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# Trends and Issues in Educational Technology Research in Saudi Higher Education: A Meta-Analysis Review

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**Abstract**
As Information Technology expands, all industries and fields in Saudi Arabia are experiencing reduced costs and improvements in the efficiency and effectiveness of operations in various systems. This has positioned the higher education sector in Saudi Arabia as the land of opportunity in terms of educational technology and its ability to support the development of sustainable educational systems. However, scholars in the field in Saudi Arabia still lack sufficient academic scientific study surrounding the various trends and issues in educational technology research in Saudi higher education. Therefore, this study contributes to this gap in knowledge by aiming to evaluate the contents of previous relevant articles concerning educational technology within Saudi universities. The study reviews the trends (i.e. types of technology, target groups, the socio-technical research context, research theories and the research paradigm and methodology) and the various issues on which studies of educational technology have concentrated. Based on this, a total of 52 studies were reviewed. Thereafter, the study outlines limitations in the previous studies and accordingly puts forward various potential future directions and opportunities for research in this field, and some implications for theory.
**Keywords:** Educational Technology, E-Learning, Higher Education, Saudi Arabia, Universities.

## 1. Introduction

Improving education systems in universities has become an essential concern for all nations, with a considerable amount of research being conducted in this area, particularly in terms of studying tools to facilitate the learning process and thereby improve the outcome and quality of national higher education systems. In the context of contemporary higher educational systems, Information and Communication Technology (ICT) is considered an essential tool to facilitate the acquisition of cognition and knowledge (Rose & Kadvekar, 2015; Benchicou et al., 2010). ICTs have been viewed, amongst other strategies, as capable of helping universities to achieve the management objectives in order to improve the quality and general outcomes of the learning process. This will also enhance the accessibility of learners from different remote sites whilst, at the same time, reducing the cost of learning operations (Benchicou et al., 2010). The radical improvement of the internet, on a worldwide scale, also has increased the overall ability of technology to provide high-quality education systems, thereby facilitating the learning processes. In addition, the capability of the World Wide Web (www) plays an important role in integrating huge varieties of material in different formats (i.e. text, audio and video); it further provides several means of real-time and interactive communication channels (Abbad & Al Bargothi, 2011). Moreover, ICT-related services, such as e-mail, online social networks and discussion forums, e-administration and digital libraries, amongst other electronic facilities, provide numerous avenues and opportunities for academic collaboration, joint research and professionalism, as well as allowing international networking amongst students and staff in universities operations (Benchicou et al., 2010). This valuable mix of ICT resources has attracted the attention of universities worldwide and has encouraged them to look at educational technology as the future fundamental infrastructure in higher education systems (Abbad & Al Bargothi, 2011).

In Saudi Arabia specifically, the government has directed much attention, for a number of different reasons, towards the reformation of the higher education systems (Eidaroos & Alkraiji, 2015). The annual population increase in Saudi Arabia is regarded as one of the greatest in the world, with the total population in 2025 expected to be twice that of today (Alkraiji et al., 2014). Another reason is the shortage of higher education professionals, which is recognised as one of the most important challenges. Additionally, women's colleges and universities are restricted to only female instructors in conventional face-to-face classes for the teaching of females in Saudi Arabia (Nasim et al., 2010). Moreover, Saudi Arabia spans a large geographical area with fragmented national development systems, the quality and outcomes of which vary considerably between its diverse and scattered regions (Alkraiji et al., 2014). Finally, Saudi Arabia, in recent years, has witnessed significant growth in the ICT sector in terms of data segments and media content owing to the penetration of the internet and mobile technology (Eidaroos & Alkraiji, 2015). Given the aforementioned reasons, the majority of its universities have redeveloped their strategies to take the advantage of the supernormal growth of the ICT sector in Saudi Arabia in order to employ various educational technologies that focus on improving the quality and outcome of the education systems (Eidaroos & Alkraiji, 2015).

 

For instance, the Ministry of Education has established the National Center of e-Learning and Distance Learning to develop a repository for e-learning material for various academic disciplines. King Saudi University in Riyadh has devised and implemented an initiative to facilitate certain transformation stages to move towards an on-campus culture of e-learning. This project has three components: namely, educational technology (i.e. smart classrooms, teaching studios and educational auditoria); control and support (i.e. protection and surveillance); and training (Almusawi, 2013). Another significant national project was the development of the Saudi Digital Library (SDL) in 2010, which serves the needs of researchers, students and professionals. The SDL has more than 24,000 complete e-books in various scientific and academic disciplines; it also subscribes to approximately 300 local, regional and international publishers (Eidaroos & Alkraiji, 2015). One major example of e-learning can be seen through the establishment of Saudi e-Universities in 2011. This initiative specialises in distance education in Saudi Arabia and supports life-long education for all members of Saudi society (Marinakou et al., 2015).

Given the aforementioned factors underpinning the supernormal growth of the ICT sector in Saudi Arabia, and the gradual change and transformation from conventional higher education to the contemporary universities that support off-campus and distance learning, both academic researchers and practitioners in Saudi Arabia are recognised as being enthusiastic in terms of having a study reference with regards to the trends and issues in educational technology research conducted in Saudi universities. In this context, the authors believe that the content analysis and collective assessment of studies in this domain could significantly contribute to the understanding of gradual development in the field of research into educational technologies in Saudi Arabia. Hence, the purpose of this study is to reveal the status of studies on educational technologies conducted in Saudi universities in terms of the trends (i.e. types of technology, target groups, the socio-technical research context, research theories, and the research paradigm and methodology) and the various issues on which the studies under review have concentrated. In addition, the study further attempts to shed light on contemporary issues that require more attention. For the purpose of this study, the remainder of this paper is structured as follows: the following section explains the different terminologies and definitions related to educational technology; subsequently, the research methodology is clarified; thereafter, the results are demonstrated and discussed; and later, various related issues and recommendation are highlighted.

## 2. Educational Technology-related Terminologies and definition

ICT can provide a significant basis for educational technology by creating a learning environment that is independent from the different beneficiaries (i.e. instructors and students) regardless their geographical location (Pellas, 2014). The evolution of ICT (i.e. Computer-Supported Collaborative Learning (CSCL) transactions) and the new generation of Web 2.0 together have enriched the formalisation of different educational technological and learning methods (Pellas, 2014). This has resulted in a confusing variety of terms applied in the field of educational technology research (Moore et al., 2011). It has been noted that researchers are concerned, when making meaningful cross-study comparisons for educational technology research, that there is always a lack of consistency in the definitions and terminology used (Moore et al., 2011). For example, learning courses were based on only two main methods, face-to-face and distance learning (i.e. basic correspondence through the postal service), until the beginning of the 1980s. Then, another learning method, referred to as Computer-Assisted Learning (CAL), was created the objectives to aid, facilitate and improve instruction through the use of simple computer programs containing text, graphics, sound and video. Different terminologies were also used interchangeably to refer to the use of computer programs in education to support teaching instruction. Such terminologies included Computer-Assisted Instruction (CAI), Computer-Aided Instruction (CAI) and Computer-Based Education (CBE), etc.

In the 1990s, distance learning witnessed a dramatic change as a result of the revolution in ICT, the common use of e-mail communication and remote access to internal organisations' networks (Moore et al., 2011). Since this time, ICT has been associated with distance learning as a fundamental tool to support distance learners. When the web became central to the development of the information and knowledge age in the late 1990s, different meanings were attributed to the terms and terminologies of educational technology; these evolved to support learning processes through the web, such as online learning and e-learning. Early in 2000, it was difficult for researchers to distinguish between distance learning and the terms 'online learning' and 'e-learning' since both terms were simply referenced to the internet through the web medium with which they were used. Therefore, various researchers identified those terms as more recent versions of distance learning, which improves the access of disenfranchised learners to educational opportunities. When the new web version, known as Web 2.0, was upgraded in the mid-2000s, a fundamental shift in educational technology was developed to support learning processes. Web 2.0 enhances deeper and more meaningful learning processes through interactive communication channels and collaborative workspaces between spatially distributed users. Owing to such rapid advancements in web technology tools, various terms and terminologies related to educational technologies were then developed, such as Learning Management Systems (LMS), Course Management Systems (CMS), Virtual Classrooms, Virtual Learning Environment (VLE), Collaborative Learning Environment, Web-based Learning and Web-based

 

Instruction, etc.

Additionally, mobile learning, otherwise known as m-learning, is a phase of educational technology that has been seen to evolve during the most recent decade, when wireless networks became common tools for gateways of communication. This period has also witnessed the optimisation of the use of mobile devices, such as smart phones, e-book readers and tablet PCs (Moore et al., 2011). The Smart Learning Environment (SLM) is another term reflecting the rapid advancement of wireless communication networks and the increased interest in mobile devices amongst various learning groups and communities to access digital resources and services without being limited by either location or time. Another valuable feature of SLM is the provision of essential learning materials, tools and suggestions for learners in the right place and form and at the right time (Klimova & Ivana, 2015).

However, over the past three decades, the gradual and dramatic evolution of educational technology has led to the emergence of various terms and terminologies that are interrelated and overlapping in their definitions and concepts, This has resulted in a conflicting situation for researchers in conducting cross-research analysis of the literature owing to the wide variety and interchangeable use of relevant terms without meaningful definitions, characteristics and tools (Pellas, 2014). In order to overcome this research barrier, the authors have made the decision to bear in mind, throughout the course of this study, all educational technology studies carried out in Saudi universities, regardless of the terminology used, since the focus of this research is a longitudinal description of the trends and issues in this regard. Nevertheless, Figure 1 provides a summary of the historical evolution of educational technology when the focus shifted from technology-assisted learning to e-learning, then to web-based learning, and later to m-learning before, more recently, shifting again to the smart learning environment. Table 1 presents the definitions of the keywords used throughout the methodology section whilst Table 2 explains the dimensions of the key differences between the educational technology-related terminologies.

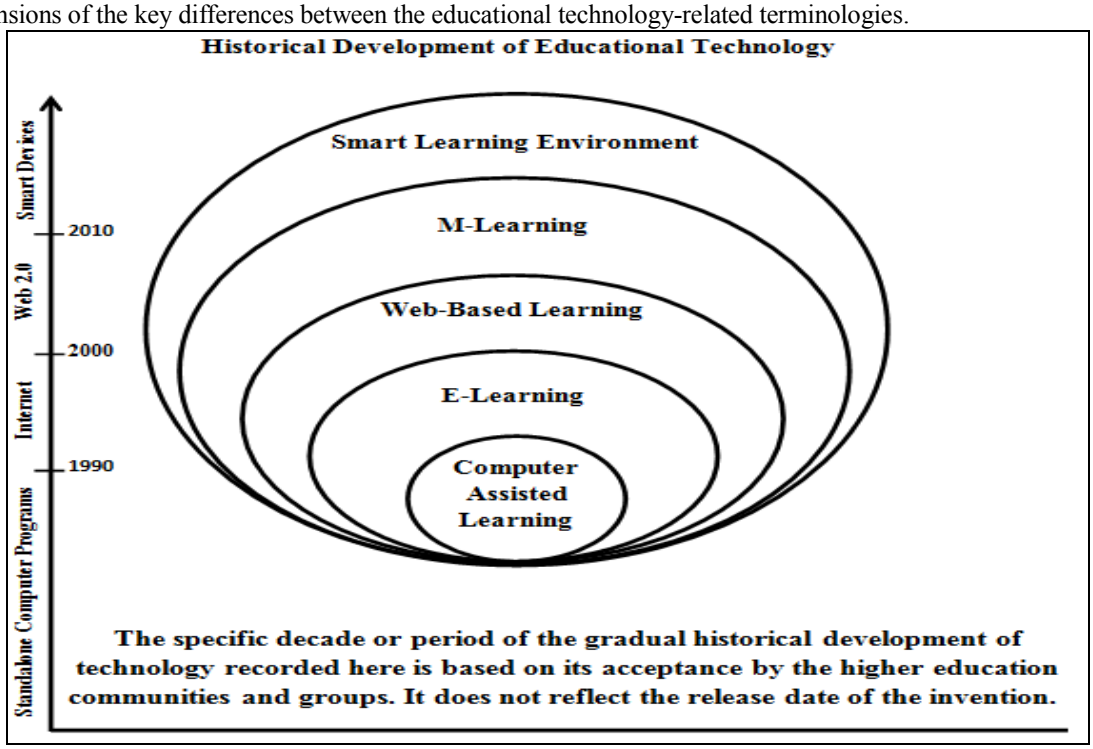


Figure 1. The gradual evolution of educational technology during the last three decades, developed by the authors.

 

Table 1: The terminologies used in this study and their definitions; these were developed by the authors based on an understanding of the related literature in this context.

| No. | Terminology | Definition |
|---|---|---|
| 1 | Educational Technology | The use of any forms or practice of technology, either advanced or basic to support the learning processes. |
| 2 | E-learning | The use of ICT resources to deliver digital content and instructions to either the off-campus or on-campus targeted learners. |
| 3 | Online learning | A method of learning taking place online and requiring Internet connection. |
| 4 | Distance learning | A method of learning to allow off-campus learners to access the various on-campus learning materials and resources. |
| 5 | Blended learning | A mix of the conventional face-to-face method and a combination of one or more educational technology methods (i.e. e-learning, web-based learning). |
| 6 | Learning management system | A set of standardised tools for learning which are designed to integrate learning with the existing information systems within an organisation or through the web portal for learning. |
| 7 | Mobile learning | The utilisation of wireless communication networks and sensing technologies to support learners' immediate context and surroundings through the medium of mobile devices such as smartphones or tablets. |

Table 2: Illustration of the key characteristics and dimensions for the development of the terminologies and terms for educational technologies.

| No. | Characteristics/ dimensions | Description |
|---|---|---|
| 1 | Environment | Most terminologies have been developed to reflect the geographical location where the actual learning takes place, such as in conventional traditional classrooms, off-campus or online. The learning environment can also refer to forms, such as collaborative, virtual, course, program and learning management systems. |
| 2 | Instructional instruments | This refers to the interaction between the learners and the instructors, the role of the instructor, the sequence of events, the direction of the instruction, personalisation, etc. |
| 3 | Technology tools | This refers to the type of the technology being used, such the Internet, web, mobiles or smart devices. |

## 3. Methodology

### *3.1 Research Method*

This study selected a longitudinal descriptive approach to carry out a Meta-Analysis of the related studies content to examine the trends and issues in educational technology research in higher education in Saudi Arabia. In doing so, the intention of the paper is to analyse quantitatively the status of the e-learning research conducted in universities in Saudi Arabia and thereafter to explain subjectively the flaws of the reviewed researches. The authors adopted quantitative content analysis to review systematically the relevant literature and to describe the occurrences (frequency) of the current trends and patterns. Within this context, the literature analysis is based on three themes, as shown in Table 3.

Table 3: The themes' trends upon which the coded and described text data are statistically based on.

| No. | Theme | Description |
|---|---|---|
| 1 | General characteristics of studies | • Number of publication per years<br>• Number of authors (nature of collaborations)<br>• Institutional affiliation<br>• University of the research context<br>• Origin of published journal (country)<br>• Journal impact factor |
| 2 | Research design | • Research paradigm<br>• Research approach<br>• Research methodology<br>• Research data collection methods |
| 3 | Research streams | • Target population<br>• Type of technology<br>• Socio-technical research context<br>• Main themes of the research<br>• Research theories |

 

*3.2 Keywords' analysis*

Drawing upon related studies, the selected articles were extracted using different names synonymous with educational technology combined with the term "Saudi Arabia" in order to come up with wide-ranging results. The candidate search terms included "e-learning", "distance learning", "online learning", "learning management system", "learning information management systems", "blended learning", "educational learning", "mobile learning", "web-based learning", "virtual classrooms", "virtual educational environment", "online distance learning", 'computer-supported collaborative learning", "computer-aided learning", "computer aided learning", "computer-assisted learning", and "computer assisted learning". A pilot search was carried out by the authors to inspect the results and to refine the candidate search terms. The pilot showed zero results for some search keywords as well as the dominant search terms used in the research conducted into educational technology in Saudi universities. The authors therefore refined the candidate keyword research terms to include only the following seven keywords: "e-learning", "distance learning", "online learning", "learning management system", "blended learning", "educational learning" and "mobile learning". The final list of keywords was combined with the term "Saudi Arabia" to start the search process for retrieving the articles. The authors also decided, after piloting the search terms, to refine the search strategy to: [("e-learning" OR "distance learning" OR "online learning" OR "learning management system" OR "blended learning" OR "educational learning" OR "mobile learning") AND "Saudi Arabia"], and to search term by term (i.e. "e-learning" AND "Saudi Arabia", "distance learning" AND "Saudi Arabia", "online learning" AND "Saudi Arabia", … etc.). Although this basic strategy results in a large number of articles, it offers greater accuracy to the results.

*3.3 Data Sources*

An extensive and advanced search of English peer-reviewed journal articles using the aforementioned keywords was carried out using different scientific and academic databases. In this paper, the academic paper analysis was carried out based on papers collected through the Saudi Digital Library (SDL), which is the main gateway for universities, researchers and academics in Saudi Arabia to the world of knowledge, as shown in Fig. 2. With more than (310,000) scientific references covering all academic disciplines, the SDL is considered the largest academic information resource in the Arab world. Based on the description of each English database (as shown in Fig. 3) and self-judgment, the authors came up with twelve databases to search the keywords and to extract the related articles, as demonstrated in Table 4.

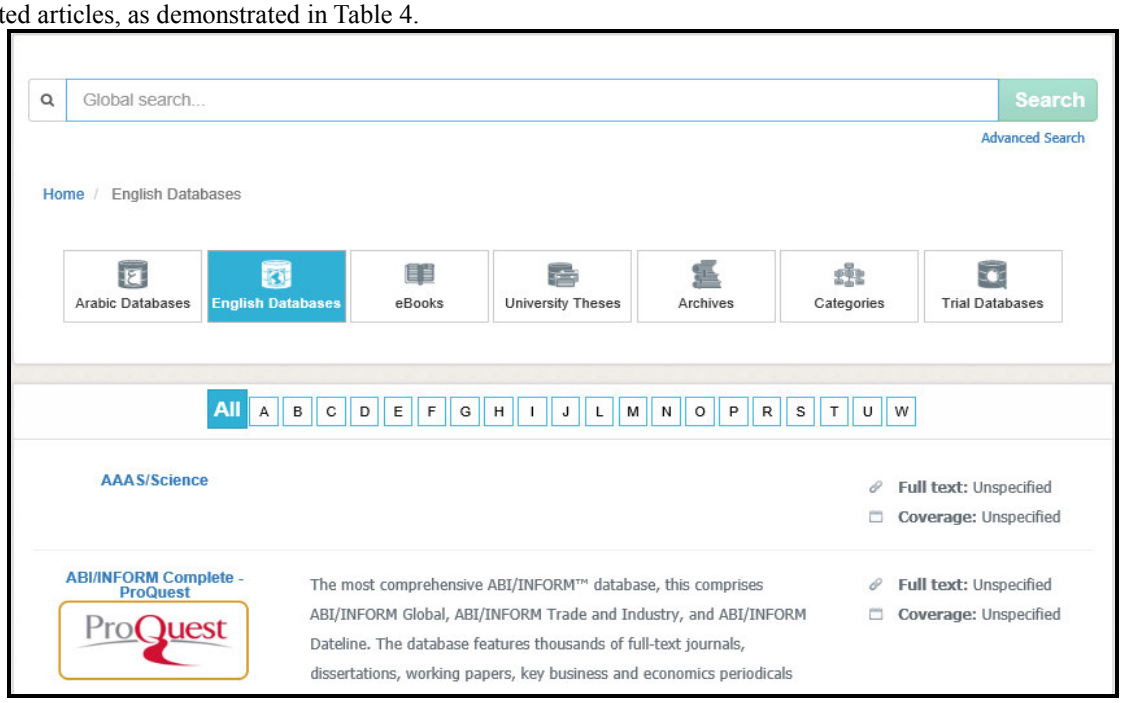


Figure 2. A snapshot of the search engine in the Saudi Digital Library (SDL).

 

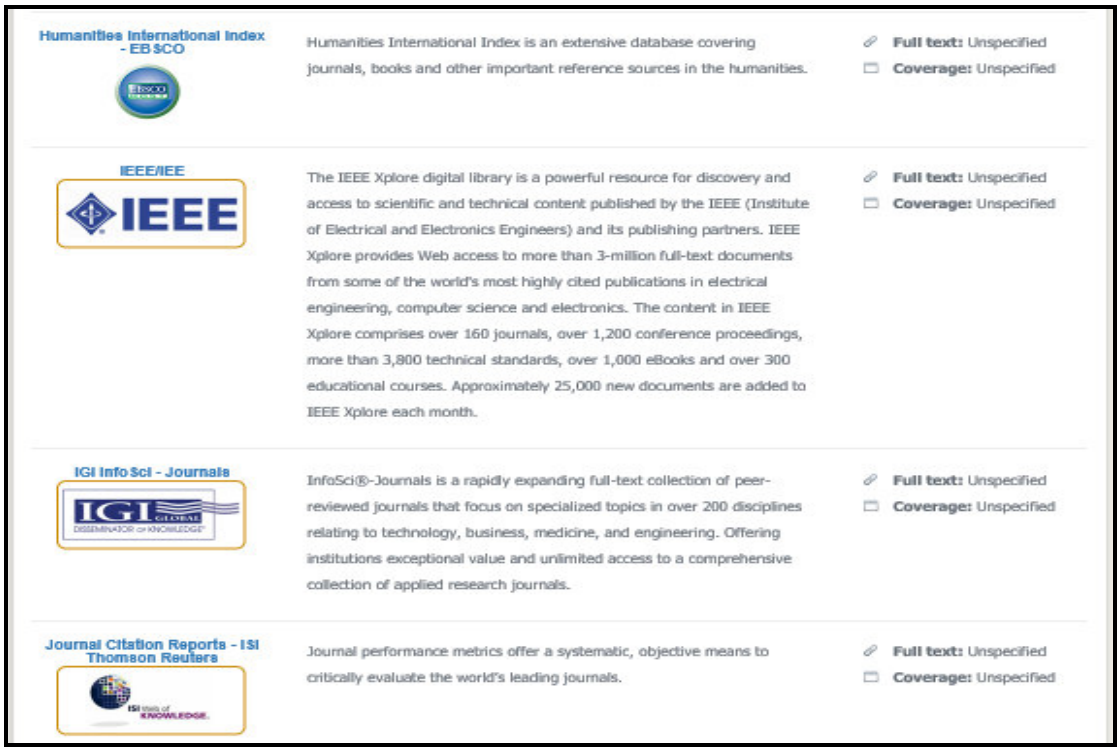


Figure 3. A snapshot of the databases' descriptions that helped to determine the most appropriate database for searching keyword terms.

Table 4: The selected databases to carry out the search and locate the articles.

| Code# | Database Name | Code# | Database Name |
|---|---|---|---|
| 1 | EBSCO | 2 | ProQuest |
| 3 | Emerald | 4 | IEEE/IEE |
| 5 | IGI InfoSci-Journals | 6 | Science Direct (Elsevier) |
| 7 | Scopus (Elsevier) | 8 | SpringerLink (Springer) |
| 9 | Taylor &Francis | 10 | Web of Science |
| 11 | Wiley Online Library | 12 | Sage Journal (Sage) |

*3.4 Search and Screening Approach*

The analysis results were processed and are presented in Fig. 4. First, the dominant search terms were selected based on the pilot search study and thereafter the targeted searched databases in DSL were determined, as explained in the previous sections. Through each database, the search filter was refined and adjusted to include all the databases in the searched database (i.e. the authors searched all the databases under ProQuest), the date was open, and only English journals were reviewed, (i.e. conference papers, reports and books were excluded). The preliminary search was conducted to register the number of hits for each keyword term according to the database (e.g. the number of hits for "e-learning" AND "Saudi Arabia" in ProQuest was 322).

 

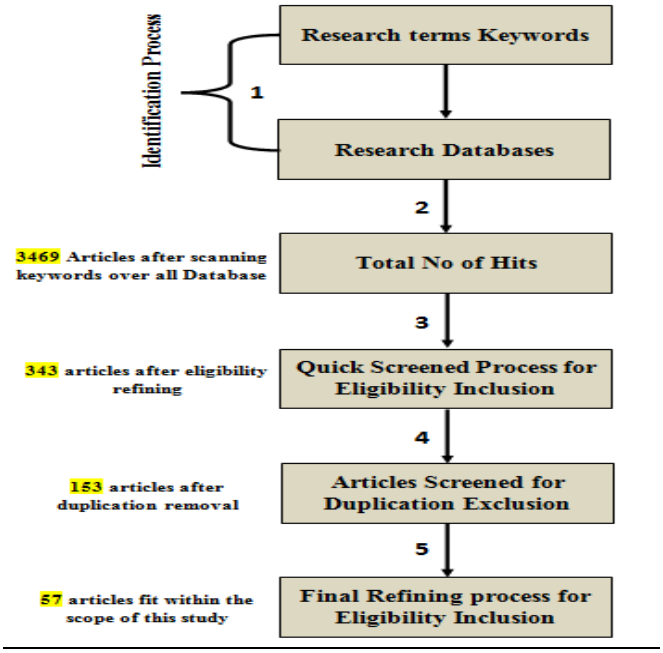


Figure 4. A flow chart showing the search and screening procedures.

Table 5 demonstrates the number of hits for each keyword and database; it also shows the total number of hits for each keyword throughout the selected databases and the overall total number of hits. Each resulting article, based on a keyword term and one database, were grouped and saved in one folder so that every database from the selected twelve had a primary folder. Each folder had inside it, in turn, seven folders based on the number of the determined keywords which, in this case, was seven. Each article from the 3469 articles collected was quickly scanned to determine whether or not it belonged to the Saudi Arabian context. This was done via the title of the article, the affiliated organisation of the authors, or sometimes through scanning the abstract. Table 6 shows, in similar way to Table 5, the number of "passed" articles, which was 343. These articles were considered in the next procedure for further revision. Later on, the collected articles were all grouped in one folder for duplication screening since each saved name for each article was based on the full title and therefore it was easy to exclude the duplicated ones from the folders. This procedure resulted in 153 articles for further consideration. The final revision procedure was based on eligibility criteria to eliminate those: 1) not within the scope of Saudi universities; 2) purely technical papers; and 3) those with no clear methodology (i.e. were just a description or report). The final procedure resulted in 52 articles which were considered to align with the objective of this paper and which were suitable for further analysis and results. Appendix A shows the articles that are sorted by the data of publication.

Table 5: Number of hits for every keyword term and database and the total and overall number of hits.

| | | Searching Keywords | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The Selected English Databases | EBSCO | 63 | 27 | 24 | 6 | 71 | 76 | 34 |
| | ProQuest | 322 | 205 | 107 | 34 | 47 | 216 | 36 |
| | Emerald | 48 | 38 | 22 | 5 | 8 | 10 | 0 |
| | IEEE/IEE | 18 | 6 | 18 | 1 | 1 | 7 | 4 |
| | IGI InfoSci - | 42 | 90 | 171 | 196 | 13 | 182 | 0 |
| | Science Direct | 6 | 1 | 1 | 0 | 1 | 2 | 1 |
| | Scopus | 178 | 126 | 69 | 33 | 34 | 111 | 23 |
| | Springer | 123 | 0 | 2 | 0 | 0 | 4 | 0 |
| | Taylor & Francis | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Web of Science | 8 | 3 | 2 | 1 | 1 | 1 | 2 |
| | Wiley Online | 238 | 114 | 85 | 23 | 42 | 72 | 14 |
| | Sage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 1046 | 610 | 501 | 299 | 218 | 681 | 114 |
| | Total of All | 3469 | | | | | | |

 

Table 6: Number of hits for every keyword term and database and the total and overall number of hits within the scope of Saudi universities.

| | | Searching Keywords | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The Selected English Databases | EBSCO | 32 | 14 | 18 | 4 | 16 | 28 | 15 |
| | ProQuest | 20 | 12 | 10 | 12 | 10 | 18 | 7 |
| | Emerald | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | IEEE/IEE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | IGI InfoSci | 7 | 13 | 7 | 2 | 2 | 5 | 0 |
| | Science Direct | 6 | 1 | 1 | 0 | 1 | 2 | 1 |
| | Scopus | 16 | 3 | 1 | 3 | 3 | 8 | 6 |
| | Springer | 2 | 0 | 2 | 0 | 0 | 4 | 0 |
| | Taylor & Francis | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Web of Science | 3 | 3 | 2 | 1 | 1 | 0 | 2 |
| | Wiley Online | 4 | 1 | 3 | 4 | 2 | 4 | 0 |
| | Sage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 91 | 47 | 44 | 26 | 35 | 69 | 31 |
| | Total of All | 343 | | | | | | |

## 4. Results

The Meta-Analysis of the content of the collected articles was conducted based on the themes demonstrated in Table 3. These theses were classified into three main trends including general characteristics of studies, research design and research streams. General characteristics of studies describe the quantity of the publication per year, the nature of collaboration in research, the institutional affiliation, the research context and some statistical analysis related to the published journal. The research design refers to some numerical analysis correlated to the methodology in general such as research paradigm, approach, methodology and data collection methods. Research streams explain some statistics in terms of target population, type of research technology, the socio-technical context and research theories. The following depicts the Meta-analysis within the aforementioned trends.

### *4.1 General Characteristics of Studies*

As presented in Table 7, the first articles with regards to the educational technology application within the context of Saudi universities were published in 2004, which might reflect the interest period of date in this discipline. However, as shown in Table 7, approximately 86 percent of 52 articles were published from 2010 through 2015. The annual rate of publication changed significantly with an increasing publication rate after 2010 (see Figure 5). This considerable increase from 2010 may possibly show the growing popularity of educational technology research in Saudi Arabia in this period of time.

Table 7: Number of Articles Published per Year (n=52) started from 2004.

| Year | Frequency | Percentage |
|---|---|---|
| 2004 | 2 | 3.85% |
| 2006 | 1 | 1.92% |
| 2008 | 2 | 3.85% |
| 2009 | 2 | 3.85% |
| 2010 | 4 | 7.69% |
| 2011 | 5 | 9.62% |
| 2012 | 6 | 11.54% |
| 2013 | 10 | 19.23% |
| 2014 | 9 | 17.31% |
| 2015 | 11 | 21.15% |
| Total | 52 | 100.00% |

 

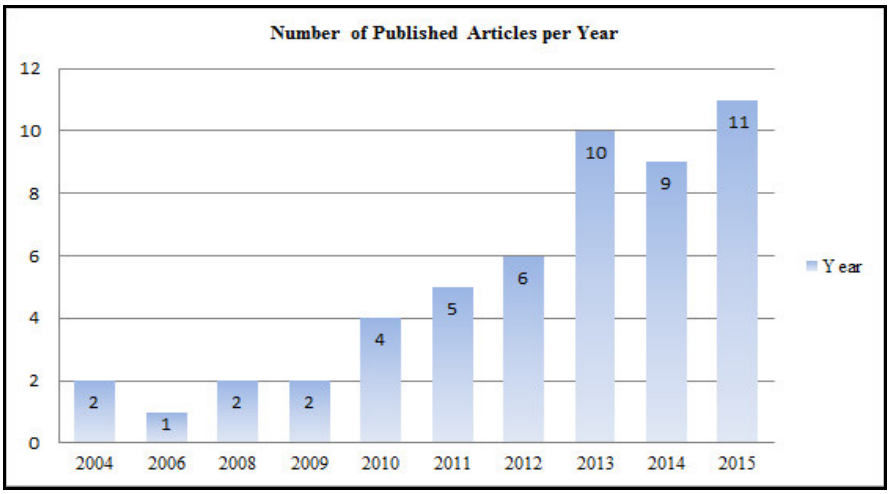


Figure 5. Number of Published Articles per Year

As can be seen in Table 8, King Saudi University, King Fahd University and King Abdulaziz University were demonstrated the most in term of the number of the publication of articles and as the research context, which seems acceptable since those universities are considered among others the largest and oldest ones. King Khalid University shows also considerable number of publication, one reason might regarded as the university was part of King Saudi University and about 10 years ago has become an independent stand-alone University. As shown also in Table 8, one affiliated university is Manchester University since the author is a Saudi student researcher. The Meta-analysis of the collected articles does not show more involved in collaborative research efforts since more than 60 percent of the research was based on individual efforts. In term of authors' gender, the data revealed that the male gender represent approximately 69.23% from the collected articled whereas 19.23% are female and 11.54% all a mix of gender (see Fig. 6).

Table 8: Quantity of the articles and their affiliated university.

| code | University Name | No. of Articles | Percentage | As a Research Context | Percentage |
|---|---|---|---|---|---|
| 1 | King Saud University | 11 | 21.15% | 11 | 26.83% |
| 2 | King Fahd University | 5 | 9.62% | 5 | 12.20% |
| 3 | King Abdulaziz University | 5 | 9.62% | 6 | 14.63% |
| 4 | University of Bisha | 1 | 1.92% | 1 | 2.44% |
| 5 | University of Dammam | 2 | 3.85% | 0 | 0.00% |
| 6 | Taibah University | 2 | 3.85% | 2 | 4.88% |
| 7 | University of Tabuk | 1 | 1.92% | 1 | 2.44% |
| 8 | Imam Muhammad Ibn Saud Islamic University | 2 | 3.85% | 0 | 0.00% |
| 9 | Umm Al-Qura University | 2 | 3.85% | 1 | 2.44% |
| 10 | Princess Noura Bint Abdulrahman University | 2 | 3.85% | 1 | 2.44% |
| 11 | King Khalid University | 6 | 11.54% | 7 | 17.07% |
| 12 | Najran University | 1 | 1.92% | 0 | 0.00% |
| 13 | Jazan University | 1 | 1.92% | 1 | 2.44% |
| 14 | Yanbu University College | 1 | 1.92% | 0 | 0.00% |
| 15 | Northern Border University | 1 | 1.92% | 1 | 2.44% |
| 16 | Riyadh Colleges of Dentistry and Pharmacy | 1 | 1.92% | 1 | 2.44% |
| 17 | Aljouf University | 1 | 1.92% | 0 | 0.00% |
| 18 | King Saud Bin Abdulaziz University for Health Sciences | 1 | 1.92% | 0 | 0.00% |
| 19 | Prince Sultan University | 1 | 1.92% | 1 | 2.44% |
| 20 | The University of Jordan | 1 | 1.92% | 0 | 0.00% |
| 21 | La Trobe University | 1 | 1.92% | 0 | 0.00% |
| 22 | Manchester University | 1 | 1.92% | 0 | 0.00% |
| 23 | King Faisal University | 2 | 3.85% | 2 | 4.88% |
| Total | | 52 | 100.00% | 41 | 100.00% |

 

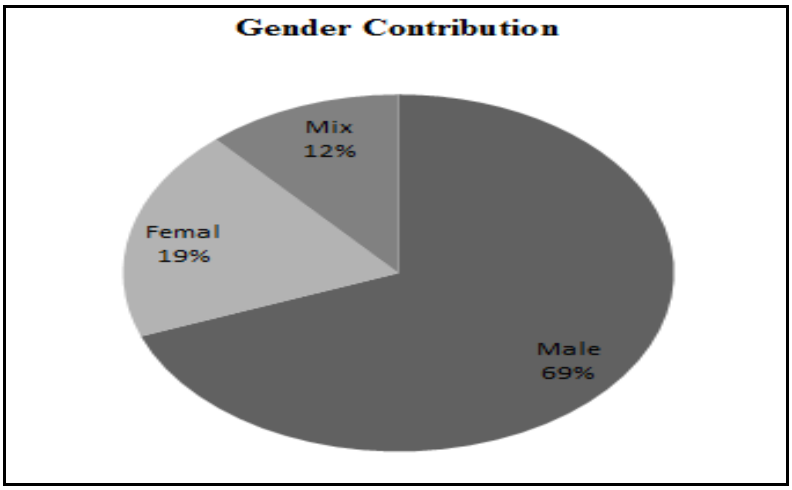


Figure 6. Comparison of male, female and mix contribution.

The statistical analysis related to the published journal, as presented in Table 9, shows approximately 62% of the collected articles where published in three country, namely US, UK and Turkey. The data also shows that the 52 collected articles were distributed among 34 journals affiliated by 15 countries. In addition, the data also shows that the about 20% from the collected journal articles were published by the Turkish Online Journal of Educational Technology (see Appendix). In addition, Table 9 displays some numbers with regards to the journal citation indexing (Journal Impact Factor - JIF) which its value represents the quality of the journal. The data showed that the publication journals were indexed by the SCImago Journal Rank (SJR indicator), the Intellectual Property and Science business of Thomson Reuters (Journal Citation Reports (JCR)), Citations in Economics (CitEc) and the General Impact Factor (GIF). However, the comparison between these indexing organisations and methods is out of the scope of this research, instead the use of these journal impact factors is to just show in general the quality of value of the collected publications. As can be seen in Table 10, 55.77% from the publication journals were indexed by SJR, whereas 5.77% were indexed equally by JCR and CitEc, and only one publication journal is indexed by GIF, and conversely 30.70% where do not have citation index.

Table 9: The number of the journals affiliated by the countries and the number of the articles published by these journals.

| No | Country | No. of Articles | Percentage | No. of the affiliated Journals | No | Country | No. of Articles | Percentage | No. of the affiliated Journals |
|---|---|---|---|---|---|---|---|---|---|
| 1 | US | 10 | 19.23% | 8 | 9 | Ireland | 1 | 1.92% | 1 |
| 2 | UK | 11 | 21.15% | 5 | 10 | West Indies | 1 | 1.92% | 1 |
| 3 | Australia | 1 | 1.92% | 1 | 11 | India | 3 | 5.77% | 3 |
| 4 | Canada | 2 | 3.85% | 2 | 12 | Pakistan | 3 | 5.77% | 3 |
| 5 | Netherlands | 1 | 1.92% | 1 | 13 | Saudi Arabia | 1 | 1.92% | 1 |
| 6 | New Zealand | 1 | 1.92% | 1 | 14 | Turkey | 11 | 21.15% | 2 |
| 7 | Poland | 1 | 1.92% | 1 | 15 | Malaysia | 1 | 1.92% | 1 |
| 8 | Austria | 4 | 7.69% | 3 | Total | | 52 | 100.00% | 34 |

Table 10. The publication journals citation indexing and the impact factor.

| Journal Index | No. of journals | No. of articles | Percentage | Lowest Values of JIF | Largest Value of JIF | Average Value of JIF |
|---|---|---|---|---|---|---|
| SJR | 14 | 29 | 55.77% | 0.11 | 1.00 | 0.33 |
| JCR | 3 | 3 | 5.77% | 0.88 | 1.36 | 1.15 |
| CitEc | 1 | 3 | 5.77% | 0.64 | 0.64 | 0.64 |
| JIF | 1 | 1 | 1.92% | 0.65 | 0.65 | 0.65 |
| No | 15 | 16 | 30.77% | No | No | No |

 

*4.2 Research Design*

Three main research paradigms coded in the collected articles, which are positivism (quantitative), interpretivism (qualitative) and post-positivism (Mixed Method approaches). 36 articles (69.23%) used the philosophical positivist paradigm to quantify the observations to statistical analysis, whereas 8 articles (15.38%) used the interpretivist paradigm to analysis the observations in subjective manner, and 8 articles (15.38%) used mix paradigm (post- positivism). In term of the methodology, the data indicated that the case study and a quasi-experimental were the predominant research methodology employed by the collected articles, where 33 articles accompanied with case study methodology and 15 articles conducted a quasi-experimental constituting approximately 92.31% from the total collected articles. Fig. 7 demonstrates the number of the articles conducted each research methodology. The data also showed that approximately 78% from the articles employed case study methodology but do not have a case study description, and the criticism details, relationships and explanations of the paper subject, research problem and the case study which in turn leaves the readers confused about the rationale behind this research. The data coded in term of data collection methods showed that approximately 83% from the articles were based on only one data collection method and no triangulation approaches were used to increase the reliability and validity of the results. Findings in this regards tabulated in Table 11 point out the number of the articles and the percentage of each used data collection method.

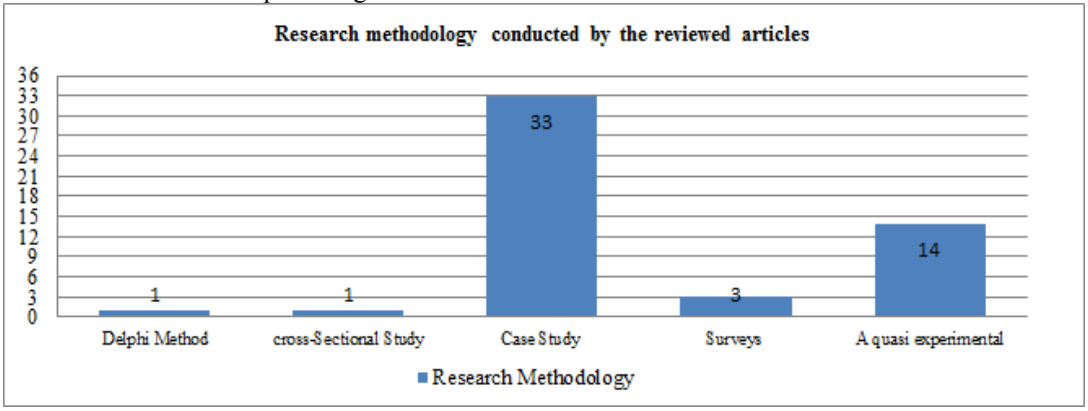


Figure 7. Chart showing the number of the articles with their research methodology.

Table 11. The data collection methods used by the articles and their quantity based on the articles numbers.

| Collection Data Method | No. of Articles | Percentage |
|---|---|---|
| Pre-test, Post-test, Control group design | 14 | 26.92% |
| Questionnaire | 23 | 44.23% |
| interview | 5 | 9.62% |
| Interviews, Observations, and Documents | 2 | 3.85% |
| Recorded Data | 1 | 1.92% |
| Questionnaire and Interview | 3 | 5.77% |
| Questionnaire with qualitative questions | 2 | 3.85% |
| questionnaire and observation | 1 | 1.92% |
| Test results and Interviews | 1 | 1.92% |
| Total | 52 | 100.00% |

*4.3 Research Streams*

Major types of educational technology employed by the reviewed articles were categorised as computer-mediated learning, LMS Blackboard, online learning, blended learning, e-learning, web-based learning, mobile learning, smart devices and mix of educational technologies. As can be seen in Table 12, the most conducted educational technology is LMS Blackboard. The reason is that the majority of the governmental universities have adopted the Blackboard and some sorts of LMS components. The target population resulted that 31 studies targeted students (59.62%), 8 targeted faculty members (15.38%), 9 were a combination of students and faculty members (17.31%), two studies targeted decision makers (3.85%), and one study equally targeted experts and a mix of university community (1.92%). For the analysis of the research main stream of themes, the authors grouped the articles based on Socio-technical system which has a long history in the Information Systems (IS) filed to refer to the complex interrelatedness of social (i.e. people and organisation) and the innovation technical aspects (Baxter & Sommerville, 2011).

 

The adoption and implementation of an innovation technology should take into consideration the interrelationship between the human aspects and organisational factors as well as the interventions and intersections of human aspects and organizational factors with the technological factors which may influence the functionality and user-behaviour of IS (Bucchiarone et al., 2015). The rationale behind the socio-technical approaches is to endeavour to eliminate the risks failures associated with pre-adoption and post-adoption stages of information systems and to enhance the successful implementation and usage of the systems Baxter & Sommerville, 2011). Different means of measures have been employed by the IS literature to study the impact of the Socio-technical system on the successful adoption and implementation of a system, such as in terms of organizational culture and structure, cost and economic perspectives, adoption and acceptance models of technologic innovation, the perception of the end users and users' satisfaction … etc. Within the context of this research, the findings tabulated in Fig. 8 highlight that the predominant socio-technical approaches were undertaken by the collected articles with regards to educational technology are pedagogical perspective (32.69%) and users' perceptions and attitude (38.46%). The data analysis were revealed that 88.46% from the reviewed articles had no adopted any theory, nor any Socio-technical system theory, while only two studies (3.58%) employed the unified Theory of Acceptance and Use of Technology (UTAUT), three studies (5.77%) included the Technology Acceptance Model (TAM), and one study (1.92%) adapted Self-determination Theory (SDT). The Meta-Analysis also showed that approximately 35% from the reviewed articled conducted linguistic academic subject to examine the impact of the educational technology on the attitude and perception of the student learning English as a foreign language.

Table 12. The type of educational technologies conducted by the reviewed articles.

| type | No | Percentage |
|---|---|---|
| Mediated | 4 | 7.69% |
| Mobile Learning | 6 | 11.54% |
| LMS Blackboard | 16 | 30.77% |
| Mix | 7 | 13.46% |
| Smart Devices | 1 | 1.92% |
| Social Network System | 2 | 3.85% |
| Online Learning | 5 | 9.62% |
| Blended Learning | 4 | 7.69% |
| E-Learning | 5 | 9.62% |
| Web-based Learning | 2 | 3.85% |
| Total | 52 | 100.00% |

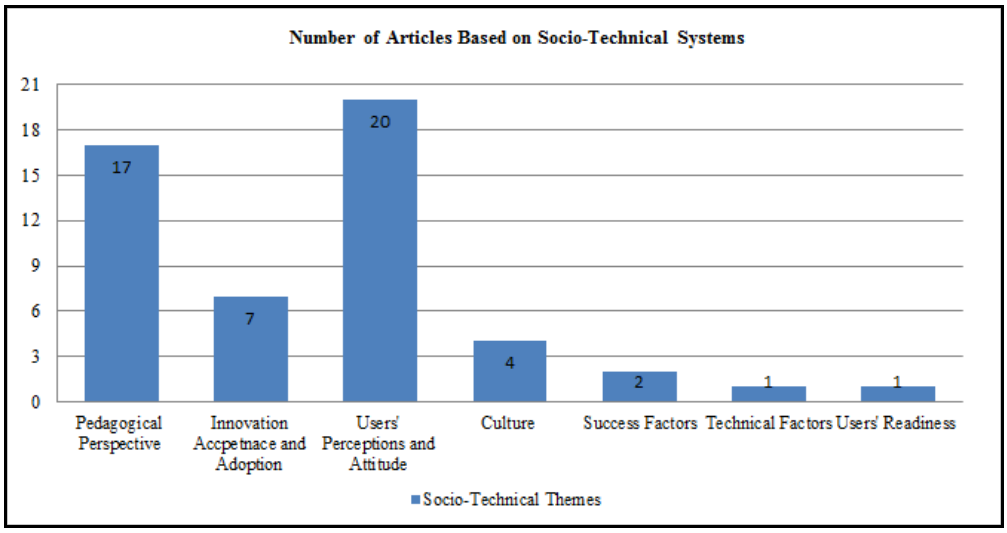


Figure 8. The Socio-Technical approaches undertaken by the reviewed articles.

## 5. Issues and Discussion

The field of educational technology has witnessed a major development owing to the great development of ICT sectors worldwide, the constant renewal of the instrumental instructions and the remarkable development of the management of the modern educational environments. One critical issue is the acquisition of the appropriate educational technologies that can be either a success or a failure. The reasons could be related to the complex of the socio-technical of the higher education systems and the multiple entities and actors such as students and faculties' members or more even the related national strategic plans and the government itself. Therefore, one

 

goal is to review the literature within the nation context to describe the status of the educational technology applications, and also important is to assess the value of the studies in this regards. In this context, this study has conducted a Meta-Analysis review based studies in the field of educational technology research in the higher education in Saudi Arabia to identify dimensions including: 1) the general characteristics, 2) the research design and, 3) the research streams of collected studies. Based on a rigor systematic review and inclusion and exclusion criteria, 52 peer-reviewed journal articles were acquired for further investigation with the aforementioned dimensions. 2004 was the date when the first two peer-reviewed articles of educational technology in the context of Saudi Universities were published, followed a low rate of publications was observed till 2010 when the publication rate changed significantly with 11 published articles in 2015. In term of collaborative research and female gender involved, the data does not show more involved between interested groups, researchers of both male and female gender. It is anticipated to observe this result owing to the absence of the concept of the collaborative and funded research in Saudi Arabia in general and for reasons regarding the academic promotions in Saudi universities. The Saudi universities pay more attention to the individual research comparing to collaborative research, and so the individual research is given a complete one point in the academic promotions comparing to half, quarter or less point for collaborative research. With regards to female contribution, one main reason is owing to the fact that the Saudi social structure is based on gender separation, whereas also the female identity and face being perceived as private. Saudi culture restrict female to move outside the house naturally, and most likely the female must be accompanied by one relative man (i.e. father, brother, son) while being outside the house in an open place (i.e. street, shopping centre, parks). This restrictions makes the contribution of female to all the areas and activities related to development in Saudi Arabia including the academia is more less than the men. This might also illustrates the low percentage of the academic collaboration between the male and female in the Saudi universities. The Meta-analysis of the collected articled indicated that the collected articles are either published in very modest journal with regards to the journal impact factor or in journals with no citation index. The low rate of the impact factor of the publication journals is due to the academic cultural in Saudi universities. The academics and professors in Saudi universities are not enthusiastic for publication in high prestige journal since it requires great efforts and a long process for the revision and decision-making. In addition, the high impact and quality journals are not considered to be criteria in the process of academic promotions, academic assessments and academic position appointment. Further, some academic think it has no academic value within the Saudi university community, instead it has only individual, moral and personal value.

In term of the research design, 69.23% of the articles were based on a positivist paradigm. The predominant research methodology were the case study and then a quasi-experimental constituting approximately 92.31% from the total collected articles. Approximately 83% from the articles were based on only one data collection method and no triangulation approaches were used to increase the reliability and validity of the results. The authors observed different issues related to the research design which makes the reader to be doubtful of the ways of collecting and analysing the data. Frist, the studies conducted case study research methodology lacked a case description and the interrelationship between the case study and the research problem. Second, the articles employed the questionnaire data collection method were based on a random sampling method with always low rate sampling size which in turn make the sampling in term of size and representative is questionable. Third, some of the research with questionnaire-based data collection method employed some qualitative questions in the questionnaire and never explained the way of analysing the qualitative data and their roles in supporting the findings. Fourth, the studies conducted survey methodology lacked an explanation of how the sampling where be choosing. Fifth, the studies with a quasi-experimental methodology never discussed the rationale behind the research in term of the case study, and so they always lacked the implication of the research within the case environment context. Sixth, the collected reviewed articles lacked the explanation of the conducted methodology, and they pursued in the methodology part to the data collection method.

Regarding the research streams, the majority of the reviewed articles (88.46%) had no adopted any theory, nor any Socio-technical system theory to improve the philosophical assumption of the research and to have a good theoretical framework to direct the researchers while proceeding to the methodology part and interpreting the collected data. Therefore, the research streams for the collected articles in general were not innovative for three main reasons. They missed out in-depth criticism of the relevant literature to identify the gap in knowledge and thereafter to build the theoretical framework to pursue to further stages. In addition, they did not describe and discuss the research problem within the context of the chosen case study, and so there was no clarity about the rationale behind the research. Second, there were no further implications explained in terms of the contribution to the knowledge and the practice which in turn underestimates the outcome of these studies. Third, the majority of the reviewed articles examined either the pedagogical impact of a well-known educational technology on the students in an academic subject using a quasi-experimental or measured the students and faculties members' perceptions and attitudes towards the use of such educational technology. The outcome of the findings is always positive since the technology has become an essential tool in every aspect of life, and so the positive impact of the technology on the learning process is obvious and is not a question. For example, the penetration of the smart devices and mobile

 

technologies are expected to reach 44.8% by 2015 in Saudi Arabia owing to main reason including the young population demographics and tech-centric population in Saudi Arabia (Altayar & Alkraiji, 2015; Eidaroos & Alkraiji, 2015). Thus, the question that we should ask in Saudi Arabia is what research should come next in the field of educational technology. In this regards, having national collaborative research groups of educational technology is crucial to determine the research basis, trends and directions for the adaptation of service strategies and ICT infrastructures within the universities to maximise the positive impact of the educational technology (Fischer et al., 2015). For example, three main national institutions in the field of educational technology including the National Center of e-Learning and Distance Learning, SDL and Saudi e-University have been established in Saudi Arabia in the recent years as the core of distance learning and e-learning. The researchers lack such studies investigating the current status and related activities of these institutions and the interrelationships with other higher education institutions or even overlapping and conflicts. Another major trend is the smart learning environment through personalization and interactivity. While personalization allows learners to participate in their learning through intelligent functions which can move from stages by predicting the learners' situations and progress rate, interactive communication between teachers-learners and learners-learners can encourage the collaborative leaning and social activities (Kim et al., 2014). One major future research direction is how the Decision Support System (DSS) and Business Intelligence (BI) can be embedded with the learning management systems and how to manipulate the big data to enhance the quality of the education systems (Sin & Muthu, 2015). The economic streams of the educational technology on the learning operations might contribute to the improvement of the educational technologies since Saudi Arabia has witnessed a steady increase of private universities and colleges in the last decade. Investigation into the future trends in educational technology and instrument instructions can be a promising area for the adaptation of national strategic plan and ICT infrastructure in higher education in Saudi Arabia. Cloud computing can help educational institutions to leverage the cost savings whilst making the collaboration of learning processes between other institutions available (Gonzalez-Martínez et al., 2015).

## 6. Implications for Theory

The remarkable implication of this research is the description of the status of the educational technology research in Saudi Arabia. This research presents a framework of three dimensions including general characteristics of studies, research design and research streams in order for other researchers to use to judge in quantitative methods the contribution and the quality of the nation studies to the field of e-learning and IS in general. In addition, this framework of analysis and results can be used to put forward about the future directions and recommendation in order to adapt the educational technology for the improvement of the instrument instructions and pedagogical aspects.

## 7. Conclusion

In this study, a systematic review based on inclusion and exclusion criteria was undertaken to retrieve peer-review journal articles conducting educational technology in Saudi universities. Fifty-two journal articles have been passed the eligibility procedures for further investigation. A Meta-Analysis approach has been employed to interpret statistically the Fifty-two collected articles in terms of general research characteristics, research design and research streams. The finding exposed that the majority of the reviewed articles were published from 2010 and later, whereas the publication journal of the reviewed articles exposed low rate in term of the impact factor. Most of the articles were based on a case study methodology; however, an observation of weakness in the methodology design was dramatically clear. The reviewed articles lacked in general a theoretical framework, the gap in knowledge within the literature, the interrelated between the case study and the research problem and the practical and theoretical implications. Using either questionnaire or pre-test and post-test, research stream within the reviewed articles was only to measure the positive impact of specific educational theologies on the pedagogical aspects or the student and faculties members' perception and attitude; which missed out the innovative aspect of the academic research. The authors highlight some various potential future directions and opportunities for research in this field in the discussion part.

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**Biographies**

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