BI influenced UB.
21	Pantazi (2019)	Netherlands	To investigate behavioural, organizational and students' acquiring of My Speech Trainer application (MyST),	84 University students. Random Sampling Deductive method Cross-sectional Quantitative. 7-point Likert scale items.	UTAUT 2 constructs + Attitude (AT)	SPSS: Descriptive Statistics to measure demographic data of respondents through frequency and percentage. PLS-SEM using SmartPLS 3.0	● SI is the prime influenced students' BI. ● Organizational factor and faculty did not moderate SI on BI. ● Organizational factor and faculty moderated attitude

							to BI.
22	Olasina (2019)	Saudi Arabia	To explore students' receptiveness to E-learning.	204 students from KwaZulu-Natal University. Random Sampling Deductive method Cross-sectional Quantitative Survey.	Modified UTAUT constructs:SI Attitude (AT) Perceived Usefulness (PU) Stress (ST) Satisfaction (SAT) Fatigue (FT)	PLS-SEM using Smart-PLS 3.0	● SI, AT, PU, ST, SAT and FT are critical factors to influence BI.
23	Almaiah and Alyoussef (2019)	Saudi Arabia	To investigate the E-learning at King Faisal University.	507 undergraduates and Postgraduates students. Random Sampling Deductive Cross-sectional Quantitative.	Extended UTAUT PE, EE, SI, FC, BI, and AU. Course Design Course Content Support Course Assessment Instructors' Characteristics.	Descriptive statistical analysis to analyse the students' demographic data via frequency and percentage. SEM AMOS	● The real use of E-learning was greatly determined by Course design, Course Content Support, Course Assessment and Instructors' Characteristics. ● PE, EE and FC influenced BI.
24	Mahande and Malago (2019)	Indonesia	Probing E-learning readiness among Postgraduate students.	170 Postgraduate students in University. Deductive method Cross-sectional Quantitative. 4-point Likert Scale.	UTAUT PE, EE, SI, FC, BI, and AU.	SPSS: Descriptive analysis to measure the E-learning variables mean and standard deviation. Requirement Analysis Test has the inclusion of the normality test	● SI, FC, EE and PE had a powerful impact on students' readiness.
25	Thongsri, Shenb, and Bao (2019)	Thailand	To investigate factors that affect learners via Class Start Application.	307 University students. Random Sampling Deductive method Cross-sectional quantitative survey.	UTAUT and Delone and McLean Information Success (IS) models:	PLS-SEM using Smart-PLS 2.0	● The intent to use online learning was greatly impacted by PE, SI, Information Quality and System Quality.

26	Ghazal, Al-Samarraie, and Aldowah (2018)	Saudi Arabia	To explore the receptiveness of acquiring online information in a blended learning setting.	174 University students. Random Sampling Cross-sectional Quantitative with online questionnaires.	Integration of the Extended Technology Acceptance Model with Information System Success Model.	Descriptive Statistics to measure the demographic characteristics: gender, age, number of courses and the year of study of the respondents by using frequency and percentage. PLS-SEM using Smart-PLS 3.0	● The prominent impact on students' receptiveness lies on the tutors' attributes, followed by the quality of the subject material and the design.
27	Aditya and Permadi (2018)	Indonesia	To investigate the readiness to utilize online Application.	105 undergraduates at Telkom University Convenience Sampling Quantitative study with cross-sectional descriptive with 5-point Likert Scale questionnaires.	UTAUT PE, EE, SI, FC, BI, and AU.	SPSS descriptive: Descriptive analysis of the UTAUT and the three-course variables. Two-way ANOVA to test the difference between the three courses and the constructs of UTAUT.	● There were no significant differences among the average count of the three courses. ● PE, EE, SI and FC had a direct effect on the acceptance among students. ● The readiness to use Online Application among the students was because it is pragmatic and applicable.
28	Halili and Sulaiman (2017)	Malaysia	To determine undergraduates' approval of E-learning.	450 undergraduates Deductive method Cross-sectional Quantitative Survey with Purposive Sampling Technique.	UTAUT PE, EE, SI, FC, BI, and AU.	SPSS 21 Descriptive statistical analysis. Inferential statistic: Spearman Correlation Analysis	● The determining factors that had a remarkable influence on intention to utilize E-learning were identified as FC, SI, PE and EE.
29	Jakkaew and Hemrungrote (2017)	Thailand	To survey constructs that determine students' receptiveness of Google Classroom.	3315 university students Random Sampling Quantitative approach 5-point Likert-scale items.	UTAUT2 PE, EE, SI, FC, HM, HT, BI, and UB.	PLS-SEM by using SmartPLS 3.0	● The students' BI was impacted by PE, EE and SI.

30	Ain, Kaur, and Waheed (2015)	Malaysia	Students' acknowledgement of E-learning.	328 University Students Random Sampling Cross-sectional Quantitative Survey 5-point Likert scales items.	Extended UTAUT 2 + Learning Value (LV) PE, EE, Si, FC, HM, HT, BI, and UB	SEM using IBM SPSS AMOS Confirmatory Factor Analysis-measurement model fit	● PE, SI and LV, influenced BI. ● FC and BI influenced UB.
31	Attuquayefio (2014)	Ghana, Africa	Analysing students' ICT adoption.	345 University students from Social Studies and Business Administration. Quantitative 7-points Likert scale	UTAUT PE, EE, Si, FC, BI, and AU	SPSS 16 SEM-AMOS using IBM SPSS AMOS 20.0 (Analysis of Moments Structures)	● EE and FC influenced BI.
32	Wong, Russo, and McDowall (2013)	Malaysia	To survey constructs that facilitate the adoption of interactive whiteboard.	112 early childhood student teachers. Random Sampling Deductive method Quantitative 5-point Likert Scales items	UTAUT PE, EE, Si, FC, BI, and AU.	Reliability and Validity SEM	● BI notably impacted by PE and EE.
33	Chang (2013)	Taiwan	To probe into students' determinant factors regarding usage of mobile Applications.	363 undergraduates and graduates' students in university libraries. Random Sampling Quantitative Cross-Sectional 5-point Likert Scales items.	UTAUT and TTF PE, EE, Si, FC, BI, and AU.	Reliability and validity PLS-SEM	● The BI of students were greatly determined by PE, EE. SI, and FC.
34	Oye, Iahad, And Rahim, (2012)	Nigeria	To probe issues on technology acceptance in the university.	100 University students Random Sampling Quantitative Cross-Sectional 5-point Likert Scale items.	Modified UTAUT + Anxiety+Self-efficacy (SE) +Attitude (ATUT)	Regression analysis	● The BI of the students was markedly impacted by PE and attitude followed by anxiety in utilizing ICTs.
35	Nassuora (2012)	Saudi Arabia	To explore predictors of Mobile learning.	80 University students Random Sampling Quantitative Cross-Sectional 5-point Likert Scales items.	UTAUT PE, EE, Si, FC, BI, and AU.	Exploratory Factor Analysis and Principal Components Analysis. Bivariate correlation.	● The dominant predictors of attitude were SI and FC. ● BI was markedly impacted by PE and EE.

36	Latif, Jamaludin, and Mahmud (2011)	Malaysia	To validate determinants influencing the utilization of digital technology in the library.	534 University students Convenience Sampling Quantitative Cross-Sectional 5-point Likert Scale items.	UTAUT+ CFA Information Quality (IQ) and System Quality (SQ) PE, EE, SI, FC, BI, and AU.	Cronbach's alpha KMO BTS Multiple regression	● BI to use digital technology was notably influenced by PE, EE and IQ.
37	Maldonado, Khan, Moon, and Rho (2011)	South America	To explore factors in the acceptance of online learning.	47 University students of Peru Random Sampling Quantitative Cross-Sectional 5-point Likert Scale items.	Modified UTAUT+ E-learning motivation PE, EE, SI, FC, BI, and AU.	PLS-SEM using SmartPLS 3.0	● E-Learning Motivation and SI markedly influenced BI.
38	Giannakos and Vlamos (2011)	Greece	Exploring determinants regarding students' adoption of Webcast.	176 students. Random Sampling Quantitative Cross-Sectional 5-point Likert Scale items.	UTAUT PE, EE, SI, FC, BI, and AU.	Factor Analysis: Varimax Rotation SPSS	● The BI to use Webcast was greatly determined by longer duration of usage.
39	Marchewka, Liu, and Kostiwa (2007)	United States	Analyzing acceptance of software Applications.	132 University students Random Sampling Quantitative Cross-Sectional 5-point Likert Scale items.	UTAUT PE, EE, SI, FC, BI, and AU.	-	● EE and SI influence BI

Abbreviations of the constructs of UTAUT, UTAUT2: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Price Value (PV), Habit (H), Behavior Intention (BI), User Behaviour (UB)

RESULTS AND DISCUSSION

The result explains 6 categories namely country, research area, focused group, a model of the study with the identified constructs, method of analysis and the outcomes except for the methodologies. The chronological profile of the 39 studies based on the three clusters as in Figure 3 showed the incremental trend and actively conducted from 2017 to date. From the 14 studies on teachers' acceptance on ICTs, 4(28.57%) studies were from Malaysia, 2(14.29%) studies from Sri Lanka and Africa, and 1(7.14%) from Taiwan, Canada, Turkey, Saudi Arabia, Belgium, and the Netherlands respectively. Meanwhile, for the teachers' acceptance of Google Classroom, there were two studies from Africa and Pakistan. Besides, from the 23 studies on students' acceptance of ICTs, 6(26.09%) from Saudi Arabia, 5(21.47%) from Malaysia, 3(13.04%) from Indonesia, 2(8.70%) from Thailand, and 1(4.35%) respectively from Africa, the Netherlands, the United States, South America, Nigeria, and Taiwan. This demonstrates that technology acceptance studies among academicians and students were extensively carried out worldwide.

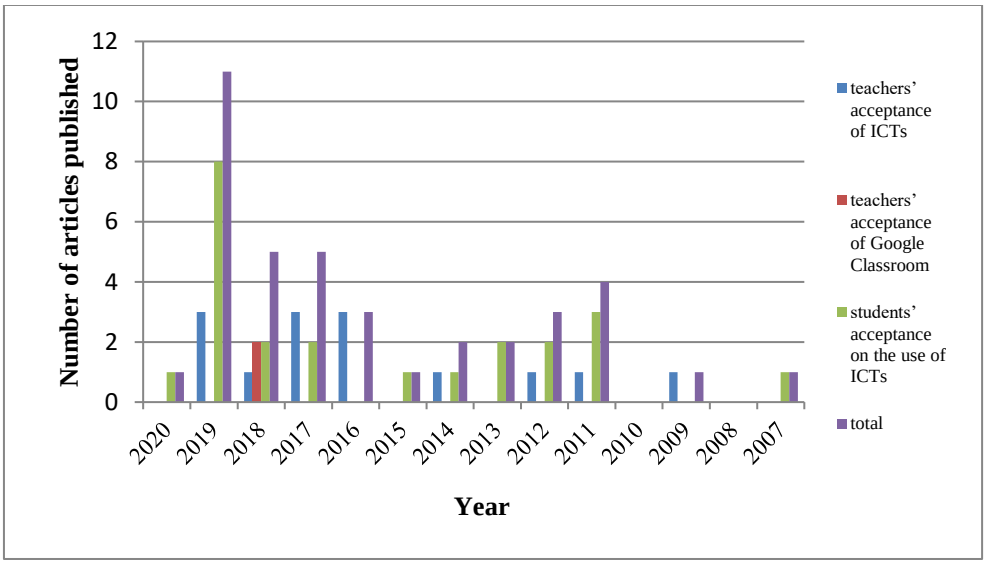

Figure 3: Chronological profile of the UTAUT studies in Education (2007-2020)

The analysis over the past 13 years demonstrated UTAUT is favoured and has progressively administered to examine one's acceptance. Studies on ICTs acceptance among academics was highest among the lecturers 6(42.86%), followed by secondary school teachers 5(35.71%), primary school teachers 2(14.28%), and only 1(7.15%) among pre-service teachers. Model UTAUT was introduced earlier and utilised by 30(76.92%), followed by 5(12.82%) Model UTAUT2, and 4(10.25%) studies used either extended or modified UTAUT models with integration of new variables and the distribution based on the three clusters are shown in Figure 4.

Besides the original variables used in UTAUT and UTAUT 2, extended models with integration of new variables were also administered. For instance, Gunasinghe et al., 2019 study on the appropriacy of the extended model to understand academicians' acquiring of Online learning in Sri Lankan Universities had Personal Innovativeness (PI) as the additional variable with no influence on the behaviour intention of the academicians. Meanwhile, Alabi (2016) used a combination of UTAUT and Diffusion of Innovation (Dol) model with new variables of Perceived Compatibility, Observability, Trialability and media literacy skills. It was found that only the skills of media literacy impacted behavioural intention and actual use of E-learning among 267 academicians. However, Oudhuis (2017) additional variable, Proximity of Support (POS) did not influence the behaviour intention of the teachers in the use of educational technology.

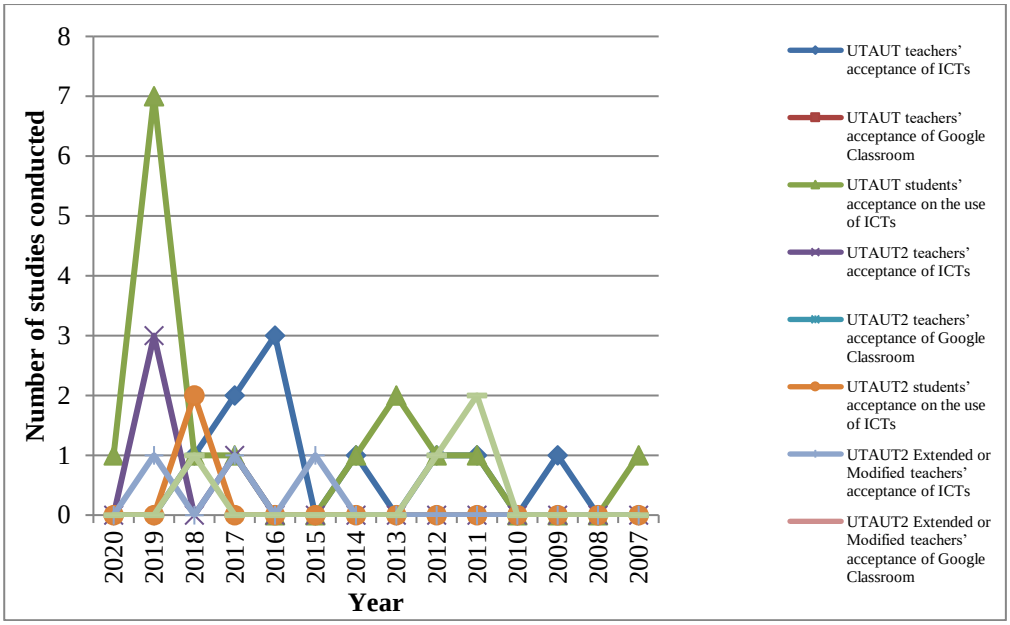

Figure 4: Utilization of UTAUT, UTAUT2 and extended or modified models as a conceptual framework in Education studies (2007-2020)

Data collected in the acceptance studies via UTAUT models were analysed via several tools, with 19(48.72%) commonly used SPSS-Inferential statistics i.e., multiple regression analysis, *t*-test or ANOVA. 5(12.83%) used the most recent tool PLS-SEM while 19(48.72%) used SEM, SEM-AMOS., PCA Varimax rotation or NVivo. The distribution of statistical analysis tools for the three clusters is shown in Figure 5.

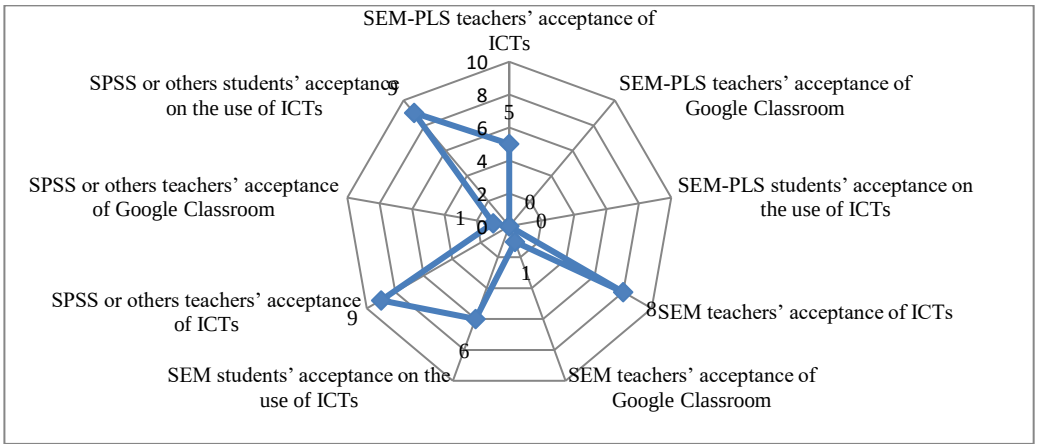

Figure 5: Statistical analysis tools utilised in UTAUT Models

Based on the 39 studies, the findings on the teachers' acceptance of the ICT were not consistent in the perspective of the utilization of UTAUT models due to the varying constructs in UTAUT and UTAUT 2 that may impact behaviour intention of teachers in utilization ICTs. Performance expectancy is the most popular construct among the teachers whereby 9(64.29%) studies revealed that performance expectancy influenced the behaviour intention of the educators in accepting ICTs in teaching and learning process. This is followed by effort expectancy drawing the second-highest number, 8 (57.14%) studies, facilitating conditions being 6(42.86%), habit is 3(21.43%), hedonic motivation is 3(21.43%) and price value is 1(7.14%). As for price value, many studies do not include this variable. According to Ain, Kaur and Waheed (2015), in an institution of education, students do

not pay for using the Learning Management System, hence price value is presumed to be immaterial and this variable is often aborted.

Moderator variables were used to control the correlation between independent variables and the behaviour intention of the teacher's acceptance of ICTs with varying results too. The study conducted by Birch and Irvine (2009) on the adoption of SmartBoard showed that as age increased, behaviour intention decreased among the teachers. Meanwhile, Alabi (2016) studied factors influencing the acceptance of E-learning among 267 academicians where gender, age and experience moderated the correlation between the adoption with the use of electronic instructional media. Saleem et al. (2016) studied the acceptance of Modular Object-Oriented Dynamic Learning Environment (Moodle) among academicians with moderators affecting the relationship between constructs and behaviour intention. A study by Ghavifekr et al. (2016) on issues and challenges of ICT usage among secondary school teachers in Malaysia disclosed that utilization of ICT tools is higher among the male teachers. Similarly, Oudhuis (2017) who examined determinants that impacted the use of technology in education among teachers said that males had a strong control on the connection between habit and intended behaviour.

The study by Amadin, Obienu and Osaseri (2018) revealed that Facilitating Conditions was the most outstanding construct that impacted behaviour intention of using Google Apps. The behaviour intention was also influenced by Performance Expectancy, Effort Expectancy, Social Influence, Hedonic Motivation, Technology Awareness and Attitude. However, the habit did not influence behaviour intention. However, another study on the perception of teachers on the receptiveness of Google Classroom by Nayab and Kaukab (2018) showed teachers perceived Google Classroom useful only for storing and handling faculty document with fundamental teaching and learning features. Unfortunately, it has no significant impact on teaching methodologies and it is lacking in users' friendly interface.

Among the studies gleaned on the students' acceptance of the ICT, there were 10(43.47%) studies that had extended the models to accommodate new variables. Dajani and Hegleh (2019); Ain, Kaur and Waheed (2015) added learning value into their UTAUT 2 models and it influenced the behaviour intention of the students to accept E-learning. Meanwhile, Alshehri, Rutter, and Smith (2019) studied on students' receptiveness of Online learning via the utilisation of Blackboard System had used technical support as a new variable. The behaviour intention and user behaviour of the students were influenced by technical availability. Almaiah and Alyoussef (2019) explored the acceptance of ICTs with an extended UTAUT model. Those added variables: Course Design, Course material, Course Assessment, tutors' attributes had significantly influenced the actual use of ICTS and the performance expectancy of ICTs among the 507 undergraduates and postgraduates' students. Thongsiri, Shenb, and Bao (2019) extended their UTAUT model with Information Success (IS) model, the additional variables were System Quality, Information Quality and Service Quality with Information Quality and System Quality having a profound impact among the 307 university students to use ClassStart Application. Similarly, a study by (Latif, Jamaludin and Mahmud, 2011) explored determinants that influenced students to use digital technology in the library with the incorporation of Information Quality and System Quality. However, only Information quality had influenced behaviour intention.

Another study by Oye, Jahad, and Rahim (2012), had used the UTAUT model with other variables, that is, anxiety, self-efficacy and attitude. The behaviour intention of the students was markedly impacted by attitude and Performance Expectancy, followed by anxiety in ICTs utilization. A study by Chang (2013) showed that the moderating effect of TTF fit was important in influencing the correlation between constructs and the behaviour intention of utilizing mobile applications in libraries among 363 undergraduates' students. Also, Olasina (2019) had used other variables: attitude, stress, satisfaction, fatigue and perceived usefulness in their extended UTAUT model in which all the variables were critical for students to accept E-learning. Last but not least, Ghazal, Al-Samarraie, and Aldowah (2018) used the extended Technology Acceptance Model (TAM) and Information Success (IS) Model in their study. The variables used were Instructors' attributes, students' attributes, System Characteristic, Classmates Characteristic, Organizational Characteristic, Course Content Quality and

Course Characteristic. The actual use of E-learning was significantly determined by Course design, Course Content Support, Course Assessment and Instructors' attributes.

The analysis showed that there are also varying findings with inconsistency in the constructs of UTAUT, UTAUT 2 and extended UTAUT 2 that influenced the students' acceptance of ICTs in the 23 studies. Performance expectancy and social influence were the most influential variables as both had 14(60.87%) respectively. These were followed by effort expectancy 12(52.17%), facilitating conditions 8(34.78%), learning value 2(8.70%), Information quality 2(8.70%), system quality 1(4.35%) and technical support 1(4.35%).

CONCLUSION

The review distinctly showed that the Technology acceptance studies on the education arena were drawn extensively throughout the world. The majority 23(58.97%) of the studies were of students' acceptance of ICTs, while 14(35.90%) were studies on teachers' acceptance of ICTs in general and only 2(5.13%) studies on teachers' acceptance of Google Classroom. Hence, it is an urgent need to study on teachers' acceptance of Google Classroom in teaching science amid CoVid-19 pandemic. The data analysis revealed that the Technology acceptance studies used varied models, such as UTAUT, UTAUT 2 and extended models with a wide range of variables to determine the academicians, university students, secondary students and primary school children acceptance or adoption of technology. All of the studies showed varying results. Hence, it is imperative to engage the UTAUT, UTAUT 2 or their extended models with the appropriate combination of variables to yield the best results. Also, the data analysis methods for these studies varied ranging from PLS-SEM, SEM-AMOS, Inferential statistic (multiple regression) to Varimax. To select the appropriate data analysis method is of utmost importance too.

Acquisition of sound scientific knowledge from this literature review is to justify the feasibility to study the science teachers' acceptance of Google Classroom in teaching Science amid Covid-19 pandemic by using an extended UTAUT 2 model with a right combination of variables: PE, EE, SI, F C, PV, HM, H and PC as independent variables, BI and the UB as dependent variables and moderator variables: age, gender, experiences and educational level. PLS-SEM is identified as the most common and current administered for data analysis.

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