Computing Departments' Academics' Perceptions on the Impact of Learning Management Systems on Academic Performance

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Abstract

There are currently more than 500 commercial e-Learning software packages and 300 educational e-Learning software packages, but the surprising fact is that academic failure remains high in universities, especially for first-year students, despite all these advances made by e-Learning. It is this high failure rate problem in this e-Learning era that is at the core of this study whose aim is to model factors affecting the perceptions of academics on the impact of learning management systems (LMSs) on academic performance.

This aim will be achieved by following the research question: what are the factors that are affecting the perceptions of academics on the impact of learning management systems on academic performance? Three types of research objectives are used to achieve this aim, namely: (i) to design a theoretically sound model of the factors affecting the perceptions of academics on the impact of LMSs on academic performance. (ii) to empirically test the designed model. (iii) to suggest recommendations on how to improve the perceptions of academics on the impact of LMSs on academic performance.

Objectives (i) was accomplished through a content analysis method of reviewing of existing appropriate literature of factors that are affecting the impact of LMSs on e-Learning context; whilst objective (ii) was met by conducting a survey of seventy-eight (78) academic staffs from four public universities of KwaZulu-Natal province of South Africa. On the other hand, objective (iii) was met through a comparison of the results of the survey conducted against the literature analysed.

The outcomes of these three objectives are as follows: (i) the Welberg's theory of education, the self-determination theory, the self-regulated learning theory, the social constructivism theory, and the task technology fit theory can be used as suitable theories applicable to examine the perceived impact of e-Learning on academic performance. (ii) It makes logic to theorize that, on the one hand, academics' perceived impact of LMSs on academic performance are indirectly affected by their gender, their type of employment and their ethnicity.

On the other hand, academics' attitude towards e-Learning, their computer self-efficacy, their pedagogical beliefs, and their use of LMSs directly affects their perceived impact of

LMSs on academic performance of students. It can be concluded that academics' perceived impact of LMSs on academic performance can be enhanced by optimising academics' computer self-efficacy, their pedagogical beliefs, and their attitude towards LMSs.

Keywords: e-Learning, LMSs, Iimpact of e-Learning, Academic performance

Declaration

Mna, Mbangata Lubabalo ndivakalisa ukuba umsebenzi wophando owethulwe kule ngcaciso ngumsebenzi wam wangaphambili, kwaye awuzange ungeniswe ngaphambili okanye inxalenye yawo kwenye iyunivesithi. Ndikwazisa ukuba lo msebenzi wokuphanda awuphuli malungelo abanye, njengoko yonke imithombo ecatshulweyo okanye esetyenzisiweyo ibonisiwe kwaye iyavunyelwa ngoluhlu olubanzi lweenkcazelo ngokubhekiselele ekupheleni kwezi zihloko.

I, Mbangata Lubabalo, hereby declare that the research work presented in this dissertation is my original work and has not been previously submitted in its entirety or in part for a degree in any other university. I also declare that this research work does not violate the right of others, as all the sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references towards the end of this document.

[redacted]

Mbangata Lubabalo 19/08/2019 **Date**

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Supervisor: Prof S.D. Eyono Obono 19/08/2019 **Date**

Dedications

KuNdikhoyo, umazi wezinto zonke, umqali nomgqibelelisi wezinto zonke, makubeludu, uzuko, nobukhosi kuye yena yedwa.

To God almighty, the all-knowing, the beginning and the ending of all things, peace, glory, and majesty to him alone.

Kumakhulu wam uMaDlomo “Gogosi” ongasekho, umkhuluwa wam uThembelani “Baba-nje” ongasekho, kunye nomtakwethu uAvumile “Tsotsitali” ongasekho, ndiyazi ukuba beniyixabise kangakanani imfundo.

To my late grandmother, uMaDlomo “Gogosi”, my late cousin brother, uThembelani “Baba-nje”, and my late brother, Avumile “Tsotsitali”, I know it to well how much you valued education.

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List of Acronyms

ANCOVA – Analysis Of Covariance

ANOVA – Analysis Of Variance

ASTD – American Society for Training and Development

CMI – Computer Mediated Instruction

CTA – Certificate in the Theory of Accounting

D2L – Desire 2 Learn

DUT – Durban University of Technology

EIES – Electronic Information Exchange System

ICT(s) – Information and Communication Technology(ies)

LCMS(s) – Learning Content Management System(s)

LMS(s) – Learning Management System(s)

MIT – Massachusetts Institute of Technology

MUT – Mangosuthu University of Technology

NJIT – New Jersey Institute of Technology

NSDL – National Science Digital Library

ODL – Open and Distance Learning

SDT – Self-Determination Theory

SPSS – Statistical Package for Social Sciences

SRLT – Self-Regulated Learning Theory

TTFT – Task-Technology Fit Theory

UCL – Universite Catholique de Louvain

UKZN – University of KwaZulu-Natal

UMDL – University of Michigan Digital Library

UNISA – University of South Africa

UniZulu – University of Zululand

VLE – Virtual Learning Environment

WBL – Web Based Learning

WebCT – Web Course Tools

Chapter 1 INTRODUCTION

The purpose of this chapter is to introduce this dissertation by defining the main concepts of this study, and by highlighting the positive impact of e-Learning in education, as well as the research background of this study. It is hoped that, after reading this chapter, readers will have a good idea on the purpose of this study and its rationale.

1.1 Research background

The background of this study resides within the context of e-Learning; more precisely, this study is an attempt to understand the perceived influence of e-Learning on academic performance in higher education for computing subjects. This being a perceptions' analysis, the choice of stakeholders for such an analysis is wide, ranging for example from students, university officials, parents, academics, and even the public at large. This is the case because of the increased popularity of e-Learning Management Systems (LMSs). What is however intriguing is that academic failure remains high in the computing field as highlighted later on in the problem statement section of this chapter. Before presenting more precisely the aim, objectives, and the research questions of this study on the perceived influence of e-Learning on academic performance in higher education for computing subjects, it seems important to define the concept of e-Learning and list a few examples e-Learning Management Systems (LMSs).

1.2 Concepts of e-Learning

The use of computing technology is increasingly entrenched in the classroom. According to Gonzalez (2010), there are three possible conceptions of the use of Information and Communication Technologies (ICTs) in education: i) As a tool to deliver learning resources, ii) As a tool for knowledge construction and distribution, and, iii) As a tool that students can use to engage in online discussions or to communicate with peers and teachers either in an asynchronous manner or in a synchronous manner. In fact, ICTs have become part of the daily life of many in this twenty-first century, even though the general use of ICTs can be traced back to the 19th century with the invention of a telegram in 1861 and the telephone in 1867 (Harasim *et al.*, 2006). In the 20th century, the use of ICTs started to spread to almost all aspects of life. This includes the health sector with e-Health, the business sector with e-Commerce, the government sector with e-Government, and the

education sector with e-Learning, just to name a few. E-Health is defined by Boogerd *et al*. (2015:2), citing Eysenbach (2001), as "an emerging field of medical informatics, referring to the organization and delivery of health services and information using the Internet and related technologies"; and it is acknowledged as an embodiment of "not only a technical development, but also a new way of working, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally and worldwide by using information and communication technology". According to DeLone and McLean (2004:31), e-Commerce is defined as "the use of the Internet to facilitate, execute, and process business transactions that involve a buyer and seller and the exchange of goods or services for money". As for e-Government, it is defined by Sá *et al*. (2016) as the delivery and consumption of government information and services via digital connections. As for e-Learning, it deserves to be presented in a more detailed fashion mainly because it is the main focus of this study.

e-Learning can be described in terms of several concepts such as the different types of e-Learning, and the categories of e-Learning tools, just to name a few.

1.2.1 Types of e-Learning

According to Guri-Rosenblit (2005), even though the use of Information and Communication Technology in education can be traced back to the beginning of the 20th century with distance education, there is still no unanimity on the choice of the best term that can define it. In fact, confusion is still high on the differences between the following terms that are all related to the use of ICTs in education (Bates, 1995, 1999; Harasim *et al*., 1995, 2006; Selinger and Pearson, 1999; Guri-Rosenblit, 2001a; Njenga and Fourie, 2010; Gerhard and Mayr, 2002; Moore *et al*., 2011; Robertson, 2003):

- Web-based learning,
- Computer-mediated instruction,
- Virtual classrooms,
- Online education,
- E-Learning,
- Open and distance learning,
- Cyberspace learning,

- Distributed learning,
- Blended learning, and
- Mobile learning.

1.2.1.1 Web-based learning (WBL)

According to Trombley and Lee (2002), web-based learning (WBL) "is defined as learning that is delivered wholly or in part via the Internet or an Intranet, and can be regarded as a means for learning, collaboration, and communication". This includes media such as text-based web pages and files, graphics, video and audio downloads, simulations, interactive web video and audio conferencing, chat rooms, instant messaging, threaded discussion groups, bulletin boards and emails. This type of learning may happen either synchronously or asynchronously. Synchronous WBL refers to situations where a community of learners and an instructor/facilitator are concurrently online, and they are interacting with one another on a real-time basis. As for asynchronous delivery, it can be accomplished in a self-paced environment without any participatory interactions, but it may also include "non-real-time" interactions such as threaded discussions, bulletin boards, and emails.

1.2.1.2 Computer-mediated instruction (CMI)

Computer-mediated instruction (CMI) is defined as a joint learning process among members of a computer-mediated learning environment with an emphasis on learner development through cognition, motivation, and social advancement, for knowledge construction and for community building (Chou, 2001). CMI usually takes place over internet, intranet and on computer networked devices either synchronously or asynchronously (Hiltz and Wellman, 1997).

1.2.1.3 Virtual classrooms

According to Hiltz and Wellman (1997:46), citing Hiltz (1994) and Hiltz (1968), "the Virtual Classroom is NJIT's [New Jersey Institute of Technologies] trademarked name for versions of its electronic information exchange system (EIES) with special software structures designed to support collaborative learning, including those meant to force active participation, and to allocate unique assignment topics, and exam and gradebook facilities". Virtual classrooms are sometimes considered as a learning instrument because they allow students and instructors to pursue their teaching and learning goals, but they

can also be considered as a community that gives a sense of belonging to students and instructors as they exchange ideas, feelings, and experiences (Hiltz and Wellman, 1997).

1.2.1.4 Online education

Porter (2015:1) defines online education "as a form of distance education where 100% of the instruction and interaction taking place between students and faculty is conducted in either a synchronous or an asynchronous manner via the Internet". However, for Allen *et al*. (2016), in order for online education to happen, at least 80% of the course content must be delivered online, while the remaining content can be delivered offline. Kelly *et al*.'s (2016:34) definition of online education is less restrictive as it refers to any "formal education that involves the use of computing technologies, irrespective of where the education takes place".

1.2.1.5 Open and distance learning

According to Peter (2017:10), open and distance learning (ODL) "is a system of education in which education is imparted to learners who may not be physically present on campus" on a full-time basis. One of the benefits of ODL is to open the doors of education in situations where "the source of information and the learners are separated by time and distance, or both" (Modesto and Gregoriose, 2016:45). Peter (2017) also highlights the fact that ODL is cost-effective to part-time learners who are then able to work and study simultaneously.

1.2.1.6 Cyberspace learning

Youn (2004:885) defines cyberspace as "the interactive digital space created by computer networks, in particular the Internet". According to Chen (2001), this term "was invented by Gibson in his novel Neuromancer for describing this new encompassing medium of communication and control". Simmons *et al*. (2004:29) also cite Beneditk (2000) who defines cyberspace as "a world in which the global traffic of knowledge, secrets, measurements, indicators, entertainments, and alter-human agency takes on form: sights, sounds, [and] presences never seen on the surface of the earth blossoming in a vast electronic light". This is in line with the claim made by Simmons *et al*. (2004) that, in cyberspace learning, it is not the learning content that is essential, but it is the interaction either between learners and instructors, or among learners themselves. Wang (2015) also states that cyberspace learning helps students to engage with their instructors and with

other students; it helps to minimize the use of papers; and it also helps students to catch-up with their school work when necessary.

1.2.1.7 Distributed learning

Chen (2001) cites Commonwealth of Learning (2000) to define distributed learning as a terminology that is synonymous with distance learning, with an emphasis on the learning process rather than on the ICTs used or the geographic distance between the teacher/instructor and the learner. Distributed learning "makes learning possible beyond the classroom and, when combined with classroom modes, [it] becomes [synonymous with] flexible learning". The same author also cites COL (2000:6) on the following characteristics of flexible learning:

- "Convergence of open and distance learning methods, media and classroom strategies;
- Learner-centred philosophy;
- Recognition of diversity in learning styles and in learners' needs;
- Recognition of the importance of equity in curriculum and pedagogy;
- Use of a variety of learning resources and media; and
- Fostering of lifelong learning habits and skills in learners and staff".

Lea and Nicoll (2013:2) also stress that distributed learning is "concerned with: the breaking down of traditional boundaries between face-to-face and open and distance education; the relationship between the global and local contexts of learning; and learning as distributed between contexts and not tied to formal institutional settings".

1.2.1.8 Mobile learning

According to Frehywot *et al*. (2013:4), mobile learning is a learning "approach that involves the use of mobile technologies [like smart phones and tablets] so that learners can access instructional materials remotely for just-in-time learning". Martin and Ertzberger (2013) see mobile learning as a form of "anytime and anywhere" access to learning resources using mobile technologies. According to Sharples *et al*. (2009), in mobile learning, mobility has three dimensions, namely, the physical dimension, the conceptual dimension, and the social dimension. As for Baran (2014), the following attributes characterise mobile learning: mobility, access, immediacy, situativity, ubiquity, convenience and contextuality.

1.2.1.9 Blended learning

Frehywot *et al*. (2013:3) define blended learning as the "mixing of different learning environments and approaches that often includes both face-to-face classroom methods and computer-mediated activities" inside or outside the classroom. Graham (2006) sees blended learning as a combination of teaching from two distinct learning environments which are the traditional teaching environment and the full e-Learning environment. Tarus *et al*. (2015) also cite Garrison and Vaughan's (2008) definition of blended learning as "the thoughtful fusion of face-to-face and online learning experiences". From the above definitions, one can note that, in blended learning, the emphasis is on the combined use of electronically mediated teaching and learning methods with face-to-face teaching and learning methods.

1.2.1.10 E-Learning

According to Tynjala and Hakkinen (2005), "it is rather worrying that e-Learning is sometimes interpreted in a narrow sense as referring to [the] process of delivering digital information and study materials to people through the electronic media". For Bora and Ahmed (2013), the term e-Learning is "commonly referred to the intentional use of networked information and communications technology (ICT) in teaching and learning", and it includes all electronically supported forms of teaching and learning. Sun *et al*. (2007:1) propose a similar definition of e-Learning as the "use of telecommunication technology to deliver information for education and training". On the other hand, Sangrà *et al*. (2012) consider e-Learning as a "natural evolution of distance learning, which has always taken advantage of the latest tools to emerge in the context of technologies for structuring education". This definition is supported by Friesen (2009), according to whom the focus of e-Learning lies at the intersection between education, teaching, learning and ICTs. Guri-Rosenblit (2006) also defines e-Learning as "the use of electronic media for a variety of learning purposes that range from add-on functions in conventional classrooms to full substitution for the face-to-face meetings by online encounters". Other definitions of e-Learning are proposed by Garrison (2011) and Sangra *et al*. (2012), cited by Tarus *et al*. (2015), according to whom e-Learning is the construction and confirmation of knowledge through the mediation of asynchronous and synchronous communications, from the natural evolution of distance learning, and with the use of the latest technologies in education. As for Ncube *et al*. (2014), the definition of e-Learning revolves around

tuition, content development and management, content delivery, assessment, interactive participation, constant monitoring, and the ability to detect risk students, with the help of Information and Communication Technology tools.

1.2.2 Categories of e-Learning tools

According to Kuhlthau (1991), cited by Marshall *et al*. (2003), there are three types of e-Learning tools, and "each type of tool emphasizes different parts of the [Kuhlthau six stages information search] process". These six stages are: initiation; collection; exploration; formulation; selection; and presentation. The three types of e-Learning tools are: curriculum tools; digital library tools; and knowledge representation tools. Curriculum tools focus on the initiation and the selection stages, digital library tools emphasize on the exploration and the collection stages, and knowledge representation tools are focussed on the formulation and the representation stages. These tools are further presented in the following sub-sections.

1.2.2.1 Curriculum tools

According to Hoadley and Galant (2016), curriculum tools refer to resources that support the implementation of the curriculum. E-Learning curriculum tools are usually made up of three "integrated parts: instructional tools, administration tools, and student tools" (Marshall *et al.*, 2003). These tools are further categorised in the context of e-Learning either as learning management systems (LMSs) or as learning content management systems (LCMSs). All the other e-Learning terms and acronyms can be considered either as synonymous of LMSs or as synonymous of LCMSs even though Watson and Watson (2007:28) consider e-Learning curriculum tools terminology as "a veritable alphabet soup of terms and acronyms". For Weller (2007:5), one "should consider VLE and LMS [as] synonymous" where VLE stands for virtual learning environment. Itamazi *et al*. (2005) also argue that learning content management systems and learning course management systems are similar denominations of e-Learning platforms, despite their minor differences. According to Irlbeck and Mowat (2007), the main difference between LMSs and LCMSs is that "the primary objective of a learning management system is to manage learners […] [but,] by contrast, a learning content management system manages content or learning objects".

1.2.2.1.1 Learning management systems (LMSs)

Itamazi *et al*. (2005) regard LMSs as systems that can, for example, manage the logs of registered users and course catalogues, track learners' activities and results, and produce reports to management. For Lepori *et al*. (2005), cited by Inversini *et al*. (2006), LMSs "are complex web-based applications that support online or blended learning activities by providing tools for content delivery, learning assessment, communication services (e.g. discussion forums or chat lines), and course management (e.g. editing, back-up, enrolment, etc.)". Learning management systems can, for example, be used by students to "communicate with their instructors and each other in learning communities, access learning materials, take quizzes, and [even] submit assignments […]" (Melton, 2006). LMSs are also helpful for monitoring students' participation and for the assessment of their performance. Some well known LMSs include: Blackboard, Moodle, WebCT, IntraLearn, DotLRN, Desire2learn, ATutor, Olat, and Claroline.

Blackboard was developed in 1997 and, since then, it is considered as one of the most popular LMSs (Alharbi and Drew, 2014). In 2000, Blackboard Inc. acquired MadDuck, one of its competitors, which was based in Richmond (USA). In 2001, it acquired CampusWide Solutions Inc. and CEI Special Teams, respectively, from AT&T and from iCollege Inc. In 2002, it acquired Prometheus from George Washington University and, in 2003, it acquired the assets of SA Cash (Bradford *et al*., 2007). After the merger of Blackboard and WebCT in 2009, some of the functionalities of WebCT were included in Blackboard Learn 9 (AUT University, 2011).

According to Ozdorgu and Cagiltay (2007), Moodle is amongst the best applications both for content management and for learners' management. It follows the social constructivism approach. It was initially developed in 2002. Moodle's open source philosophy allows users to change its design according to their own needs. According to AUT University (2011), citing Pina (2010), since 2002, Moodle has always been available for free download and implementation, and it is firmly evolving because of the support of developers, users and administrators. This global support leads to exciting and professional customisations (Pandey and Pandey, 2009).

WebCT (Web Course Tools) was developed in 1995 by Murray Goldberg, a faculty member at the University of British Columbia (USA), but it was purchased in 1999 by

Universal Learning Technologies WebCT (Yaqub *et al*., 2015). WebCT has different communication tools, including a bulletin board, chat rooms and e-mail. Furthermore, Yaqub *et al*. (2015) note that graphics, audio files and video can be integrated to WebCT sites. These features facilitate the interaction between instructors and students (Bonk *et al*., 2003). WebCT also offers a collection of features and tools for tele-conferencing, access control, ease of navigation, grades management and for the tracking of student progress (Williams, 2003).

IntraLearn was developed in 1994 by IntraLearn Corporation, a USA company, but it also has a Portuguese version (Martinez Zaina *et al*., 2001). According to Santos and Hammond (2006), IntraLearn was developed in 1994 to enhance the teaching and learning environment, by offering both asynchronous and synchronous communication tools. IntraLearn can either be used as a public space for individual learners that do not belong to any formal class, or it can be used as a private space for only registered users. According to Martinez Zaina *et al*. (2001), IntraLearn is well reputed for it user-friendly interface.

DotLRN was developed by the Massacheusetts Institute of Technology (MIT) in 1997 (DotLRN, 2017). It is an open source code learning management system that stores both study materials and students' assignments (Yildiz and Isman, 2016). The same authors note that DotLRN caters for "course management, learning management, content management, and online community management" (Yildiz and Isman, 2016:2860). According to Aberdour (2007), DotLRN is supported by the LRN Consortium, a non-profit organisation that handles its governance, its coordination and its ongoing development. In 2007, DotLRN was being used worldwide by over half a million of users, both in higher education, in the government sector by non-profit organisations, and by the USA's K-12 education sector (Aberdour, 2007).

The first release of Desire2Learn (D2L) took place in 1999 (Desire2Learn, 2017). According to Wang and Shoa (2008), D2L has a "built-in competency structure for specifying learning objectives and assessing students' accomplishments through associated learning activities". It also allows the instructor to post quizzes and exams for the mid-term exams and for the end of the course exams. These quizzes and exams are

often posted with a certain access period, and students can take open-book tests at their chosen location which might not necessarily be their classroom (Mendez 2014). According to Sridhara (2009), "assignments, tests, and other course-related materials posted on the D2L can be edited online if they are saved in the *html* format". Furthermore, D2L has an efficient grading tool that allows the posting of grades in different formats, such as letter grades, points or percentage.

ATutor was initially developed in 2002 by the Adaptive Technology Resource Centre at the University of Toronto, Canada (ATutor, 2017; Yaqub, 2015; Khaimook, 2010). Lengyel *et al*. (2006:21) consider ATutor as "a promising system that provides good documentation, ease of installation, and strong potential for development". It was designed with accessibility and adaptability in mind in order to make its installation and update easy, and to allow system administrators to customise their user interface (Álvarez-González *et al*., 2005). According to Alvarez-Gonzales *et al*. (2005:3), in ATutor, "educators can quickly assemble, package, and redistribute Web-based instructional content, easily retrieve, and import pre-packaged content, and conduct their courses online". ATutor has been identified by the American Society for Training and Development (ASTD) as having desirable features for disabled people (Yildiz and Isman, 2016). For Alvarez-Gonzales *et al*. (2005), ATutor is one of the very few LMSs that supported learning object repositories in 2005, making it even more reusable. Gordillo *et al*. (2013) note that the main benefit of the reusability of learning objects is to "reduce time and to enable cost-effective development by reusing learning materials instead of repeatedly authoring them". In fact, the following definitions of learning objects are all focused on the concept of reusability.

*"Any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning" (*Arslan and Yildirim, *2016);*

A small, self-contained, and reusable entity that can be used independently or collectively into a larger content (Millar, 2003, cited by Arslan and Yildirim, 2016); and

"A digital piece of learning material that addresses a clearly identifiable topic or learning outcome and has the potential to be reused in different contexts" (Weller *et al*., 2005:3 cited by Arslan and Yildirim, 2016).

According to Mabbed and Koehler (2012) and Filser and Schneider (2008), the initial development of OLAT started in 1999 at the University of Zurich, in Switzerland, where it was maintained and supported by the Information Technology Department of the University. Currently, the system is freely available for download. It is a web-based learning management system developed in the JAVA programming language and it can support MySQL server, Postgres and HSQL. According to Yildiz and Isman (2016), OLAT offers "file sharing, chat, discussion forums, and support groups". OLAT also allows for the creation of user groups.

According to Lebrun *et al.* (2009:347), Claroline "was initially developed between 2001-2002 to sustain and foster pedagogic innovation at the Université Catholique de Louvain (UCL) in Louvain-la-Neuve, Belgium". Its initial intention was to serve in a blended environment, mixing traditional lectures with online technological tools. According to Lebrun *et al.* (2009:351), "the Claroline platform does not presuppose a certain pedagogical style, [instead], the platform allows teachers to use complements to traditional lectures (e.g., the tools "Documents and Links" and "Agenda)"; it also allows collaborative supported work (with inter alia, the tools "Announcements" and "Forums") and student activities (using "Works" or "Exercises")".

1.2.2.1.2 Learning content management systems (LCMSs)

According to Irlbeck and Mowat (2007), the primary function of LCMSs is to store "online content to be managed and reused through integrated databases". For Jones (2001), as cited by Irlbeck and Mowat (2007), the purpose of LCMSs is to improve the delivery of digital learning content. As for Sejzi and Aris (2013), LCMSs epitomize a multi-users' workplace where education content developers can create, store, reuse, manage, and deliver digital learning content from a dominant object repository. Sejzi and Aris (2013) also cite Donello (2002) to re-iterate that "LCMS are 1) an authoring tool suitable for non-programmers; 2) a dynamic delivery interface that delivers content; 3) an administrative component that manages learner records, launches course, and tracks progress; 4) a learning object repository that is a central database that houses and manages content". For Irlbeck and Mowat (2007), LCMSs' central databases or repositories deliver learning objects which can "either be reusable learning objects or learning assets or sharable content" and can "combine objects into learning modules […] [that] are

presented to learners through the interface which tracks users, provides links to information, and handles assessments and feedback". As a result, these LCMSs offer the following features to learners: chat-rooms, discussion forums and video conferencing.

1.2.2.2 Digital libraries

According to Saracevic and Dalbello (2001:212), citing Arms (2000), digital libraries are "a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network". Tejed-Lorente (2014) sees digital libraries as computerized systems capable of creating information quicker than their users can process. An earlier perspective on digital libraries is the one from Gapen (1993), where the emphasis is on the interaction between the system and its users. Roknuzzaman *et al*., (2009) view digital libraries as the "remote access to the contents and services of libraries and other information resources, [which combine] an on-site collection of current and heavily used materials in both print and electronic form, with an electronic network which provides access to, and delivery from, external world-wide library and proprietary information and knowledge sources''. As for Witten *et al*. (2000), digital libraries are a "collection of digital objects, including text, video, and audio, along with methods for access and retrieval, and for selection, organisation and maintenance of the collection". Witten *et al*. (2000) also cite Lesk (1998) to emphasise that digital libraries are an "organised collection of digital information […] where the principles governing what is included and how the collection is organised" are clearly articulated. These tools "help users find the right information amidst a huge amount of digital material [s, and their] features usually include search, browsing, and discovering special collections or exhibits" (Marshall *et al*., 2003:2). Some examples of digital libraries include the Computing and Information Technology Interactive Digital Educational Library (CITIDEL), the University of Michigan Digital Library (UMDL), and the National Science Digital Library (NSDL), all located in the United States of America (Marshall *et al*., 2003). According to Fox (1998), there are ten variations to the word digital library, however, the following four terms can be found in the exiting literature in reference to digital library: virtual library, electronic library, library without walls and internet library (Borgman, 1999; Roknuzzaman *et al*. 2009).

1.2.2.3 Knowledge representation and mapping tools

Knowledge representation tools are also known as knowledge mapping tools or knowledge visualization tools, as opposed to text-based curriculum tools (Marshall *et al*., 2003). According to Evagorou and Avraamidou (2008:37), these visual tools are "specially designed to help students construct [visual] arguments by connecting evidence to the appropriate claim". They facilitate collective learning by "providing learners with the means to articulate emerging knowledge in a persistent medium, inspectable by all participants, where the knowledge then becomes part of the shared context" (Suthers, 1999:4). Concept maps and web maps are two well-known knowledge representation tools (Marshall *et al*., 2003).

According to Ku *et al.* (2014:143), concept maps are a "graphical meta-cognitive tool […] to express [the] understanding of [a] knowledge theme". For Coa and Zhang (2005:72), concept maps are an "information visualization technique that allows both learners and instructors to construct spatial-semantic displays of […] concepts, knowledge, and skills". According to Karpicke *et al*. (2001:772), "concept mapping bears the defining characteristics of an elaborative study method: It requires students to enrich the material they are studying and encode meaningful relationships among concepts within an organized knowledge structure". A concept map uses node-link diagrams to represent concepts as well as the relationships between these concepts. Concept mapping is regarded as an active learning approach in the sense that it allows students to visually represent learning concepts when they are learning.

Fernández *et al*. (2000:4) define web maps as a "common set of [the] possible requests that a server […] [can] answer". Web map servers have three common types of requests: map requests, feature information requests and capabilities requests. "Map [requests] refer […] to […] requests [made] to the server in order to obtain a specific map file covering a zone of interest". Feature information requests can be considered as an "extension of map requests" in the sense that they intend to seek the information features of map requests. As for capabilities' requests, they refer to the following characteristics of map servers: the services that they can perform, their different types of maps, and the format and reference systems of their answers (Fernández *et al.*, 2000). For Kraak (2004:87), one of the main advantages of web maps is that they "can be easily used in the

world of mobile geo-computing [where] people […] have portable devices such as mobile phones and/or personal digital assistants". Geocomputing is defined by Ehlen *et al.* (2002) as "the eclectic application of computational methods and techniques to portray spatial properties, to explain geographical phenomena, and to solve geographical problems".

1.3 Advantages of e-Learning

The use of e-Learning in education comes with many advantages as classified in the following examples from Popescu and Simon (2012), Akaslan and Law (2010), and MacKeogh and Fox (2008). These e-Learning advantages are the enhancement of reputation, the development of information skills, the broadening of access to education, support for disabled learners, the improvement of the quality and flexibility of teaching and learning, and the reduction of the cost of education (MacKeogh and Fox, 2008). As for Arforful and Abaidoo (2015), these advantages can be classified in the following categories: a) Time and place flexibility; b) Enhanced efficacy of knowledge and qualification due to the ease of access to a huge amount of information; c) Provision of communication opportunities between learners through discussion forums; d) Consideration of individual differences between learners; e) Compensation for the scarcity of academic staff, including instructors of teachers as well as facilitators, and lab technicians; and f) Self-paced learning.

1.3.1 Time, pace, and place flexibility

According to Ncube *et al.* (2014), e-Learning allows lecturers to be able to respond to students' queries even when they are not in their physical offices. Karlovcec *et al.* (2005) also note that e-Learning allows students to be "able to study the materials and take necessary exams to successfully complete the course", even when they were absent from the class. This is made possible because of the use of self-paced e-Learning tools which refer both to off-line and to online learning resources (Bretz & Johnson, 2000; Burgess, 2003; Twigg, 2002). Students can, therefore, learn at their own pace within their own locations, for example, at home, in residence halls, in laboratories, and even at the workplaces. The use of ICTs in education can remove time and place constraints on teaching and learning to provide the flexibility that many tertiary students are now demanding (Wang 2009). Both synchronous and asynchronous e-Learning have the capability to facilitate time, pace and place flexibility for learners and for instructors.

1.3.2 Reduction of cost of education

According to Gilbert *et al.* (2007:561), citing Alexander (2001), two of the main reasons why technology should be used in higher education are to "reduce the costs of education; and to improve the cost-effectiveness of education". Alexander (2001) also claims that the adoption and the use of e-Learning has the ability to "enhance student learning while significantly reducing instructional costs". Alexander (2001) cites Daniel (1997) who believes that "technology provides the most fertile ground for growing these key ingredients of university renewal: lower costs and unique attractions". This claim is supported by Wang (2009) according to whom e-Learning can help universities to lower their average courses' costs per student. Popescu and Simion (2012) also regard e-Learning as an affordable teaching and learning approach. According to Dharmalingam and Pazhanivelu (2015), the technological advancements of e-Learning help educational establishments reduce their costs and such cost savings are passed on to students to the point where they contribute to bringing education to a wider students' population. E-Learning also has the ability to reduce travelling costs for students, in general, and for working students, in specific (Akaslan and Law, 2010). It is worth noting that these savings in travelling costs can be cumulated with accommodation and study savimgs in material costs , and they apply both to synchronous and to asynchronous e-Learning. The same applies to cost savings related to the compensation of staff shortages.

1.3.3 Improved interactions between learners

E-Learning interaction features facilitate active communications and discussions between learners (Arkorful and Abaidoo, 2015). They can also contribute to the improvement of the interaction between students and instructors, including for group work, either synchronously or asynchronously (Wang, 2009). Such synchronous and asynchronous communications offer the provision of both instant and delayed reactions where learners and instructors engage in in-depth discussions and feedback (Almosa and Almubarak, 2005). According to Chauhan (2017), the nature of feedback is not the same in synchronous e-Learning and in asynchronous e-Learning. In synchronous e-Learning, feedback is fast and instantaneous, but in asynchronous e-Learning, learners have the opportunity to join ongoing online sessions at their own pace and time. Feedback is particularly enhanced by asynchronous e-Learning for low pace students as it allows them to develop critical thinking skills when they are engaged in online discussions.

1.4 Problem statement

The main problem at the core of this study is academic failure in this e-Learning era, be it for primary education, for secondary education, or for tertiary education, despite the above highlighted advantages of e-Learning. This problem is well documented in the existing literature, as shown by the following examples from tertiary education. In fact, according to Sadler and Erasmus (2005), in 2003, for the University of South Africa's CTA (Certificate in the Theory of Accounting), Black students enjoyed a pass rate of 21% only, and a mere 9% in 2004. Bennedsen and Caspersen (2007:4) also cite another example where "one [United States (US) computer science community college] reported an average failure rate, over a ten-year period, of 90%". They also mention an undated case of a US university where computer science was the second largest major and which "reported a failure rate of 72%". The same authors are adamant that "there is a huge number of students enrolling in tertiary education who do not graduate" (Bennedsen and Caspersen, 2007:4). Similar trends are reported by Selingo (2013) according to whom Fairleigh Dicknson, an American university, had a graduation rate of only 38% in 2006. These reported high failure rates are alarming, and they might only be a tip on the iceberg, as mentioned by Bennedsen and Caspersen (2007) who claim that many universities are not divulging their real failure figures "because they are embarrassed by their numbers". This calls for the need to investigate these persisting failure rates in this e-Learning era, starting with a brief summary of the disadvantages of both synchronous and asynchronous e-Learning.

1.4.1 Disadvantages of synchronous e-learning

One of the main disadvantages of synchronous e-Learning is its over reliance on technology. If a learner lacks technical skills or computer self-efficacy, then its online learning activities might get unfulfilled and this could push him or her to drop-out from the class (Chauhan, 2017). Since synchronous e-Learning takes place over the network, efficient and high-speed internet connection is a non-negotiable requirement whose absence has direct consequences on teaching and learning. As much as synchronous e-Learning eliminates the challenge of distance, it also comes with a time zone challenge as it may require learners to interact with peers or instructors in different time zones. According to Chauhan (2017), one of the disadvantages of synchronous learning is that it requires careful planning in order to avoid conflicting schedules, and even though this

"coordination of schedules is absolutely necessary, [it is] sometimes not possible". Moreover, synchronous e-Learning requires learners to be outspoken, therefore, learners with poor communication skills may find it difficult to participate in synchronous online discussions and activities.

1.4.2 Disadvantages of asynchronous e-learning

Since communication is delayed in asynchronous e-Learning, it requires the learner to be self-disciplined and self-motivated in order for him or her to learn on his or her own. The lack of instant feedback in asynchronous e-Learning can lead to difficulties to address course-related issues and misunderstandings. According to Chauhan (2017), "communication can be difficult [in asynchronous e-Learning] due to [..] isolation", and it can lead to discouragement and disengagement. Furthermore, Chauhan (2017) notes that "procrastination is more likely to occur in an asynchronous learning environment". According to Njagi (2013), unmotivated learners or those with poor study habits may fall behind, because they do not have an established learning routine and they may take time to get used to the online learning environment. Furthermore, Njagi (2013) notes that, in asynchronous e-Learning, "students may feel isolated or miss […] interaction sessions, and instructors may not always be available on demand, especially when students require them to be online". In an asynchronous e-Learning environment, students require more time to engage with the subject matter and it may take time for them to understand the topic at hand (Jonson, 2006). Hrastinski (2008) also claims that, in asynchronous e-Learning, students "may spend more time [trying to] refine their contributions" so they can be considered as more thoughtful and more of value to the course content discussion. Furthermore, Hrastinski (2008:53) notes that because e-Learners rarely meet face-to-face in asynchronous e-Learning, "students might feel isolated and not [form] part of learning communities, which is essential for collaboration and learning".

To be concise, this study focuses on the problem of high academic failure rate within the context of e-Learning platforms.

1.5 Research question, aim, and objectives

The above presented benefits and challenges seem to question both the actual and the perceived impact of e-Learning on academic performance. The approach adopted by this study is to examine the perceived impact of e-Learning on academic performance, rather

than its actual impact. Therefore, the aim of this study is to model factors affecting the perceptions of computing academics on the impact of learning management systems on academic performance. This aim can also be formulated as the following research question: What are the factors that are affecting the perceptions of academics on the impact of learning management systems on academic performance?

1.5.1 Objectives

The above defined aim will be accomplished through the following three objectives:

i. To design a theoretically sound model of the factors affecting the perceptions of academics on the impact of LMSs on academic performance;

ii. To empirically test the above announced model; and

iii. To suggest recommendations on how to improve the perceptions of academics on the impact of LMSs on academic performance.

1.5.2 Research sub-questions

The above announced research objectives can be formulated through the following three research sub-questions:

i. How can a theoretically sound model of the factors affecting the perceptions of academics on the impact of LMSs on academic performance be designed?

ii. To what extent is the above announced model empirically validated?

iii. Which research recommendations can be made to improve the perceptions of academics on the impact of LMSs on academic performance?

1.6 Structure of the dissertation

This dissertation on the factors affecting the perceptions of academics on the impact of learning management systems on academic performance will consist of six chapters. A brief outline of each chapter of these six chapters is described as follows:

CHAPTER ONE: INTRODUCTION

This chapter defines e-Learning and presents the different types of e-Learning tools and devices as well as the main advantages and disadvantages of e-Leaning. It also presents the aim, research question and objectives of this study on the factors affecting the

perceptions of computing academics on the impact of learning management systems on academic performance.

CHAPTER TWO: RESEARCH METHODOLOGY

This chapter will provide a comprehensive description of the two methodologies that will be followed by this study both for the design of its conceptual model and for the empirical validation of that model. These two methodologies are the content analysis methodology and the survey methodology.

CHAPTER THREE: LITERATURE ANALYSIS AND THEORETICALLY SOUND CONCEPTUAL MODEL

This chapter will review the existing literature on the factors effecting academics' perceptions on the impact of learning management systems on academic performance. Some of these reviewed theories and models will be selected into a theoretically sound model of the factors affecting the use of LMSs by academics.

CHAPTER FOUR: RESEARCH FINDINGS

This chapter will present the results of the survey conducted by this study on the factors affecting the perceptions of computing academics on the impact of learning management systems on academic performance. These results will be presented in the form of set of statistics computed from the analysis of the survey data in terms on means, frequencies and correlations.

CHAPTER FIVE: DISCUSSION, RECOMMENDATIONS AND CONCLUSION

This chapter will compare the current study against the ones presented by chapter three. This comparison will intend to analyse the novelty of this study compared to the existing literature. It will also suggest new ideas and recommendations on how to improve the perceptions of academics on the impact of LMSs on academic performance. The end of this chapter will provide a conclusion for this study on the factors affecting the perceptions of academics on the impact of learning management systems on academic performance.

1.7 Summary

This chapter has briefly introduced the general applications of Information and Communications Technologies (ICTs) in e-Commerce, e-Health, and e-Government,

prior to its focus on e-Learning. It has presented the common synonyms of e-Learning, including web-based learning, computer-mediated instruction, virtual classrooms, online education, e-Learning and mobile learning. It has also presented a comparison of open source e-Learning tools against proprietary e-Learning tools as well as an overview of the history of e-Learning. Learning management systems (LMSs) and learning content management systems (LCMs) are also compared and presented in this chapter, including the following examples: Moodle; ATutor; Blackboard; Claroline; WebCT; Desire2Learn; Intralearn; DotLRN; and OLAT

This chapter has also discussed how e-Learning offers time, pace and place flexibility; how it reduces the cost of education; and how it improves the interaction between students and instructors. However, the persistence of academic failure and the disadvantages of both synchronous and asynchronous e-Learning are highlighted in this chapter, despite the above-identified advantages of e-Learning. Lastly, the structure of this dissertation is given in this chapter after the presentation of its problem statement, its aim and objectives, and its research question and sub-research questions. The next chapter will describe the research methodology to be followed by this study.

Chapter 2 LITERATURE ANALYSIS

The purpose of the previous chapter was to introduce this study. As for the current chapter, its purpose is to present the results of the literature analysis that was conducted by this study on the existing literature on the factors affecting the perceptions of academics on the impact of LMSs on academic performance, in pursuit of the first objective of this study. This presentation will be made according to the following listed steps of content analysis, as recommended by Gaur and Kumar (2017:13): a) the selection of the databases for the content analysis; b) the selection of the sample of the literature to be included in the content analysis; c) the development of the coding scheme of the content analysis; d) the coding of the sample of the content analysis; e) the analysis of the reliability of the coding scheme; and f) the summary of the results of the content analysis as coded by the above-mentioned coding scheme. The results of this content analysis will help with the design of a theoretically sound model of the factors affecting academics' perceptions on the impact of LMSs on academic performance.

The use of content analysis for the achievement of the first objective of this study is motivated by its following definition by Lu and Nepal (2009:7): "Content analysis is a research technique for making replicable and valid references based on the systematic and objective analysis of communications". Content analysis will therefore help this study to analyse the existing literature for the identification of the factors that were found or hypothesised by existing studies to have an impact on the perceptions of academics on the impact LMSs on academic performance in different contextual backgrounds. Those factors are the ones that will form the foundation for the construction of the theoretically sound model mentioned by the first objective of this study.

2.1 Selection of the databases for the content analysis

Google scholar was considered as the central database for the selection of the studies to be reviewed by this dissertation.

2.2 Selection of the sample of the literature to be included in the content analysis

For a paper to be selected by the content analysis performed by this study, the first selection criterion is its free access on google scholar. The second criterion is that it must use the keyword "impact of e-Learning" or the keyword "academic performance", and its

publication date must be between 2003 and 2017. The choice of these keywords is closely related to the words that are used on the title of this study. Finally, this content analysis will only consider empirical studies.

2.3 Development of the coding scheme of the content analysis

The content analysis will code its selected studies in terms of their author(s), their context and their time intervals, their theories, their research method, their data source, their type of data, their sampling techniques, their type of analysis, method of analysis, and their validity and reliability tests methods, as described below.

2.4 Coding of the sample of the content analysis

The content analysis will code its selected studies in terms of their author(s), their context and their time intervals, their theories, their research method, their data source, their type of data, their sampling techniques, their type of analysis, method of analysis, and their validity and reliability tests methods, as described below. All those coding items are important for the interpretation of the different studies beyond their findings on the factors that are affecting the perceptions of academics on the impact of LMSs on academic performance.

2.4.1 Author(s)

This content analysis will present the authors of its list of studies together with their identification codes as enumerated by Tables 2.1 and 2.2.

Table 2.1 Coding scheme for authors of the reviewed studies

Code	Author
1	Fayomi
2	Regueras *et al.*
3	Chong
4	Dodd
5	Owinoi
6	Al-Rahmi *et al.*
7	Zacharis
8	Galy *et al.*
9	Al-Saai *et al.*
10	Islam
11	Owston *et al.*
12	Merino
13	López
14	Romero
15	Barbera
16	McGill
17	Klobas
18	Sharma
19	Lee

Code	Author
20	Eom
21	Lynch
22	Dembo
23	Bianchi *et al.*
24	Johnson *et al.*
25	Bas *et al.*
26	Ladyshewsky
27	Yang
28	Tang
29	Lee
30	Yu
31	Jo
32	Michinov *et al.*
33	Al-Rahim
34	Othman
35	Villavicencio
36	Bernardo
37	Chang
38	Crampton *et al.*
39	Conijn

There are thirty-nine (39) different names that are cited as the main authors of the thirty-four (34) studies of this review (see Table 2.1). The identification of the studies published by these different authors is done by Table 2.3.

Table 2.2 Coding scheme of the reviewed studies

Code	Study
1	Fayomi (2015)
2	Regueras et al (2009)
3	Chong (2010)
4	Dodd (2009)
5	Owinoi (2016)
6	Al-Rahmi et al (2014)
7	Zacharis (2015)
8	Galy et al (2011)
9	Al-Saai et al (2011)
10	Islam (2015)
11	Islam (2013)
12	Owston et al (2012)
13	Islam (2012)
14	Merino and López (2013)
15	Romero and Barbera (2011)
16	McGill and Klobas (2008)
17	Sharma (2007)

Code	Study
18	Lee (2009)
19	Eom (2006)
20	Lynch and Dembo (2004)
21	Bianchi et al (2008)
22	Johnson et al (2009)
23	Bas et al (2013)
24	Ladyshewsky (2004)
25	Yang and Tang (2003)
26	Lee and Lee (2008)
27	Yu and Jo (2014)
28	Michinov et al (2010)
29	Al-Rahim and Othman (2013)
30	McGill et al (2008)
31	Villavicencio and Bernardo (2013)
32	Chang (2014)
33	Crampton et al (2012)
34	Conijn (2016)

The graphical representation of Table 2.3 can be found on Figure 2.1, which shows that each of the following author codes has more than one study: 10, 16 and 19. According to Table 2.1, the authors that are corresponding to these codes are Islam, McGill, and Lee, respectively. In fact, Figure 2.1 indicates that three studies are authored by the author with code 10: Islam (2012), Islam (2013) and Islam (2015). There are two studies from the author with code 19: Lee and Lee (2008), and Lee (2009). Similarly, there are two studies from the author with code 16: McGill (2008), and McGill and Klobas (2008).

Table 2.3 List of studies and their author codes

Study	Author
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	10
12	11
13	10
14	12, 13
15	14, 15
16	16, 17
17	17

Study	Author
18	19
19	20
20	21,22
21	23
22	24
23	25
24	26
25	27, 28
26	19, 29
27	30, 31
28	32
29	33, 34
30	16
31	35, 36
32	37
33	38
34	39

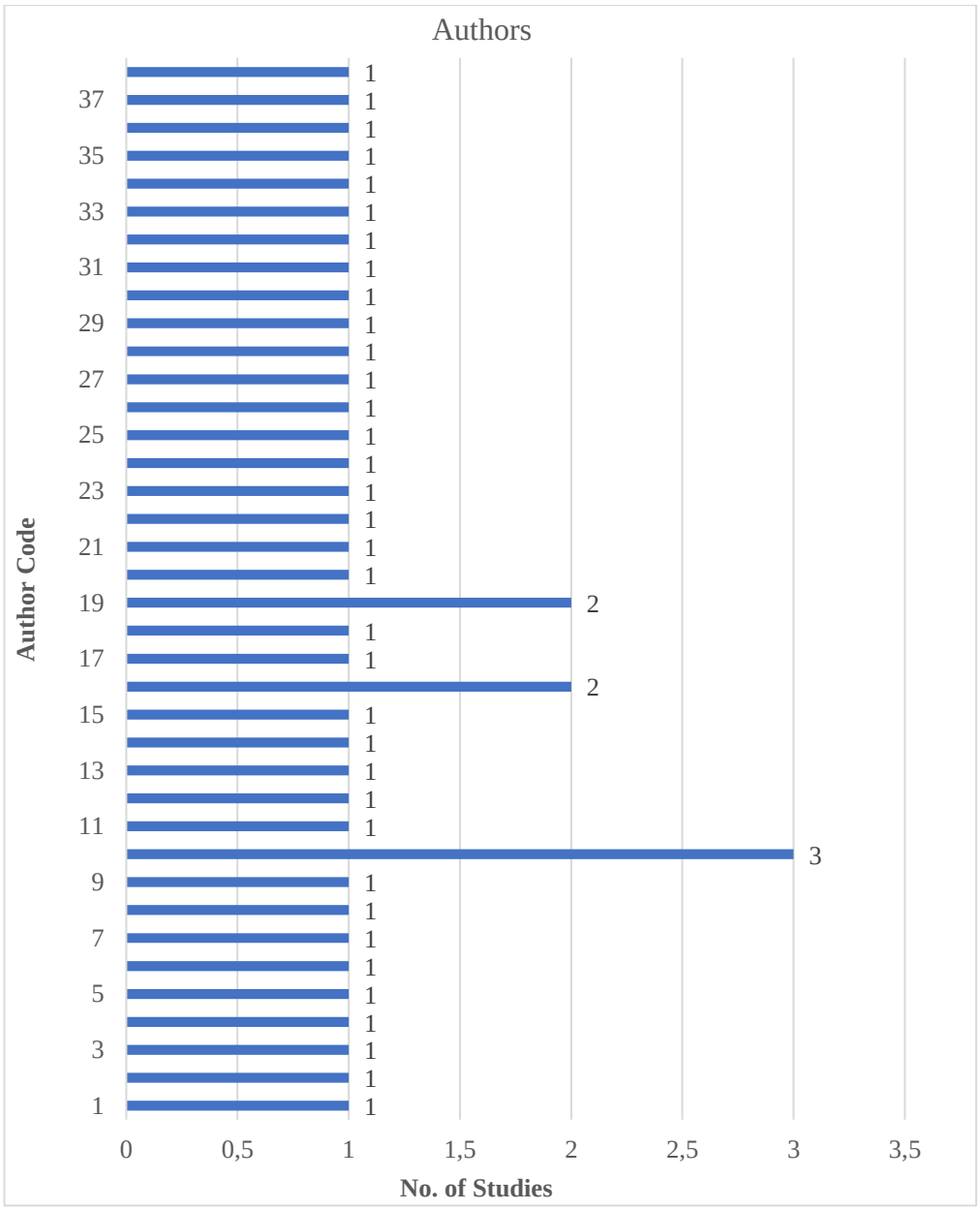


Figure 2.1 Context codes and their number of studies

2.4.2 Context of the study

This content analysis will present the continents serving as the context of its list of studies, as enumerated by Table 2.4, together with their identification codes.

Table 2.4 Coding scheme for context of the studies and time intervals

Table 2.4.1 Coding scheme for the contexts of the studies

Code	Context of study
1	Africa
2	Asia
3	Australia
4	Europe
5	North America

Table 2.4.2 Coding scheme for the time intervals of the studies

Code	Time interval
1	2003 – 2007
2	2008 – 2012
3	2013 – 2017

There are five (5) different continents that are cited as the main context of the thirty-four (34) studies of this review (see Table 2.4.1). The identification of the studies published in these different continents is done by Table 2.5. The graphical representation of Table 2.5 can be found on Figure 2.2, which shows that these two continents each have ten (10) studies, i.e., the continent with code number 2, and the continent with code number 4. According to Table 2.4.1, these continents codes, respectively, correspond to Asia and Europe. On the other hand, the continent with code number 1 has two studies, and according to Table 2.4.1, this continent corresponds to Africa.

Table 2.3 List of studies codes and their context codes

Study Code	Context Code
1	1
2	4
3	2
4	5
5	1
6	2
7	4
8	5
9	2
10	4
11	4
12	5
13	4
14	4
15	4
16	3
17	3

Study Code	Context Code
18	2
19	5
20	5
21	5
22	5
23	4
24	3
25	2
26	2
27	2
28	4
29	2
30	3
31	2
32	2
33	3
34	4

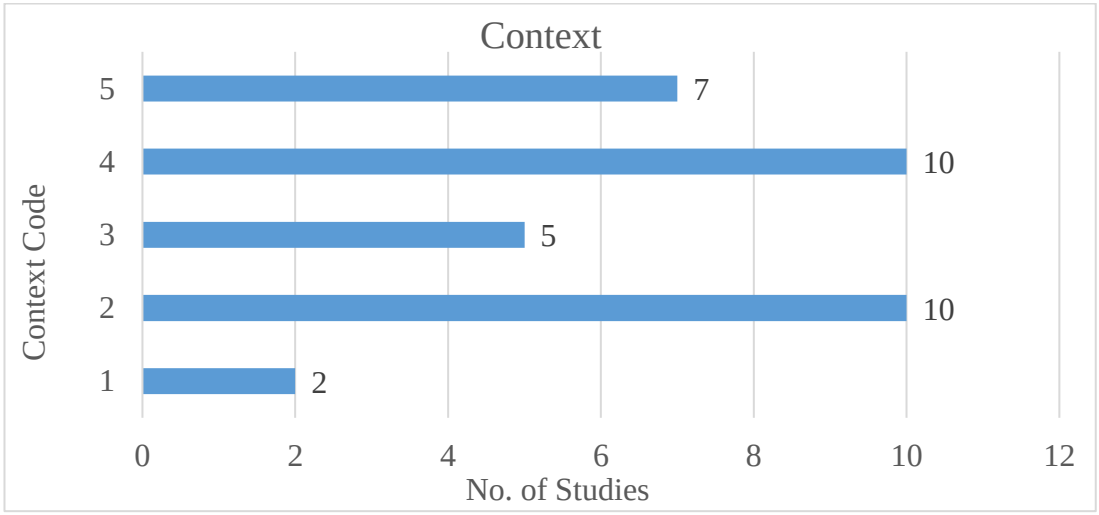


Figure 2.1 Context codes and their number of studies

The time periods of the publications of the thirty-four (34) studies of this review are categorised by Table 2.4.2 into three (3) different intervals. The identification of the studies published during these different time periods is presented by Table 2.6. The graphical representation of the Table 2.6 can be found on Figure 2.3. According to Figure 2.3, the time period with code number 2 has the highest number of studies followed by the time period with code number 3. According to Table 2.4.2, these time period codes, respectively, correspond with the period between the year 2008 and the year 2012, and the period between the year 2013 and the year 2017.

Table 2.4 List of study codes and their time periods' codes

Study Code	Time period Code
1	3
2	2
3	2
4	2
5	3
6	1
7	3
8	2
9	2
10	3
11	3
12	2
13	2
14	3
15	2
16	2
17	1

Study Code	Time period Code
18	2
19	1
20	1
21	2
22	2
23	3
24	1
25	1
26	2
27	3
28	2
29	3
30	1
31	3
32	3
33	2
34	3

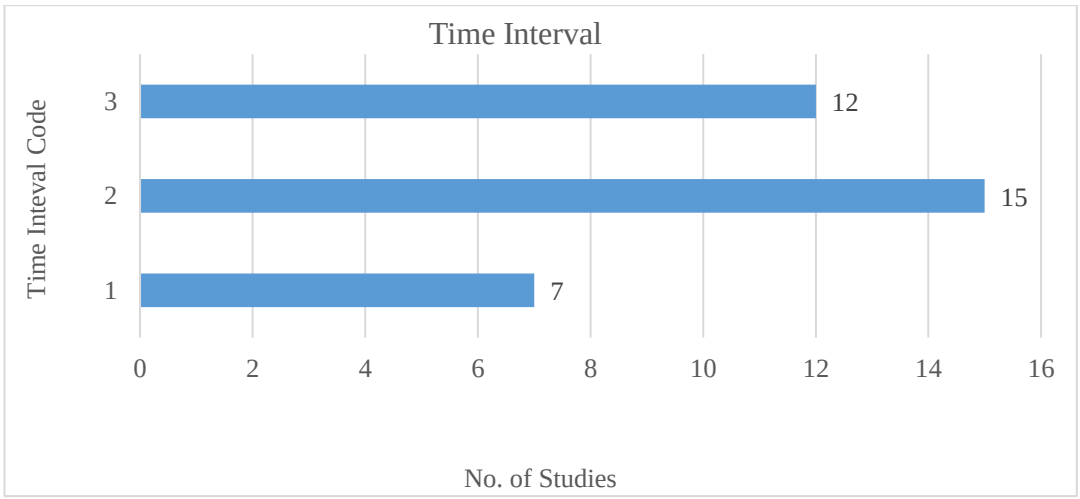


Figure 2.2 Time interval codes and their number of studies

2.4.3 Theories and models

This content analysis will present the theories and models used by its list of studies, as enumerated by Table 2.7, together with their identification codes.

Table 2.7 Coding scheme for theories and models

Code	Theory
1	Not specified
2	Information Systems Success based
3	Technology-to-performance based
4	TAM based
5	Self-regulated learning
6	Social cognitive theory
7	Self-developed
8	Perspective of constructivism

The theory/model of the thirty-four (34) studies of this review are presented by Table 2.7. The identification of the studies that are using these different theories/models is done by Table 2.8. The graphical representation of Table 2.8 can be found on Figure 2.4, which shows that code 1 applies to almost half of the reviewed studies, and according to Table 2.4, this code represents all the studies that did not specify their theory/model. Figure 2.4 also shows that code 7 is the second mostly represented code, and this corresponds to the studies that developed their own model.

Table 2.8 List of studies and their theory(ies)'/model(s)' codes

Study Code	Theory(ies)'/Model(s)' Code
1	1
2	1
3	4
4	1
5	1
6	7
7	1
8	4
9	1
10	7
11	4
12	1
13	4
14	5
15	1
16	3
17	7
18	2
19	7
20	1
21	1
22	7
23	7
24	1
25	1
26	2
27	8
28	1
29	7
30	3
31	1
32	6
33	1
34	1

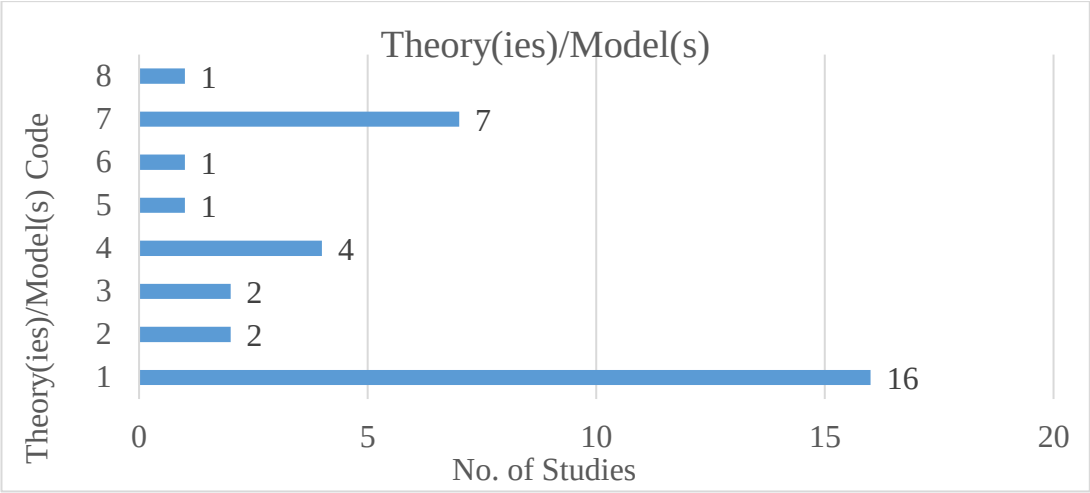


Figure 2.3 Theory(ies)/Model(s) and their number of study(ies)

2.4.4 Research method

This content analysis will present the research methods used by its list of studies, as enumerated by Table 2.9, together with their identification codes.

Table 2.9 Coding scheme for research methods

Code	Research method
1	Questionnaire-based
2	Experiment
3	Review
4	Mixed (questionnaire-based and interview-based)

The research methods of the thirty-four (34) studies of this review are presented by Table 2.9. The identification of the studies that are using these different research methods is done by Table 2.10. The graphical demonstration of Table 2.10 can be found on Figure 3.5, which shows that code 1 applies to most of the reviewed studies, and according to Table 2.5, this code represents the studies that are using questionnaire-based research methods. Figure 2.5 also shows that code 2 is the second mostly represented code, and this corresponds to the studies that are using experiments as their research method.

Table 2.10 List of study codes and their research methods' codes

Study code	Research method code
1	1
2	1
3	1
4	3
5	1
6	1
7	2
8	1
9	2
10	1
11	1
12	1
13	1
14	1
15	2
16	1
17	1

Study code	Research method code
18	1
19	1
20	1
21	2
22	1
23	2
24	2
25	1
26	1
27	1
28	1
29	1
30	4
31	1
32	1
33	2
34	2

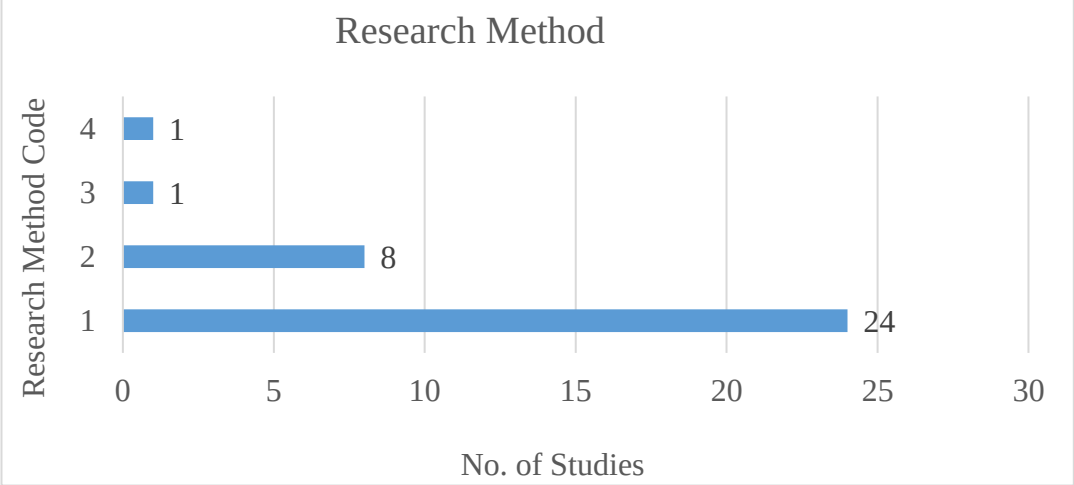


Figure 2.4 Research methods' codes and their number of studies

2.4.5 Data sources

This content analysis will present the data sources of its list of studies, as enumerated by Table 2.11, together with their identification codes.

Table 2.11 Coding scheme for data sources or research populations

Code	Data source
1	Learners and students
2	Students
3	Provincial Department of Education and Registrar's office
4	LMSs data records
5	Academic

The data sources or research populations of the thirty-four (34) studies of this review are presented by Table 2.11. The identification of the studies that are using these different data sources or research populations is done by Table 3.12. The graphical representation of Table 3.12 can be found on Figure 2.6, which shows that code 2 applies to most of the reviewed studies, and according to Table 2.12, this code represents the studies that are using students as their data sources or research population. Figure 2.6 also shows that code 4 is the second mostly represented code, and this corresponds to the studies that are using LMSs data records as their data source.

Table 2.12 List of study codes and their data sources or research populations

Study code	Data sources/research populations' code
1	1
2	2
3	2
4	3
5	2
6	2
7	4
8	2
9	2
10	2
11	2
12	2
13	2
14	2
15	4
16	2
17	2

Study code	Data source/research populations' code
18	2
19	2
20	2
21	2
22	2
23	2
24	2
25	2
26	2
27	2
28	2
29	2
30	5
31	2
32	2
33	4
34	4

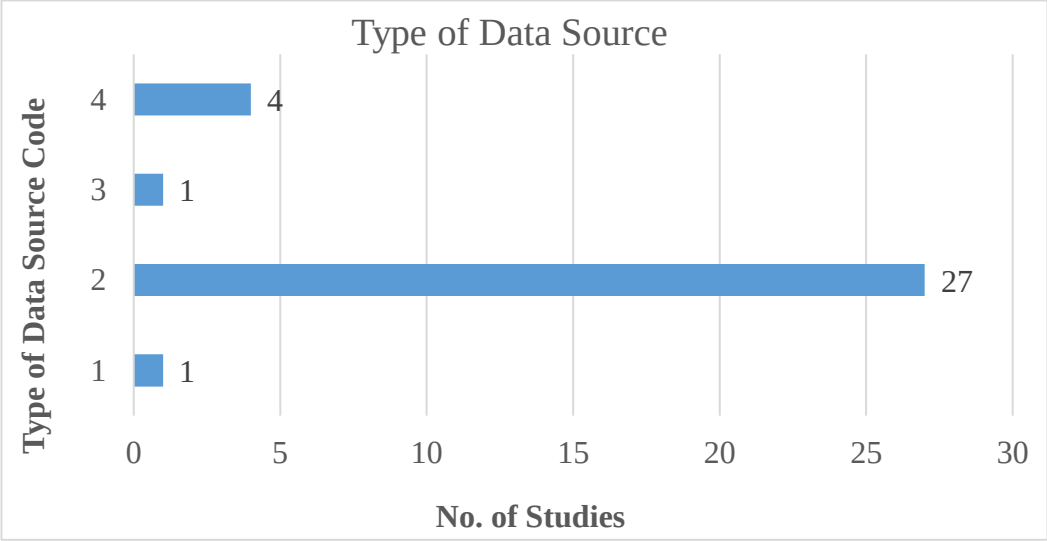


Figure 2.5 Types of data sources or research populations and their number of studies

2.4.6 Type of data

This content analysis will present the types of data of its list of studies, as enumerated by Table 2.13, together with their identification codes.

Table 2.13 Coding scheme for types of data

Code	Type of data
1	Perceptions data
2	Experimental data

The types of data for the thirty-four (34) studies of this review are presented by Table 2.13. The identification of the studies that are using these different types of data is done by Table 2.14. The graphical representation of Table 2.14 can be found on Figure 2.7, which shows that code 1 applies to most of the reviewed studies, and, according to Table 2.14, this code represents the studies that are using perceptions' data as their type of data. Figure 2.7 also shows that code 2 applies to all the other studies, and this code represents experimental data.

Table 2.14 List of study codes and their types of data codes

Study code	Type of data code
1	1
2	1
3	1
4	2
5	1
6	1
7	2
8	1
9	2
10	1
11	1
12	1
13	1
14	1
15	2
16	1
17	1

Study code	Type of data code
18	1
19	1
20	1
21	2
22	1
23	2
24	2
25	1
26	1
27	2
28	1
29	1
30	1
31	1
32	1
33	2
34	2

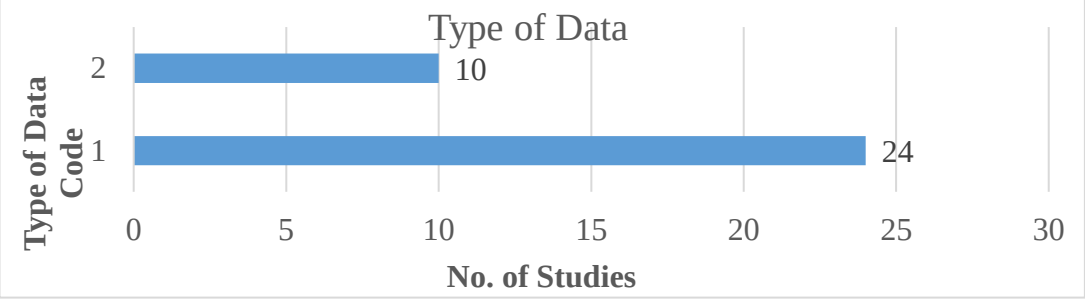


Figure 2.6 Types of data codes and their number of studies

2.4.7 Sampling techniques

This content analysis will present the sampling techniques of its list of studies, as enumerated by Table 2.15, together with their identification codes.

Table 2.15 Coding scheme for sampling techniques

Code	Sampling technique
1	Not specified
2	Random selection
3	Systematic random
4	Bootstrap
5	Clustered random
6	Cohort selection
7	Non-random
8	Aggregation and classification

The sampling techniques of the thirty-four (34) studies of this review are presented by Table 2.15. The identification of the studies that are using these different sampling techniques is done by Table 2.16. The graphical representation of Table 2.16 can be found on Figure 2.8, which shows that code 1 applies to most of the reviewed studies, and, according to Table 2.16, this code represents the studies that did not specify their sampling technique. Figure 2.8 also shows that code 2 is the second mostly represented code, and this corresponds to the studies that are using the random selection sampling technique.

Table 2.56 List of study codes and their sampling techniques

Study code	Sampling technique code
1	5
2	1
3	1
4	1
5	3
6	1
7	6
8	1
9	2
10	2
11	2
12	1
13	2
14	1
15	1
16	1
17	1
18	1
19	4
20	7
21	8
22	1
23	1
24	2
25	1
26	1
27	1
28	4
29	2
30	2
31	1
32	1
33	1
34	1

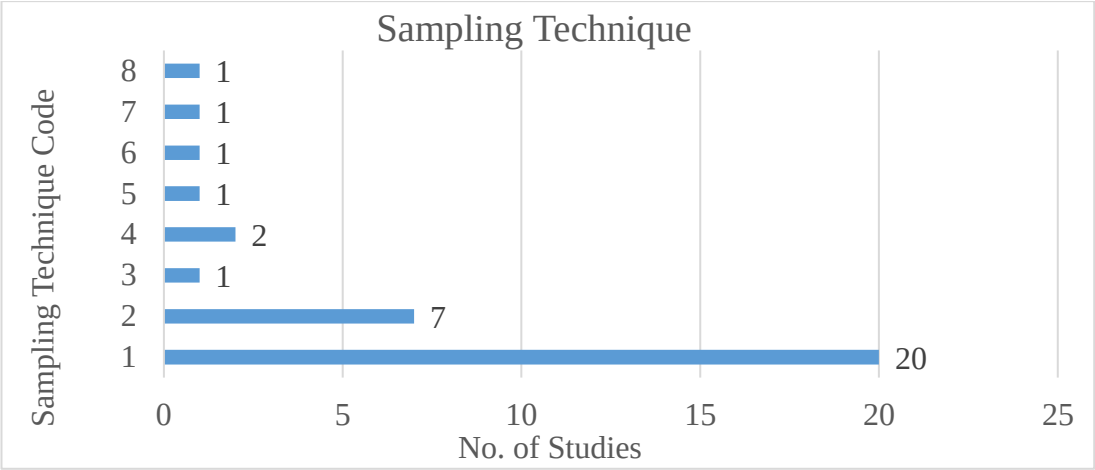


Figure 2.7 Sampling techniques and their number of studies

2.4.8 Type of analysis

This content analysis will present the types of analysis of its list of studies, as enumerated by Table 2.17, together with their identification codes.

Table 2.17 Coding scheme for types of analysis

Code	Type of analysis
1	Not specified
2	Cross-sectional
3	Longitudinal

The types of analysis of the thirty-four (34) studies of this review are presented by Table 2.17. The identification of the studies that are using these different types of analysis is done by Table 2.18. The graphical representation of Table 2.18 can be found on Figure 2.9, which shows that code 1 applies to most of the reviewed studies, and, according to Table 2.18, this code represents the studies that did not specify their type of analysis. Figure 2.9 also shows that code 2 is the second mostly represented code, and this corresponds to cross-sectional studies, while code 3 is the least represented code, and it corresponds to longitudinal studies.

Table 2.18 List of study codes and their types of analysis codes

Study code	Type of analysis code
1	2
2	1
3	2
4	1
5	1
6	1
7	3
8	3
9	1
10	2
11	3
12	1
13	1
14	1
15	1
16	1
17	1

Study code	Type of analysis code
18	2
19	2
20	1
21	1
22	1
23	1
24	1
25	1
26	2
27	1
28	1
29	1
30	1
31	2
32	1
33	1
34	1

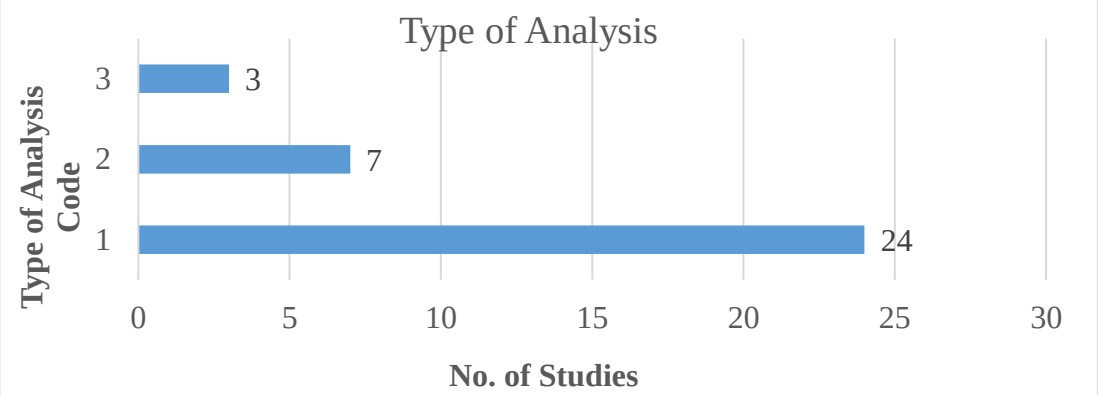


Figure 2.8 Types of analysis codes and their number of studies

2.4.9 Methods of analysis

This content analysis will present the methods of analysis of its list of studies, as enumerated by Table 2.19, together with their identification codes.

Table 2.19 Coding scheme for methods of analysis

Code	Method of analysis
1	Non-parametric
2	Parametric
3	Parametric and non-parametric
4	Not specified

The methods of analysis of the thirty-four (34) studies of this review are presented by Table 2.19. The identification of the studies that are using these different methods of analysis is done by Table 2.20. The graphical representation of Table 2.20 can be found

on Figure 2.10, which shows that code 1 applies to most of the reviewed studies, and, according to Table 2.20, this code represents the studies that are using non-parametric methods as their method of analysis. Figure 2.10 also shows that code 3 is the least represented code, and this corresponds to the studies that are using a mix of non-parametric and parametric methods as their method of analysis.

Table 2.20 List of study codes and their methods of analysis codes

Study code	Method of analysis code		Study code	Method of analysis code
1	4		18	1
2	2		19	1
3	1		20	1
4	4		21	2
5	2		22	2
6	2		23	2
7	2		24	2
8	3		25	2
9	2		26	1
10	1		27	3
11	1		28	1
12	1		29	2
13	1		30	1
14	4		31	1
15	4		32	2
16	1		33	2
17	1		34	1

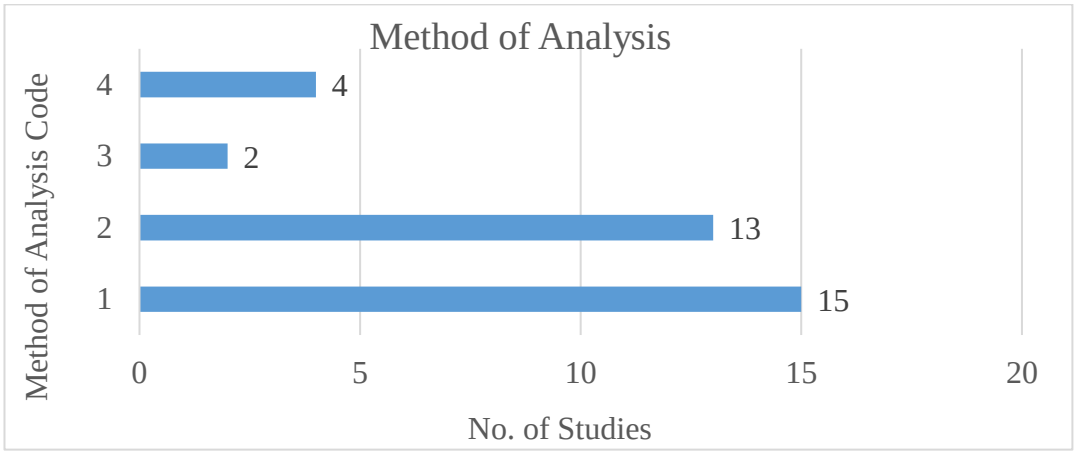


Figure 2.9 Methods of analysis and their number of studies

2.4.10 Research variables

This content analysis will present the research variables of its list of studies, as enumerated by Table 2.21, together with their identification codes.

Table 2.21 Coding scheme for research variables

Code	Research variables
1	Demographics
2	Motivation and pride
3	Intensity use of e-Learning
4	Self-efficacy and learning approach
5	Perceptions on the suitability of e-Learning
6	Sense of community and interactivity

The research variables of the thirty-four (34) studies of this review are presented by Table 2.21. The identification of the studies that are using these different research variables is done by Table 2.22. The graphical representation of Table 2.22 can be found on Figure 2.11, which shows that code 4 applies to most of the reviewed studies, and, according to Table 2.22, this code represents the studies that are examining self-efficacy related variables. Figure 2.11 also shows that code 5 and code 3 are, respectively, the second and the third mostly used codes, and they, respectively, correspond to the studies that have variables on users' perceptions on the suitability of e-Learning, and on the intensity of use of e-Learning. Lastly, Figure 2.11 also shows that code 2 is the least represented code, and it corresponds to the studies that are making use of motivation and pride research-related variables.

Table 2.22 List of study codes and their research variables' codes

Study code	Research variable(s) code
1	3
2	3, 4
3	3
4	3, 1
5	1
6	3
7	4, 5
8	1, 3, 5
9	3, 4, 5
10	3
11	5
12	4, 5, 6
13	5
14	1, 2
15	4, 5
16	3, 4
17	3

Study code	Research variable(s) code
18	5
19	2, 4
20	4, 5
21	3, 4, 5, 6
22	3
23	2, 3, 5
24	4, 5, 6
25	4
26	3
27	3, 5, 6
28	5
29	3, 6
30	3
31	2, 4, 5, 6
32	3, 4
33	3
34	3

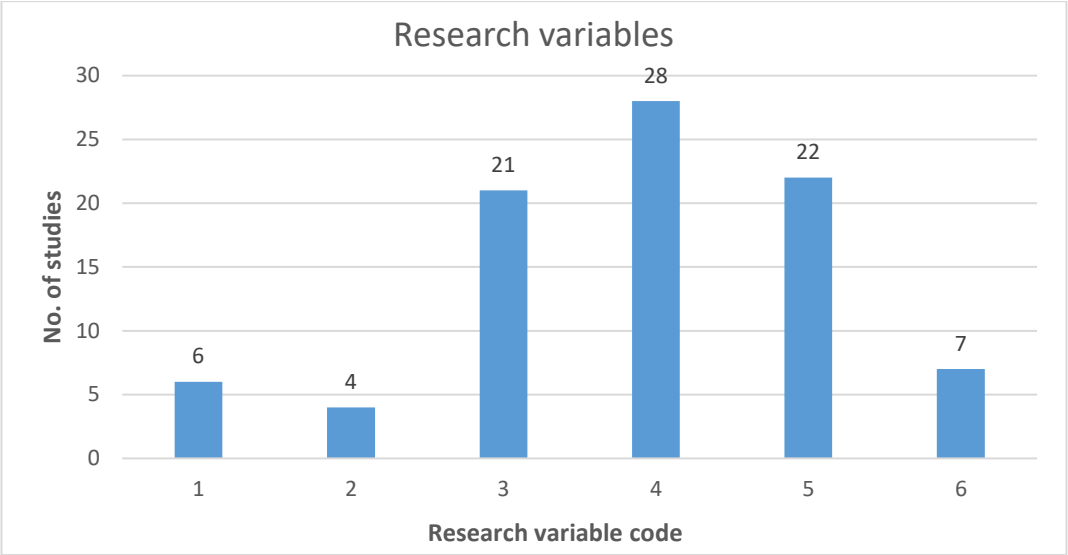


Figure 2.10 Research variable codes and their number of studies

2.4.11 Validity and reliability tests' methods

This content analysis will present the validity and reliability tests of its list of studies, as enumerated by Table 2.23, together with their identification codes.

Table 2.23 Coding scheme for validity and reliability tests' methods

Code	Validity test method
1	Not specified
2	Pearson's correlation coefficients
3	Exploratory factor analysis
4	Face and content validity
5	Cross-validation
6	Kaiser Normalization
7	Pre-test post test
8	Discriminant
9	Factor analysis
10	Descriptive statistics
11	Inter-correlation

Code	Reliability test method
1	Not specified
2	Cohen's kappa coefficient
3	Cronbach's alpha coefficient
4	Test/re-test approach
5	Binary logistic regression
6	Composite
7	Convergent

The reliability tests' methods of the thirty-four (34) studies of this review are presented by Table 2.23. The identification of the studies that are using these different reliability tests' methods is done by Table 2.24. The graphical representation of Table 2.24 can be found on Figure 2.12, which shows that code 3 applies to most of the reviewed studies, and, according to Table 2.24, this code represents the studies that are using Cronbach's alpha coefficient test method. Figure 2.12 also shows that code 1 is the second code, and this corresponds to the studies that did not specify their reliability test method.

Table 2.24 List of study codes and their reliability tests' methods codes

Study code	Reliability test code
1	3
2	7
3	1
4	1
5	4
6	3
7	5
8	3
9	3
10	6
11	7
12	3
13	7
14	1
15	1
16	3
17	6

Study code	Reliability text code
18	3
19	3
20	3
21	1
22	3
23	3
24	1
25	1
26	6
27	1
28	3
29	2
30	7
31	3
32	3
33	3
34	1

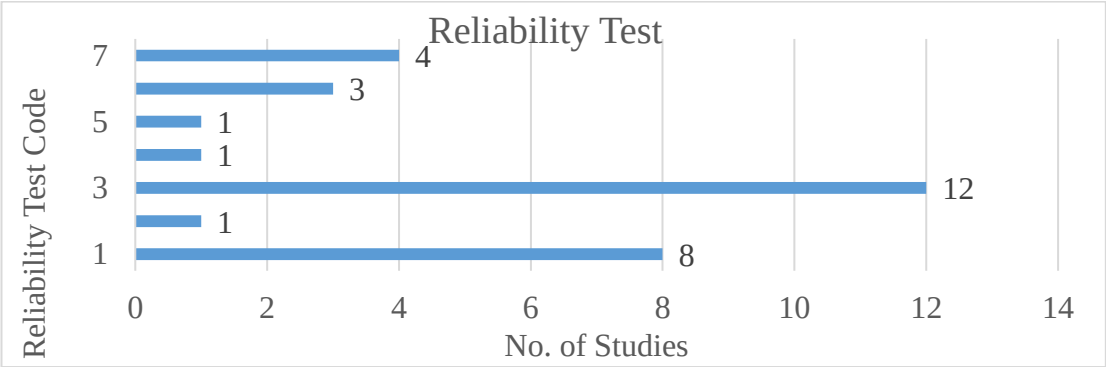


Figure 2.11 Reliability tests' methods codes and their number of studies

The validity tests methods of the thirty-four (34) studies of this review are presented by Table 2.23. The identification of the studies that are using these different validity tests methods is done by Table 2.25. The graphical representation of Table 2.25 can be found on Figure 2.13, which shows that code 1 applies to most of the reviewed studies, and, according to Table 2.25, this code represents the studies that did not specify their validity test method. Figure 2.13 also shows that code 7 is the second code, and this corresponds to the studies that are using the discriminant test as their validity test method.

Table 2.25 List of study codes and their validity tests' methods codes

Study code	Validity test method code
1	4
2	2
3	1
4	1
5	2
6	2
7	5
8	6
9	7
10	8
11	8
12	10
13	8
14	1
15	1
16	8
17	9

Study code	Validity test method code
18	8
19	8
20	3
21	1
22	10
23	11
24	1
25	1
26	8
27	1
28	2
29	2
30	5
31	10
32	10
33	3
34	1

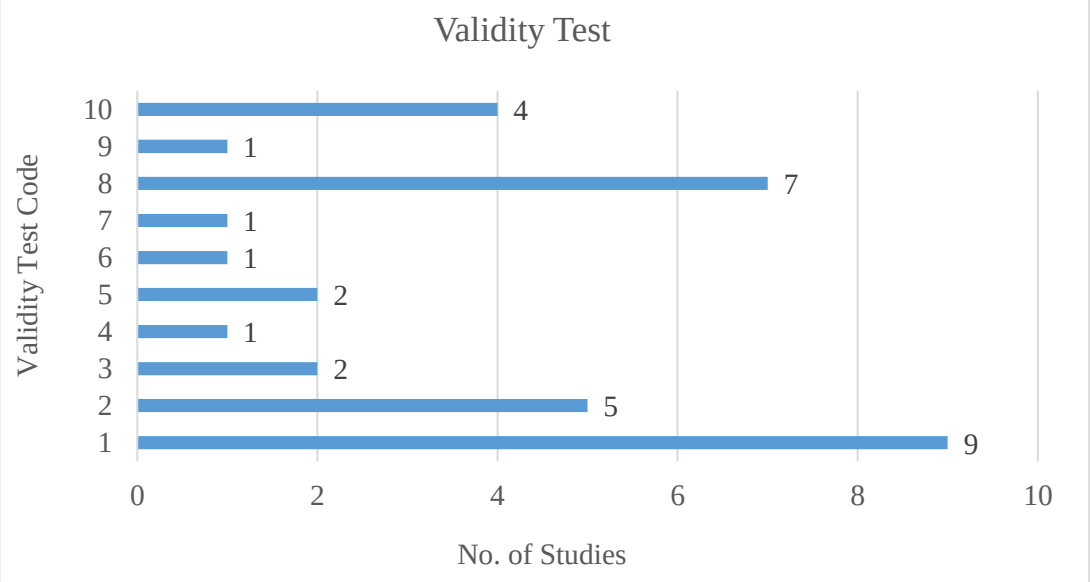


Figure 2.13 Validity tests' methods codes and their number of studies

2.4.12 Key research findings

This content analysis will present the key research findings of its list of studies, as enumerated by Table 2.26, together with their identification codes.

Table 2.26 Coding scheme for key research findings

Code	Key research findings
1	No correlation
2	Positive correlation
3	Negative correlation
4	Inconclusive

The key research findings of the thirty-four (34) studies of this review are presented by Table 2.26. The identification of the studies that came up with these different key research finding codes is done by Table 2.27, whose summary is given by Table 2.28. The graphical representation of Table 2.28 can be found on Figure 2.14, which shows that the key research findings of this literature analysis are inconclusive on the effect of the variables with the codes 1, 2 and 5 on the perceptions of students on the impact of e-Learning on academic performance. These variables are, respectively, representing demographics, motivation and pride and the perceived suitability of e-Learning. Figure 2.14 also shows that the key research findings of this literature analysis are in agreement on the positive effect of the variables with the codes 3, 4 and 6 on the perceptions of students on the impact of e-Learning on academic performance. These variables are, respectively, representing intensity use of e-Learning, self-efficacy and learning approach, and sense of community and interactivity.

Table 2.27 List of study codes, their research variable codes and their key findings' codes

Study code	Research variable(s) code	Key findings' code
1	3	2
2	3, 4	2, 4
3	3	2
4	3, 1	2, 2
5	1	2
6	3	2
7	4, 5	2, 2
8	1, 3, 5	1, 2, 2
9	3, 4, 5	3, 2, 1
10	3	1
11	5	2
12	4, 5, 6	2, 1, 2
13	5	2
14	1, 2	1, 2
15	4, 5	2, 2
16	3, 4	1, 2
17	3	2
18	5	1
19	2, 4	1, 2
20	4, 5	2, 1
21	3, 4, 5, 6	2, 3, 4, 2
22	3	2
23	2, 3, 5	1, 2, 2
24	4, 5, 6	2, 2, 2
25	4	2
26	3	3
27	3, 5, 6	2, 1, 1
28	5	1
29	3, 6	2,1
30	3	1
31	2, 4, 5, 6	2, 2, 3, 2
32	3, 4	2, 2
33	3	2
34	3	2

Table 2.28 List of research variables codes and their key research findings' codes

Research variable code	1 (No Corr.)	2 (Pos. Corr.)	3 (Neg. Corr.)	4 (Incl.)	Conclusion
1 (Demographics)	1	2	0	0	4
2 (Motivation and pride)	2	2	0	0	4
3 (Intensity use of e-Learning)	3	14	2	0	2
4 (Self-efficacy and learning approach)	0	11	3	4	2
5 (Perceptions on the suitability of e-Learning)	6	7	1	1	4
6 (Sense of community and interactivity)	2	4	0	0	2

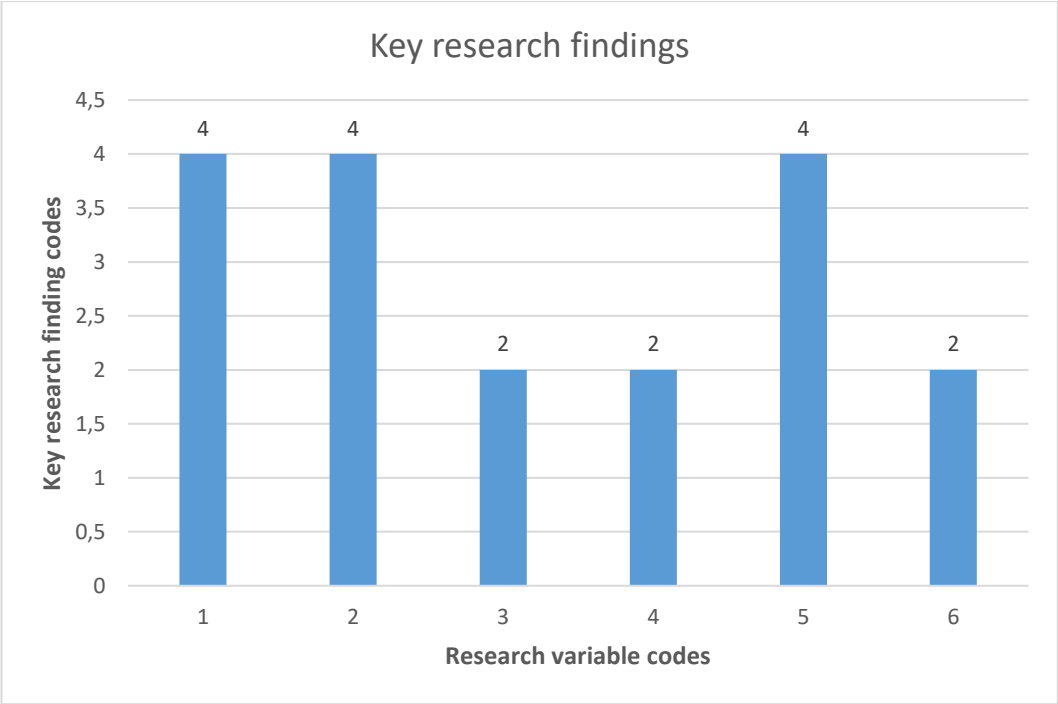


Figure 2.12 Key research findings and their research variable codes

2.1.4 Coding of the entire sample of the studies under review

Table 2.29 gives a general overview of the different studies included in the content analysis undertaken by this dissertation. Table 2.29 makes use of the variables V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, and V14, and the meaning of these variables is given by Table 2.30. It is important to understand the coding of Table 2.29 as hereby explained for example for row number 7. Where for V1 is the author number 1. V2 is the context, which is Europe continent. V3 is the time interval, which is time-period between 2013 and 2017. V4 is the theory or model used, which was not specified. V5 is research methodology, which is an experiment. V6 is the data source, which is LMS data records. V7 is type of data, which is an experimental data. V8 is sampling techniques, which is Aggregation and classification. V9 is the type of analysis, which is Longitudinal. V10 is the method of analysis, which is parametric. V11 is research variable, which are Self-efficacy and learning approach and Perceptions on the suitability of e-Learning. V12 is the validity test, which the Cross-validation test. V13 is the reliability, which is the Binary logistic regression, and V14 are the key research findings, which were positive correlations and negative correlations.

Table 2.29 Coding scheme for the entire studies reviewed

V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14
1	1	3	1	1	1	1	5	2	1	3	4	2	2,3,3,3
2	4	2	1	1	2	1	1	1	2	4,3	2	2	2
3	2	2	4	1	2	1	1	2	3	3,	1	1	1,3,3,3,3
4	5	2	1	3	3	2	1	1	1	3,1	1	1	2
5	1	3	1	1	2	1	3	1	3	3,1	2	4	2,2,2,2
6	2	1	7	1	2	1	1	1	1	3	2	3	2,2
7	4	3	1	2	4	2	6	3	2	5,4	5	5	2,2,2,2,2,2,2,2,1,1,1,1,1
8	5	2	4	1	2	1	1	3	2	6,3	6	3	2,2,1,1,1,1
9	2	2	1	2	2	2	2	1	2	5,4,3,1	7	3	3
10	4	3	7	1	2	1	2	2	1	3	8	7	2
11	4	3	4	1	2	1	2	3	1	5,1	8	7	2,2
12	5	2	1	1	2	1	1	1	1	6,5,4	2	3	2,2,2,2
13	4	2	4	1	2	1	2	1	2	5	8	7	2
14	4	3	7	1	2	1	1	1	1	4,3,1	1	1	2,3,3,3,3,3,3,3
15	4	2	1	2	4	2	1	1	1	5,4	1	1	2,2,3,3
16	3	2	3	1	2	1	1	1	2	4,3	8	3	2,3
17	3	1	5	1	2	1	1	1	1	3	8	3	2,2,2,2
18	2	2	2	1	2	1	1	2	2	5	8	3	2,3
19	5	1	7	1	2	1	4	2	3	5,4,2	8	3	2,2,2,2,3,3,3
20	5	1	1	1	2	1	7	1	3	4,2	9	3	2,2,3,3,3,3
21	5	2	1	2	2	2	8	1	2	6,5,4,3	1	1	2
22	5	2	7	1	2	1	1	1	3	5,4,2,1	10	3	2,2,2,2,2,1,1,3,3
23	4	3	7	2	2	2	1	1	1	3,2	11	3	2,2,2
24	3	1	1	2	2	2	2	1	2	6,5,4	1	1	2
25	2	1	1	1	2	1	1	1	2	4	1	1	2,2,1,3,3,3,3,3
26	2	2	2	1	2	1	1	2	2	3	8	6,3	2,1
27	2	3	8	2	2	2	1	1	1	6,5,3	1	1	2,2,2,2,3
28	3	2	1	1	2	1	4	1	3	5,4	2	3	2,1
29	2	3	7	1	2	1	2	1	3	6,3	2	3	2,2,2,2
30	3	1	3	4	5	1	2	1	1	3	8	6	2,2
31	2	3	1	1	2	1	1	2	1	6,5,4,3,2	10	3	2,2,2
32	2	3	6	1	2	1	1	1	3	5,4,3,1	10	3	2,2
33	3	2	1	2	4	2	1	1	2	3	10	3	2,2
34	4	3	1	2	4	2	1	1	1	3	1	1	2,2,2,2,1,1,1,1,3,3,3,3,3,3,3,3,3

Table 2.30 Coding scheme of the content analysis

Code	Variables
V1	Author(s)
V2	Context
V3	Time interval
V4	Theories and models
V5	Research method
V6	Data source
V7	Type of data

Code	Variables
V8	Sampling techniques
V9	Type of analysis
V10	Method of analysis
V11	Research variables
V12	Validity
V13	Reliability
V14	Key research findings

2.5 Analysis of the reliability of the coding scheme

This study made use of the intra-class correlation coefficient method to test the reliability of its content analysis. Two information technology post-graduate students were asked to assess the suitability of the coding schemes of each of the variables on Table 2.30.

This section presents the Cronbach's alpha (α) coefficients that were calculated for the assessment of the reliability of the coding scheme of the content analysis conducted by this study. Table 2.31 shows the descriptive statistics of the content analysis presented on the previous chapter, while Table 2.33 shows the intra-class correlation coefficient of the content analysis also presented on the above section. On the other hand, Table 2.32 shows that the value of the Cronbach's alpha (α) coefficient is 0.726 and this shows that the coding scheme of the content analysis conducted by this study is reliable, since 0.726 is greater than 0.7.

Table 2.21 Descriptive statistics of the content analysis

		N	%
Cases	Valid	34	100.0
	Excluded[a]	0	.0
	Total	34	100.0

a. Listwise deletion based on all variables in the procedure

Table 2.36 Cronbach's coefficient of the content analysis

Cronbach's alpha coefficient	N of Items
.726	15

Table 2.37 Intra-class correlation coefficient of the content analysis

	Intra-class Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.143[a]	.087	.226	3.500	53	742	.003
Average Measures	.726[c]	.589	.815	3.500	53	742	.003

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. The estimator is the same, whether the interaction effect is present or not.

b. Type C intra-class correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

2.6 Summary of the results of the content analysis into a theoretically sound model of the factors affecting academic performance in the e-Learning context

The correlations that are identified by Table 2.28 are represented by the model on Figure 2.15 on the factors that are affecting users' perceptions on the impact of e-Learning on academic performance. Having in mind that some of those relationships were not conclusively confirmed by the above-presented literature analysis, it seems important to examine whether or not they can be justified by existing theories. Figure 2.16 presents a theoretically sound model on the factors that are affecting users' perceptions on the impact of e-Learning on academic performance after discussing the justification by existing theories.

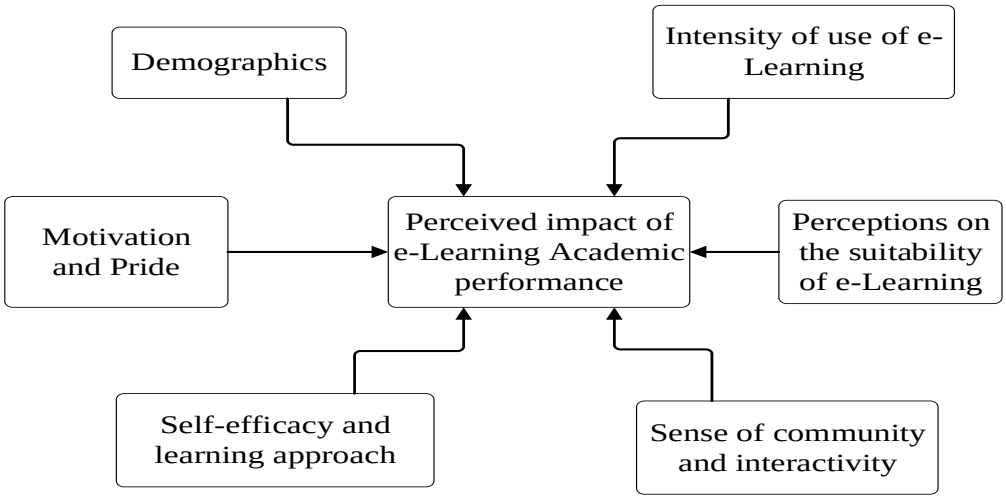


Figure 2.13 Research model of factors that are affecting perceived impact of e-Learning on academic performance

The influence of students' demographics and their intensity of use of e-Learning on their academic performance is supported by the Walberg's theory of education. Similarly, the influence of students' motivation and their sense of pride on their academic performance is supported by the self-determination theory. On the other hand, the self-regulated theory is justifying the influence of self-efficacy and learning approach on academic performance. Similarly, the task technology fit theory supports the relationship between student perceptions on the suitability of e-Learning and their academic performance in the e-Learning context. Finally, the social constructivism theory links students' sense of community and interactivity to their academic performance.

2.6.1 Walberg's theory of educational productivity

Walberg's theory of educational productivity (1981 and 1984) posits that there are nine factors which contribute to variances in students' cognitive and affective outcomes: ability or prior achievement; age or stage of maturity; motivation or self-concept; amount of time; quality of the instructional experience; the home; the classroom social group; the peer group outside school; and the use of time outside school. These factors influence one another, and they are also influenced by the learner's academic performance (Walberg, 1984). According to Walberg (1984), five factors, i.e., ability, age, motivation, amount of time and quality of the instructional experience are fundamental for students' ability to learn, as confirmed by the educational model from Benjamin Bloom (1968). Consequently, academics are doubtful to significantly influence learning outcomes on their own for learners who exhibit a negative profile for these five fundamental factors. The remaining four factors, i.e., the home, the classroom social group, the peer group and the use of time outside school, are environmental factors that can either directly influence academic performance or indirectly influence it by raising students' abilities, their motivation and their responsiveness to instruction.

2.6.2 Self-determination theory

According to Kusurkar *et al*. (2013), the self-determination theory (SDT) advocates that the more self-determined, self-motivated and self-directed are students, the more improved are their academic performance, their adjustment and their overall well-being. SDT considers the quality of motivation to be more important than its quantity. As for Black and Deci (2000), SDT suggests that motivated behaviours are either autonomous or controlled. Autonomous behaviours have an internal drive; they are usually based on past experiences, and they are performed out of personal interest. On the contrary, controlled behaviours are caused by external forces, and they are experienced as being pressured by interpersonal demands, such as the feeling that one has to achieve high grades in order to be a worthy person.

2.6.3 Social constructivism

According to Yu and Jo (2014), social constructivism is one the fundamental theories for educational technology, where "learning is a self-developing process by creating or reorganizing a concept or cognitive structure" using learners' experiences and beliefs. Dagar and Yadav (2016) define social constructivism as an epistemological view of

knowledge acquisition, in which "social interaction has a central role in [the] learning process". Social constructivism focuses both on the learning environment and on learners' ability to self-reflect on subject matters. It proposes that learning happens because of the replication of previous experiences by learners, and because of their cultural, physical and social settings. Social constructivists believe that teaching and learning are conditioned by self-reflection and by self-understanding. In social constructivism, learners are more involved in the teaching process because knowledge acquisition relies more on individual experiences. The constructivist view of learning suggests that knowledge is personally formed and socially constructed by a learner during his or her interaction both with the world and with the learning subject matter.

Finally, Dagar and Yadav (2016) divide the outcomes of constructivism base learning into three groups: subject-based outcomes, personal transferable outcomes and generic academic outcomes. Subject-based outcomes are learning outcomes measured by traditional examination questions and they are usually assessed in university courses. Personal transferable outcomes are as a result of students' ability to work independently, of their skills ability to cooperation and communication, and their ability to use information. Generic academic outcomes are as a result of students' ability to think critically and the ability to synthesize ideas and information.

2.6.4 Task-technology fit theory

The task-technology fit theory (TTFT) suggests that information systems affect users' performance depending upon the fit between the users' task requirements and the functionality of the system (Goodhue and Thompson, 1995). According to Staples and Seddon (2004), TTFT also suggests that the impact on users' performance depends on the fit between the individual characteristics of the users and the functionality of the system. The bottom line of the task-technology theory is that the performance of a technology and its utilisation directly depend on how it fits with the task at hand.

2.6.5 Self-regulated learning theory

The self-regulated learning theory (SRLT) implies that learners must possess certain self-regulatory attributes in order to succeed. According to Lee and Lee (2008), in self-regulated learning theory, self-regulated learners are those who take an active responsibility for their own learning and for their academic achievement. Self-regulatory

learning is a learner's intended effort for subject learning. It is a systematic management process regarding one's own thoughts, emotions, and behaviour for his or her personal goals and achievements (Schunk and Ertmer, 2000). In the SRLT, motivated students display a high level of effort and persistence, they develop a high level of interest in their learning, as well a high level of self-confidence to learn how to achieve their tasks (Schunk, 1986).

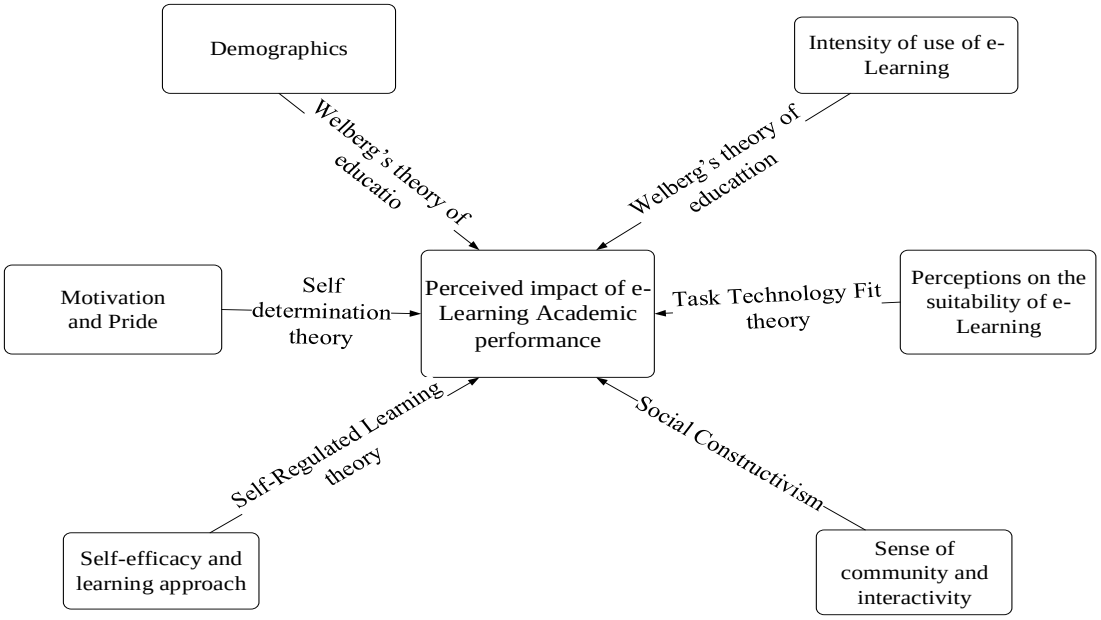


Figure 2.14 Theoretically sound model of factors that are affecting perceived impact of e-Learning on academic performance

2.7 Summary

This literature analysis shows that the majority of the studies included in this chapter were written by more than two authors as compared to single or two authored studies, and most studies were written by authors from Asia and from Europe. Most of these studies were conducted between the year 2008 and the year 2012, and nearly half of them did specify the theory or the model that they employed. Surveys are by far the mostly used research method for the reviewed studies with students usually being their main data source or research population. Almost two thirds of the studies did not specify the sampling technique.

This literature analysis also found that most studies used discriminant analysis, Cronbach alpha coefficients, and partial least squares to confirm the validity and the reliability of their research data and methods. Interestingly, more than two thirds of the studies did not

state whether they were longitudinal or cross-sectional. Finally, this literature analysis found that academic performance in the context of e-Learning can be affected either positively or negatively by students' demographics, by their pride and motivation, by their intensity of use of e-Learning, by their self-efficacy and learning approach, by their perceptions on the suitability of e-Learning, and by their sense of community and interactivity. The next chapter will present the results of the survey explained on chapter two.

Chapter 3 RESEARCH METHODOLOGY

The purpose of the previous chapter was to analyse existing literature on the factors affecting the perceptions of academics on the impact of e-Learning on academic performance. On the other hand, the current chapter intends to describe the different methodologies that were used in pursuit of the second objective of this study. The survey's methodology was used for the achievement of the second objective of this study, as recommended by Peng *et al*. (2011) for whom surveys are used to validate or empirically test proposed research theoretical framework. The same rationale is supported by Johnson (2001:8) for whom "the term survey research […] refer[s] to most quantitative non-experimental research, including what is called causal-comparative and correlational [research]". This chapter will describe the above announced survey in terms of research population, sampling, research instruments and data analysis methods.

According to Fan *et al*. (2015), a survey is defined as the process of gathering data in a planned and systematic manner from the population that is being investigated. Surveys use well-defined concepts, methods and procedures, and they present the analysis of their data as a set of useful and meaningful summarised reports on their findings. Surveys are usually used to collect data for various purposes, such as the quest to understand the preferences of a research population, their perceptions, or their behaviours. Fan *et al*. (2015) posit that surveys are mostly useful when collecting data on phenomena that cannot be directly experimented. This section will present the survey that will be conducted by this study in terms of its population, its sampling method and sample size, its research instrument, its reliability and validity and its method analysis.

3.1 Population

This survey was conducted in the KwaZulu-Natal province of the Republic of South Africa in the period between June and August 2017. The KwaZulu-Natal province is one of the nine provinces of the Republic of South Africa. The other eight provinces of the Republic of South Africa are: Eastern Cape; Free State; Gauteng; Limpopo; Mpumalanga; Northern Cape; North West; and Western Cape. The KwaZulu-Natal province was selected for this survey because the university of the researcher is located within that province. This province is situated on the east coast of South Africa and it

shares a border with three countries, namely, Lesotho, Swaziland, and Mozambique (Figure 3.1).

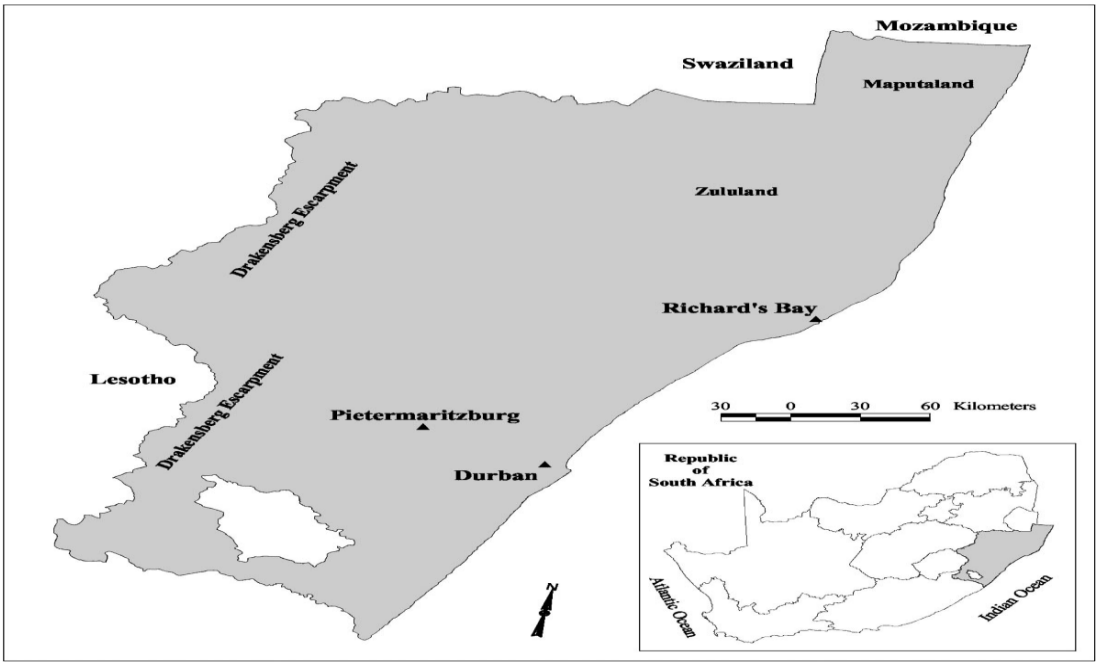


Figure 3.1 The KwaZulu-Natal province location within the Republic of South Africa

The KwaZulu-Natal province has a total number of five (5) public universities: the Durban University of Technology (DUT), the Mangosuthu University of Technology (MUT), the University of KwaZulu-Natal (UKZN), the University of Zululand (UniZulu), and the University of South Africa (UNISA). DUT, MUT and UKZN each have their main campuses in Durban which is considered as the economic capital of KwaZulu-Natal. The main campus of UniZulu is located at KwaDlangezwa, next to Empangeni, which is around 150 kms north of Durban. The main campus of UNISA is situated in Gauteng, in Tshwane or Pretoria, which is the capital city of the Republic of South Africa. The targeted population of this research study is made up of academic staff from computing departments from the above identified universities, except for UNISA. UNISA has been excluded from this study because its main campus is not located in KwaZulu-Natal.

This survey covers academic staff of all ages, genders, origins and teaching experiences. Departments from all the computing disciplines are part of this study, except for Computer Engineering and Software Engineering. Software engineering departments are

excluded from this study because such departments do not exist in any of the four universities considered by this study. As for computer engineering, it is excluded from this study even though the School of Engineering of the University of KwaZulu-Natal offers it. The exclusion of computer engineering from this study is related to the fact that the University of KwaZulu-Natal is the only university that offers computer engineering in the KwaZulu-Natal provinces, housed within the School of Engineering that also hosts many other engineering programmes. It was difficult to identify these computer engineering staff without a prior physical visit of the School of Engineering of the University of KwaZulu-Natal. The choice of these universities is justified by their close proximity to the geographical location of the researcher.

The population sizes for the different computing departments of the four above-selected universities are available on Table 3.1. This table shows that there are 47 academic staff in the department of Information Technology of DUT. The department of Information Technology of MUT has 21 academic staff and the department of Computer Science of UniZulu has 8 academic staff members. As for the department of Computer Science of UKZN, it has 9 academic staff members, and the Information Systems and Technology of UKZN has 19 academic staff members. This gives a total population of 104 academic staff members from all the four universities.

Table 3.1 Population of a survey by universities

University name	**Computing department**	**Population size**
DUT	Information Technology	47
MUT	Information Technology	21
UKZN	Computer Science	9
	Information Systems and Technology	19
UniZulu	Computer Science	8
		N = 104

3.2 Sampling

The sample of the survey conducted by this study consists of seventy-eight (78) academic staff from the above-described population. It is important to briefly describe how that sample was selected, having in mind that sampling is “the selection of a number of study units from a defined study population” (Aklila, 2016:33). The sample of this survey was selected with the help of a randomly stratified sampling method. Stratified sampling consists of dividing the objects of the study into partitions or groups with alike variables

(Podgurski *et al*. 1999). Fricker Jr (2012:199) considers random sampling as probability-based sampling where "the respondents are selected using some sort of probabilistic mechanism, and where the probability with which every member of the frame population could have been selected into the sample is known". The sample size was calculated with the help of the sample size formula proposed by Naing *et al*. (2006) for populations, as shown by the equation below, with the following values as parameters: *n* = Sample size; N = Population size equal to 104; Z = Confidence level equal to 1,96; P = Estimated proportion equal to 70%; and d = precision/acceptable margin of error equal to 0,05. Equation 2.1 gives the formula to calculate samples, as proposed by Naing *et al*. (2006).

$$n = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)} \qquad (3.1)$$

Using equation 3.1, for our study, we obtained sample size *n* of seventy-eight (78). The stratification of this sample was done, as shown by Table 3.2, using the different university computing departments as strata.

Table 3.2 Sampling of participants by universities' computing departments

Universities Computing Departments	**Department Size**	**Population Proportion**	**Sample Size**
DUT Information Technology	47	(47/102) = 46%	46%*78=36
MUT Information Technology	21	(21/102) = 21%	21%*78=16
UKZN Computer Science	09	(09/102) = 9%	9%*78=7
UKZN Information Systems and Technology	17	(17/102) = 17%	17%*78=13
UniZulu Computer Science	08	(08/102) = 7%	7%*78=6
			n = 78

3.3 Research instrument and scales

The main research instrument of this survey is its questionnaire which was designed based on the research model from the previous chapter of this study. This questionnaire was developed and administered by the researcher and it consists of the following five Likert-scale (Bertram, 2013) variables in addition to its demographics' section on the biographical data of the respondents: A) Demographics; B) Attitude towards e-Learning; C) Computer self-efficacy; D) Pedagogical beliefs; E) Use of LMSs; and E) Perceived

impact of LMSs on academic performance. These six research variables are further described below.

3.3.1 Demographics

Respondents were requested to provide information on their following eight (8) biographical items: Age range; gender; racial category or ethnic group; citizenship; academic institution; academic department; academic rank; and employment status. The different options for these eight biographical items can be found on the questionnaire in Appendix A.

3.3.2 Attitude towards e-Learning

This study defines attitudes as the "feelings that a person has about an object, based on their beliefs about that object" (Fishbein and Ajzen, 1975, cited by Kind *et al*. 2007). Respondents were, hence, requested to provide data on their feelings and beliefs on the ability of e-Learning to: eliminate tedious work; make learning easer; improve academic performance; reduce copying and cheating; bring fun to teaching and learning; create quality jobs; create communication channels; and reduce the cost of education. Some of these items were inspired by the attitudes' scales from Kay (1990), Christensen and Knezek (1996), Durndell and Haag (2002), Mishra and Panda (2007), and. These scales are briefly discussed below.

Kay (1990) measured the attitude of education students towards computers on two major aspects, namely cognitive attitude, and affective or emotional attitude in a scale whose reliability is tested and confirmed in same paper. According to Veloo *et al*. (2015:36), "*cognitive attitude refers to how information is processed using of knowledge about changes towards the choices of a human mind*". Veloo *et al*. (2015:36) also claim that cognitive attitude "*processes may exist in their natural form or they may be consciously or unconsciously be developed; and therefore, cognitive attitude is a reaction based on knowledge to clarify concepts that will be perceived or practiced*". As for affective or emotional attitude, Broekens and Brinkman (2013:64) defines it as "how one generally feels about something or someone, not specifically because of that thing or person". The same authors claim that, "because an attitude refers to the associated emotional connection that one has with someone or something, *emotional attitude is expressed with*

adjectives such as exciting, worrisome, and cool; as well as with expressions such as "I like this a bit" referring to how much one values a particular thing".

Christensen and Knezek (1996:3) measured the attitude of junior high school learners towards computers as "*feelings toward a person or thing" and as "prevailing dispositions*". One can therefore infer that Christensen and Knezek (1996) is concerned with emotional or affective attitude towards computers. They performed conclusive reliability and validity tests for their computer attitude scale. Their scale is made up of sixty-five items, with sixty-two Likert scale statements, and three multiple options questions.

Some examples of Likert scale statements from Christensen and Knezek (1996:13) are:

I. *I would work harder if I could use computers more often.*
II. *Computers do not scare me at all.*
III. *I think that it takes a long time to finish when I use a computer.*

An example of a multiple options question from Christensen and Knezek (1996:13) is:

Which would be more difficult for you?

(1) Read a book or (2) write

(1) Write or (2) watch television

(1) Watch television or (2) use a computer

(1) Use a computer (2) read a book or

(1) Read a book or (2) watch television

(1) Write or (2) use a computer

Durndell and Haag (2002) measured the attitudes of university students towards Internet. They performed a conclusive reliability test for their Internet attitude scale. Their scale is made up of twenty-nine items measuring both positive and negative attitudes towards Internet.

Some examples of negative attitude items from Durndell and Haag (2002:352) are:

I. *The Internet's complexity intimidates me.*
II. *The Internet turns people into just another number.*
III. *The Internet will replace the working human.*

Some examples of positive attitude items from Durndell and Haag (2002:352) are:

I. *The Internet can eliminate a lot of tedious work.*
II. *Life will be easier and faster with the Internet.*
III. *The use of the Internet is enhancing our standard of living.*

Mishra and Panda (2007) measured the attitudes of academics towards e-Learning. They performed conclusive reliability and validity tests that led to the distinction between two types of attitudes: functional attitude, and individualistic attitude. In fact, the seventy items on the e-Learning attitudes scale proposed by Mishra and Panda (2007:31) are divided into two factors:

> *"Factor 1 involving 12 items that were related to the attributes of e-learning and therefore this Factor 1 was described as the functional factor, and Factor 2 involving 5 items that were related to the respondents' feelings about e-learning and was therefore termed the individualistic factor".*

Some examples of functional attitude items from Mishra and Panda (2007:29) are:

I. *E-Learning saves time and effort for both teachers and students.*
II. *E-Learning will increase my efficiency in teaching.*
III. *E-Learning enhances the pedagogic value of a course.*

Some examples of individualistic attitude items from Mishra and Panda (2007:29) are:

I. *I feel intimidated by e-Learning.*
II. *E-Learning makes me uncomfortable because I do not understand it.*
III. *E-Learning is a de-humanizing process of learning.*

3.3.3 Computer self-efficacy

This study defines computer self-efficacy as one's judgement on his or her capacity to master the use of computing devices (Bandura, 1986, cited by Compeau and Higgins, 1995). Respondents were, hence, requested to provide data on their judgement of their capabilities to master the use of computing devices in terms of: typing fast; typing fast on mobile devices; using common computer programs; learning new computer tasks through trial and error; learning new computer tasks with manual references; troubleshooting common computer programs; understanding computer terminology; and using computer

programs to analyse data. These questionnaire items are taken from the computer self-efficacy scale proposed by Torkzadeh and Koufteros (1994). This scale is briefly discussed below.

Torkzadeh and Koufteros (1994:814) measured undergraduate students' computer self-efficacy as a "*self-percept held by students on their ability in different situations to computers*". The same authors also insist that they consider self-efficacy as an "*individualised self-percept that can vary across activities and situational circumstances, rather than a global disposition that can be assessed by an omnibus test*" (Torkzadeh and Koufteros, 1994:814). They adopted Murphy (1989)'s computer self-efficacy scale and performed conclusive reliability and validity tests that led to the distinction between four components of computer self-efficacy according to the different levels of skills required for use of computers: beginning skills, advanced skills, mainframe skills, and file and software skills.

Some examples of the beginning-level computer skills items from Torkzadeh and Koufteros (1994:817) are:

I. *Calling up a data file to view on the monitor screen*
II. *Moving the cursor around the monitor screen*
III. *Handling a floppy disk correctly*

Some examples of the advanced computer skills items from Torkzadeh and Koufteros (1994:817) are:

I. *Troubleshooting computer problems*
II. *Using the user's guide when help is needed*
III. *Understanding terms/words relating to computer software*

The three mainframe computer skills items from Torkzadeh and Koufteros (1994:817) are:

I. *Logging off the mainframe computer system*
II. *Logging onto a mainframe computer system*
III. *Working on a mainframe computer*

Some examples of file and software computer skills items from Torkzadeh and Koufteros (1994:817) are:

I. *Getting a software up and running*
II. *Organizing and managing files*
III. *Adding and deleting information from a data file*

3.3.4 Pedagogical beliefs

This study defines teachers' pedagogical beliefs as their "educational beliefs about teaching and learning" (Pajares, 1992, cited by Ertmer, 2005). Respondents were, hence, requested to provide data on their educational beliefs on the constructivist abilities of students by stating whether or not they believe that students have the self-ability to: share knowledge; experience, and ideas; adapt acquired knowledge to different contexts; self-improve their thinking; take responsibility for their learning; self-improve their academic performance; relate educational knowledge to their daily life; analyse situations from different perspectives; and discover relevant strategies for new problems. These questionnaire items are taken from the pedagogical beliefs' scale proposed by Obafemi (2015: 102).

Obafemi (2015) measured Educators' pedagogical beliefs on students' self-abilities to conform to the constructivist learning theory, which posits that "*knowledge is personally moulded and socially constructed by the learner's interactions with his or her world* "(Jonassen (1999) cited by Obafemi (2015:21)). He performed conclusive reliability and validity tests for his pedagogical beliefs scale. His scale is made up of ten items measuring Educators' pedagogical beliefs.

Some examples of Educators' pedagogical beliefs items from Obafemi (2015:21) are:

I. *I believe that learners have the self-ability to adapt acquired knowledge to different contexts,*
II. *I believe that learners have the self-ability to take responsibility for their learning,*
III. *I believe that learners have the self-ability to improve their thinking skills,*
IV. *I believe that learners have the self-ability to analyse situations from different perspectives,*

V. *I believe that learners have the self-ability to relate educational knowledge to their daily life,*

VI. *I believe that learners have the self-ability to improve their own academic performance,*

VII. *I believe that learners have the self-ability to share knowledge, experiences, and ideas with others,*

VIII. *I believe that learners have the self-ability to discover relevant strategies for new problems*

3.3.5 Use of LMSs

This construct was intended to measure the extent of use of different functionalities and aspects of LMSs by the respondents (Llamas *et al*., 2011). Respondents were, hence, requested to provide data on their usage of LMSs with regards to: the uploading of text based teaching resources; the uploading of video and audio-based teaching resources; the conduct of live interactive teaching; the downloading of students' submissions; the broadcasting of messages; the exchange of individual messages; discussions on teaching and learning issues; the conduct of assessments; participation in academic newsgroups; and the setting-up of time management tasks. The LMSs' usage scale from Mahdizadeh (2007) inspired some of these items.

Mahdizadeh (2007:158) measured the use of e-Learning by teachers for selected features and capabilities of E-learning Environments. He performed conclusive reliability and validity tests for his use of LMSs scale. His scale is made up of twenty-seven items, with only thirteen five-point items on teachers' use of selected features and capabilities of E-learning Environments (Mahdizadeh (2007:57 – 58).

An adaptation of some examples of the five points scale items on teachers' use of selected features and capabilities of E-learning from Mahdizadeh (2007:56) can be found below:

I. *I use the course calendar and schedule functions and capabilities of e-Learning as part of my teaching tasks.*

II. *I use the videoconferencing and net-meeting functions and capabilities of e-Learning as part of my teaching tasks.*

III. *I use the course materials presentation and literature functions and capabilities of e-Learning as part of my teaching tasks*

3.3.6 Perceptions on the impact of LMSs on academic performance

This study uses Da Silva's (2005:10) definition of perception, as cited by Lara Herrera (2015:109): "a physical and intellectual ability used in mental processes to recognize, interpret, and understand events". Respondents were, hence, requested to state whether or not they recognised that LMSs can improve students' academic performance by helping them to: adapt existing solutions to different domains or ranges; analyse the complexity of existing solutions; apply existing solutions to different contexts; debug, detect, and correct flaws in existing solutions; design and devise solutions to different problems; implement a given design into a solution; model, illustrate, and create an abstraction for a solution; present or explain a solution to others; recognise the base knowledge and vocabulary of different subject matters; and refactor, redesign, and optimise a solution. The perceptions' measurement scales from Carvalho *et al*. (2011), and from McGill and Klobas (2009) inspired some of these items.

McGill and Klobas (2009:498) measured the perceived impact of LMSs technologies for university students as the degree to which they have a "*positive impact on individual performance, [and how] the technology must fit with the tasks it is supposed to support*". They performed conclusive reliability and validity tests for their scale which is made up of forty-two Likert scale items.

Some examples of Likert scale of LMSs items from McGill and Klobas (2009:506) are:

I. *Using WebCT will improve my performance in units.*
II. *Using WebCT will give me greater control over my learning tasks.*
III. *Using WebCT will improve the quality of my learning.*

Carvalho *et al*. (2011) also measured students' perceptions on the overall impact of using LMSs as learning tools. They performed conclusive reliability and validity tests for their scale which is made up of forty-six Likert scale items.

Some examples of Likert scale of LMSs items from Carvalho *et al*. (2011:839) are:

I. *Using an LMS has a positive impact on my learning.*
II. *Using an LMS helps me keep up when I miss a class.*
III. *Using an LMS helps with group work.*

3.4 Analysis methods

This section describes the analysis method used to examine the data collected by the above-described questionnaire. First, the validity and reliability of this questionnaire was tested by means of Cronbach Alpha coefficients and, thereafter, its data were analysed using the Statistical Package for Social Sciences (SPSS) version 24.0 (IBM-SPSS Inc.). SPSS is an application that is used to perform data entry and data analysis, and to create tables and graphs. The SPSS software is capable of handling large amounts of data and can perform many different types of data analysis. It is commonly used in the social sciences, in the business world and in academic research (McKendrick, 2003; Holmes *et al*. 2014, cited by Sofowora, 2015). Some of the functionalities of SPSS includes: descriptive statistics; reliability tests; correlation, ANOVA; ANCOVA; t-tests; log linear regression; discriminant analysis; and factor analysis (IBM-SPSS Inc., 2017).

The data of the above-described questionnaire were analysed both descriptively and inferentially in terms of frequencies and means analysis, and inferential analysis. This inferential analysis was carried out in the form of the calculation of Pearson's correlation coefficients between the different variables of the questionnaire, and, thereafter, linear regression equations were calculated for the variables with positive Pearson's correlations. The ANOVA method was also used to assess the influence of the demographic profile of academics on their perceptions on the impact of e-Learning on academic performance. All the above presented tests were conducted with a level of confidence of 95% with a significant p-value between 0.00 and 0.05.

3.5 Summary

The first part of this chapter described the content analysis method used for the analysis of the literature analysis conducted by this study, as proposed by Gaur and Kumar (2017). The second part of this chapter gave a description of the survey of seventy-eight (78) academic staff from of a population of 102 staff from the computing departments of the

four (4) KwaZulu-Natal universities (South Africa) by using stratified sampling. This chapter also provided a description of the six variables in the survey questionnaire. These variables were: A) demographics; B) attitude towards e-Learning; C) computer self-efficacy; D) pedagogical beliefs; E) use of LMSs; and E) perceived impact of LMSs on academic performance. Lastly, this chapter described the data analysis process of this study with the use of SPSS for the validation of the questionnaire, and the calculation of descriptive and inferential statistics.

Chapter 4 RESEARCH RESULTS

This chapter presents the findings of this study after conducting the different research procedures that were described in the previous chapter. This includes findings on the instrument's reliability and validity as well as descriptive and inferential statistical results. The final outcome of this chapter is the presentation of the empirically validated model that is proposed by this study on the factors that are affecting the perceptions of academics on the impact of learning management systems (LMSs) on students' academic performance. In short, this chapter presents the empirical findings of the questionnaire described by the previous chapter, whilst the second chapter was on the findings of the systematic content analysis.

4.1 Instrument's reliability and validity results

This section presents the Cronbach's alpha (α) coefficients that were obtained for the testing of the reliability of the questionnaire instrument of this study as well as the Pearson coefficients that were obtained for the testing of its validity.

4.1.1 Instrument's reliability

Table 4.1 shows the Cronbach's alpha (α) coefficients of the Likert-scale research variables of this study. The values of all these Cronbach's alpha (α) coefficients are by far greater than 0.7. This clearly indicates that the questionnaire of this study is reliable.

Table 4.1 Data reliability for research variables

Research Variable	**No. of Items**	**Cronbach's Alpha**
Attitude Towards e-Learning	8	.846
Computer Self-Efficacy	8	.915
Pedagogical Beliefs	8	.945
Use of LMSs	10	.877
Perception on the Impact of LMSs on Academic Performance	10	.961

4.1.2 Instrument's validity

Each of the Likert-scale research variables of this study has a dedicated subsection on the convergent validity of its items according to the values of their Pearson correlation coefficients (r) against their scale.

4.1.2.1 Validity of the attitude scale

Table 4.2 shows the Pearson correlation coefficients (r) between each attitude item and the attitude scale itself. The values of all these Pearson coefficients (r) are by far greater than 0.4. This clearly indicates that the attitude scale of this study is valid.

Table 4.2 Data validity for attitude (Independent variable)

		B1	B2	B3	B4	B5	B6	B7	B8	Attitude
B1	Pearson Correlation	1	.513**	.377**	.254*	.316**	.572**	.486**	.404**	.698**
	Sig. (2-tailed)		.000	.001	.025	.005	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
B2	Pearson Correlation	.513**	1	.638**	.408**	.565**	.446**	.561**	.394**	.791**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
B3	Pearson Correlation	.377**	.638**	1	.417**	.524**	.383**	.339**	.260*	.691**
	Sig. (2-tailed)	.001	.000		.000	.000	.001	.002	.022	.000
	N	78	78	78	78	78	78	78	78	78
B4	Pearson Correlation	.254*	.408**	.417**	1	.625**	.418**	.202	.351**	.669**
	Sig. (2-tailed)	.025	.000	.000		.000	.000	.076	.002	.000
	N	78	78	78	78	78	78	78	78	78
B5	Pearson Correlation	.316**	.565**	.524**	.625**	1	.550**	.416**	.292**	.756**
	Sig. (2-tailed)	.005	.000	.000	.000		.000	.000	.010	.000
	N	78	78	78	78	78	78	78	78	78
B6	Pearson Correlation	.572**	.446**	.383**	.418**	.550**	1	.308**	.368**	.730**
	Sig. (2-tailed)	.000	.000	.001	.000	.000		.006	.001	.000
	N	78	78	78	78	78	78	78	78	78
B7	Pearson Correlation	.486**	.561**	.339**	.202	.416**	.308**	1	.360**	.631**
	Sig. (2-tailed)	.000	.000	.002	.076	.000	.006		.001	.000
	N	78	78	78	78	78	78	78	78	78
B8	Pearson Correlation	.404**	.394**	.260*	.351**	.292**	.368**	.360**	1	.639**
	Sig. (2-tailed)	.000	.000	.022	.002	.010	.001	.001		.000
	N	78	78	78	78	78	78	78	78	78
Attitude	Pearson Correlation	.698**	.791**	.691**	.669**	.756**	.730**	.631**	.639**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	
	N	78	78	78	78	78	78	78	78	78

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.1.2.2 Validity of self-efficacy scale

Table 4.3 shows the Pearson correlation coefficients (r) between each self-efficacy item and the self-efficacy scale itself. The values of all these Pearson coefficients (r) are by far greater than 0.4. This clearly indicates that the self-efficacy scale of this study is valid.

Table 4.3 Data validity for self-efficacy (Independent variable)

		C1	C2	C3	C4	C5	C6	C7	C8	Self-Efficacy
C1	Pearson Correlation	1	.753**	.741**	.520**	.484**	.699**	.708**	.630**	.857**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
C2	Pearson Correlation	.753**	1	.694**	.610**	.432**	.644**	.634**	.497**	.824**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
C3	Pearson Correlation	.741**	.694**	1	.704**	.517**	.748**	.681**	.610**	.885**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
C4	Pearson Correlation	.520**	.610**	.704**	1	.343**	.568**	.535**	.562**	.756**
	Sig. (2-tailed)	.000	.000	.000		.002	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
C5	Pearson Correlation	.484**	.432**	.517**	.343**	1	.461**	.476**	.331**	.650**
	Sig. (2-tailed)	.000	.000	.000	.002		.000	.000	.003	.000
	N	78	78	78	78	78	78	78	78	78
C6	Pearson Correlation	.699**	.644**	.748**	.568**	.461**	1	.718**	.733**	.861**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
C7	Pearson Correlation	.708**	.634**	.681**	.535**	.476**	.718**	1	.693**	.830**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000
	N	78	78	78	78	78	78	78	78	78
C8	Pearson Correlation	.630**	.497**	.610**	.562**	.331**	.733**	.693**	1	.771**
	Sig. (2-tailed)	.000	.000	.000	.000	.003	.000	.000		.000
	N	78	78	78	78	78	78	78	78	78
Self-Efficacy	Pearson Correlation	.857**	.824**	.885**	.756**	.650**	.861**	.830**	.771**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	
	N	78	78	78	78	78	78	78	78	78

**. Correlation is significant at the 0.01 level (2-tailed).

4.1.2.3 Validity of the pedagogical belief scale

Table 4.4 shows the Pearson correlation coefficients (r) between each pedagogical belief item and the pedagogical belief scale itself. The values of all these Pearson coefficients (r) are by far greater than 0.4. This clearly indicates that the pedagogical belief scale of this study is valid.

Table 4.4 Data validity for pedagogical belief (Independent variable)

		D1	D2	D3	D4	D5	D6	D7	D8	Pedagogical
D1	Pearson Correlation	1	.698**	.644**	.619**	.632**	.525**	.642**	.610**	.781**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
D2	Pearson Correlation	.698**	1	.742**	.725**	.682**	.716**	.735**	.732**	.881**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
D3	Pearson Correlation	.644**	.742**	1	.764**	.676**	.612**	.696**	.715**	.859**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
D4	Pearson Correlation	.619**	.725**	.764**	1	.711**	.573**	.658**	.764**	.856**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
D5	Pearson Correlation	.632**	.682**	.676**	.711**	1	.688**	.788**	.690**	.862**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
D6	Pearson Correlation	.525**	.716**	.612**	.573**	.688**	1	.687**	.719**	.812**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000
	N	78	78	78	78	78	78	78	78	78
D7	Pearson Correlation	.642**	.735**	.696**	.658**	.788**	.687**	1	.750**	.875**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000
	N	78	78	78	78	78	78	78	78	78
D8	Pearson Correlation	.610**	.732**	.715**	.764**	.690**	.719**	.750**	1	.884**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000
	N	78	78	78	78	78	78	78	78	78
Pedagogical	Pearson Correlation	.781**	.881**	.859**	.856**	.862**	.812**	.875**	.884**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	
	N	78	78	78	78	78	78	78	78	78

**. Correlation is significant at the 0.01 level (2-tailed).

4.1.2.4 Validity of the use of LMSs' scale

Table 4.5 shows the Pearson correlation coefficients (r) between each use of LMSs' item and the use of LMSs' scale itself. The values of all these Pearson coefficients (r) are by far greater than 0.4. This clearly indicates that the use of LMSs' scale of this study is valid.

Table 4.5 Data validity for LMS uses (Independent variable)

		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Use of LMS
E1	Pearson Correlation	1	.451**	.091	.612**	.759**	.363**	.555**	.573**	.224*	.160	.604**
	Sig. (2-tailed)		.000	.429	.000	.000	.001	.000	.000	.048	.161	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E2	Pearson Correlation	.451**	1	.455**	.628**	.498**	.458**	.519**	.481**	.436**	.295**	.742**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.009	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E3	Pearson Correlation	.091	.455**	1	.381**	.093	.451**	.431**	.235*	.577**	.557**	.674**
	Sig. (2-tailed)	.429	.000		.001	.419	.000	.000	.038	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E4	Pearson Correlation	.612**	.628**	.381**	1	.542**	.575**	.510**	.608**	.396**	.260*	.759**
	Sig. (2-tailed)	.000	.000	.001		.000	.000	.000	.000	.000	.022	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E5	Pearson Correlation	.759**	.498**	.093	.542**	1	.439**	.497**	.553**	.181	.237*	.609**
	Sig. (2-tailed)	.000	.000	.419	.000		.000	.000	.000	.114	.037	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E6	Pearson Correlation	.363**	.458**	.451**	.575**	.439**	1	.671**	.425**	.516**	.425**	.769**
	Sig. (2-tailed)	.001	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E7	Pearson Correlation	.555**	.519**	.431**	.510**	.497**	.671**	1	.435**	.529**	.490**	.802**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E8	Pearson Correlation	.573**	.481**	.235*	.608**	.553**	.425**	.435**	1	.389**	.179	.657**
	Sig. (2-tailed)	.000	.000	.038	.000	.000	.000	.000		.000	.116	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E9	Pearson Correlation	.224*	.436**	.577**	.396**	.181	.516**	.529**	.389**	1	.523**	.726**
	Sig. (2-tailed)	.048	.000	.000	.000	.114	.000	.000	.000		.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
E10	Pearson Correlation	.160	.295**	.557**	.260*	.237*	.425**	.490**	.179	.523**	1	.634**
	Sig. (2-tailed)	.161	.009	.000	.022	.037	.000	.000	.116	.000		.000
	N	78	78	78	78	78	78	78	78	78	78	78
Use of LMS	Pearson Correlation	.604**	.742**	.674**	.759**	.609**	.769**	.802**	.657**	.726**	.634**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	78	78	78	78	78	78	78	78	78	78	78

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.1.2.5 Validity of the academics' perceptions on the impact of LMSs on academic performance scale

Table 4.6 Data validity for academic performance (Dependent variable)

		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Academic Performance
F1	Pearson Correlation	1	.759**	.754**	.705**	.702**	.688**	.713**	.740**	.539**	.665**	.846**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F2	Pearson Correlation	.759**	1	.821**	.778**	.662**	.698**	.687**	.712**	.480**	.715**	.849**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F3	Pearson Correlation	.754**	.821**	1	.767**	.747**	.698**	.724**	.681**	.549**	.664**	.860**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F4	Pearson Correlation	.705**	.778**	.767**	1	.872**	.836**	.652**	.754**	.665**	.731**	.901**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F5	Pearson Correlation	.702**	.662**	.747**	.872**	1	.867**	.741**	.754**	.708**	.685**	.899**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F6	Pearson Correlation	.688**	.698**	.698**	.836**	.867**	1	.739**	.785**	.680**	.718**	.896**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F7	Pearson Correlation	.713**	.687**	.724**	.652**	.741**	.739**	1	.732**	.576**	.730**	.848**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F8	Pearson Correlation	.740**	.712**	.681**	.754**	.754**	.785**	.732**	1	.636**	.753**	.877**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F9	Pearson Correlation	.539**	.480**	.549**	.665**	.708**	.680**	.576**	.636**	1	.741**	.765**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
	N	78	78	78	78	78	78	78	78	78	78	78
F10	Pearson Correlation	.665**	.715**	.664**	.731**	.685**	.718**	.730**	.753**	.741**	1	.860**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	78	78	78	78	78	78	78	78	78	78	78
Academic Performance	Pearson Correlation	.846**	.849**	.860**	.901**	.899**	.896**	.848**	.877**	.765**	.860**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	78	78	78	78	78	78	78	78	78	78	78

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.6 above shows the Pearson correlation coefficients (r) between each academic performance item and the academic performance scale itself. The values of all these Pearson coefficients (r) are by far greater than 0.4. This clearly indicates that the academic performance scale of this study is valid.

4.2 Descriptive statistics

This section presents the means and frequency descriptive statistics of the research variables of this study. This will start with an overall description of the demographics of the participants of this study.

4.2.1 Demographic descriptive statistics

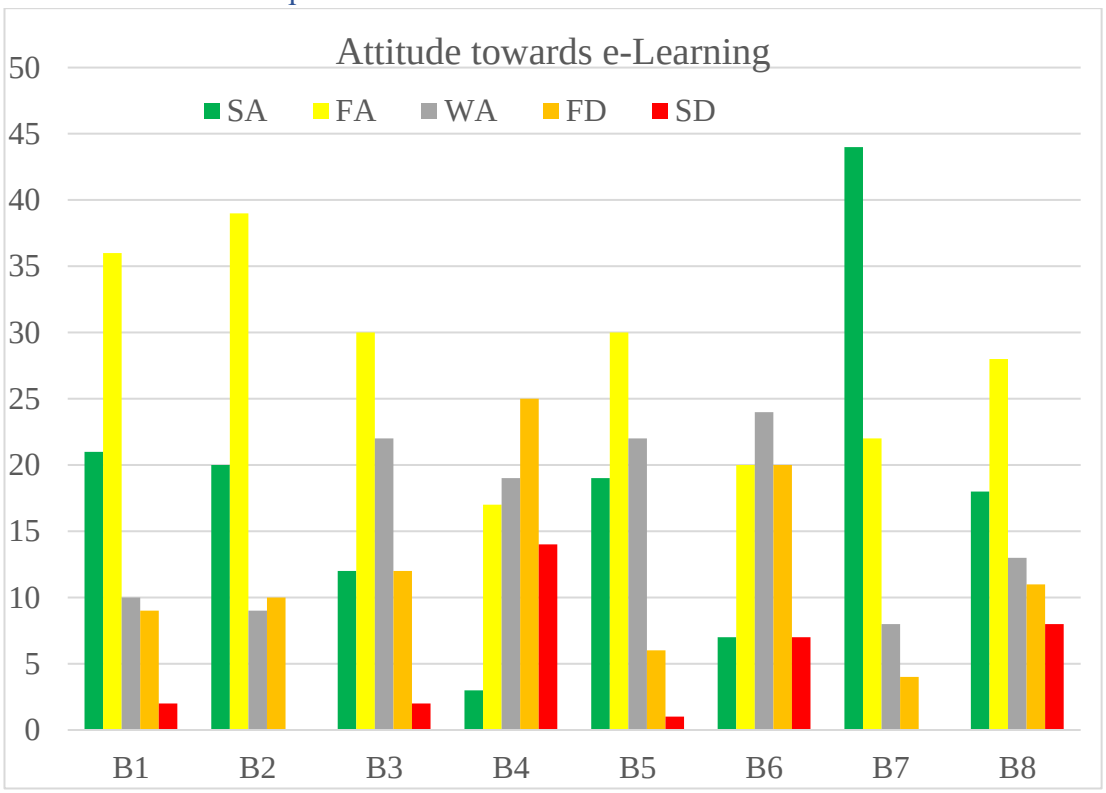
Table 4.7 shows the distribution of the participants of this study according to their gender, their age, their ethnic group, their computing field, their employment status, their nationality and their academic rank.

Table 4.7 Descriptive statistics for demographics

Demographics Items		**Percentage (%)**
Institution	DUT	46.2
	MUT	20.5
	UKZN	25.6
	UNIZULU	7.7
Department	IT	83.3
	CS	16.7
Age	U30 years	11.5
	30 – 40 years	44.9
	41 – 50 years	17.9
	51 – 60 years	20.5
	Above 60 years	5.1
Gender	Female	41
	Male	59
Ethnic Group	Black	50
	Coloured	3.8
	White	14.1
	Indian	29.5
	Prefer Not to Say	2.6
Employment Type	Permanent	71.8
	Contract	28.2
Citizenship	South African	70.5
	Expatriate	24.4
	Prefer Not to Say	3.8
Rank	Junior Lecturer	16.7
	Lecturer	47.4
	Senior Lecturer	17.9
	Associate Professor	9
	Full Professor	1.3
	Other	7.7

There were relatively more male participants (59%) compared to the percentage of female participants (41%). Most of the participants are aged between 30 and 60 years old with the majority of them being considered as relatively young academics aged between 30 and 40 (44.9%). Half of the respondents were Black and almost a third of them were Indians (29.5%). More than two thirds of the participants were permanent employees (71.8%), and almost the same proportion of employees were South African citizens (70.5%). An overwhelming majority of staff members were from Information Technology departments (83.3%). Almost half of participants held the position of lecturer (47.4%).

4.2.2 Attitudes' descriptive statistics



SA: Strongly Agree; FA: Fairly Agree; WA: Weakly Agree, FD: Fairly Disagree; SD: Strongly Disagree

Figure 4.1 Descriptive statistics for attitude towards e-Learning

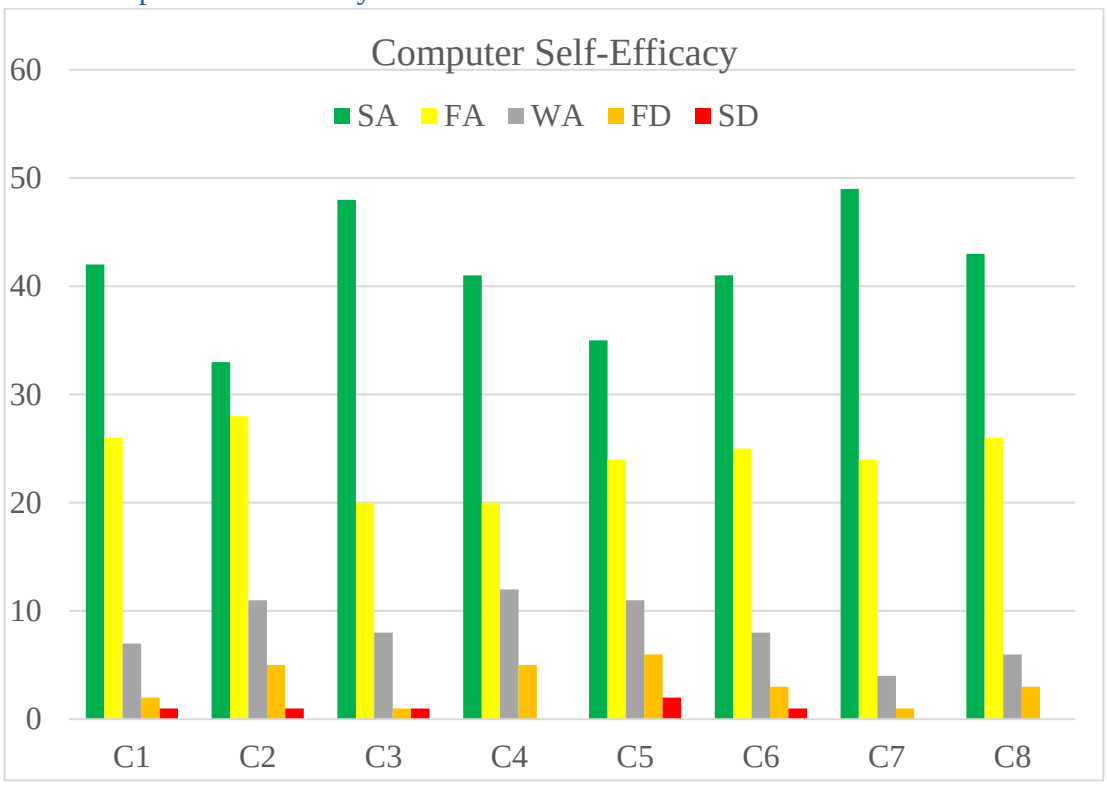
Table 4.8 shows mean values on the perceptions of the participants on the benefits of e-Learning. According to these mean values, the ability of e-Learning to reduce copying and cheating (Item B4) was given the lowest rating by the participants of this study (2.63 out 5). On the other hand, the ability of e-Learning to create many communication channels in academia (Item B7) was given the highest rating by the participants of this

study (4.36 out of 5). These mean values also indicate that, on average, the overall benefits of e-Learning are rated as being slightly above average by the participants of this study (3.5497 out of 5).

Table 4.8 Descriptive statistics towards e-Learning

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
B1	78	1	5	3.83	1.037
B2	78	2	5	3.88	.939
B3	78	1	5	3.47	1.003
B4	78	1	5	2.63	1.141
B5	78	1	5	3.77	.952
B6	78	1	5	3.00	1.117
B7	78	2	5	4.36	.868
B8	78	1	5	3.45	1.265
B	78	1.75	4.88	3.5497	.72673
Valid N (listwise)	78				

4.2.3 Computer self-efficacy



SA: Strongly Agree; FA: Fairly Agree; WA: Weakly Agree, FD: Fairly Disagree; SD: Strongly Disagree

Figure 4.2 Descriptive statistics for computer self-efficacy

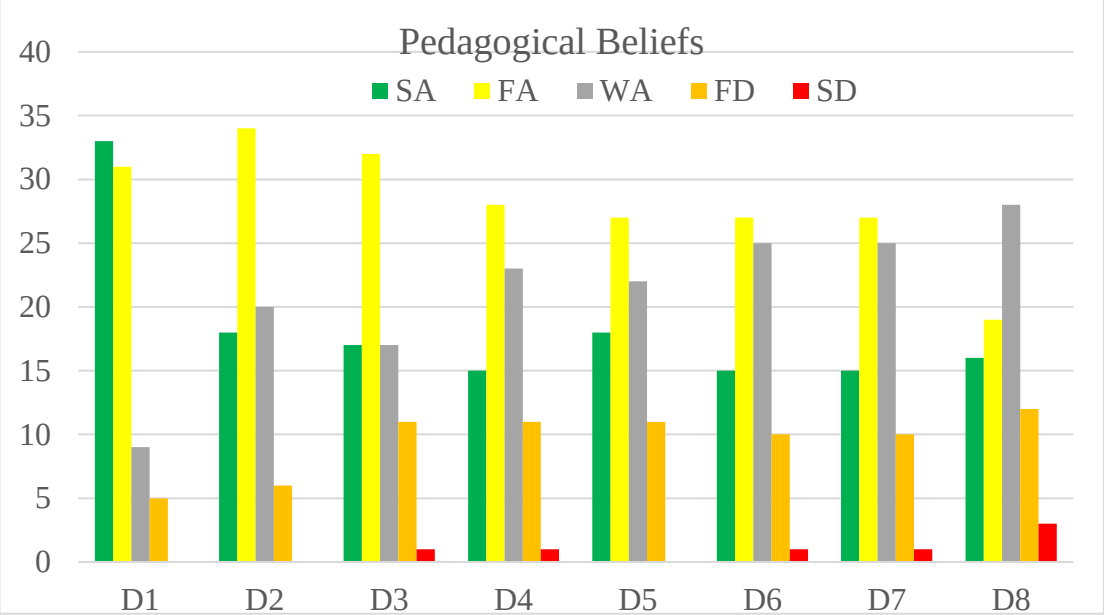
Table 4.9 shows mean values on the computer self-efficacy of the participants of this study in terms of their ability to learn new computing trends. In general, the participants of this study highly rated their computer self-efficacy, and even the lowest-rated computer

self-efficacy item, i,e., the ability to learn new computer tasks with the help of reference manuals (Item C5), was given a mean value of 4.08 out 5.

Table 4.9 Descriptive statistics for computer self-efficacy

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
C1	78	1	5	4.36	.852
C2	78	1	5	4.12	.967
C3	78	1	5	4.45	.832
C4	78	2	5	4.24	.942
C5	78	1	5	4.08	1.066
C6	78	1	5	4.31	.902
C7	78	2	5	4.55	.658
C8	78	2	5	4.40	.795
C	78	1.75	5.00	4.3125	.70040
Valid N (listwise)	78				

4.2.4 Pedagogical beliefs



SA: Strongly Agree; FA: Fairly Agree; WA: Weakly Agree, FD: Fairly Disagree; SD: Strongly Disagree

Figure 4.3 Descriptive statistics for pedagogical beliefs

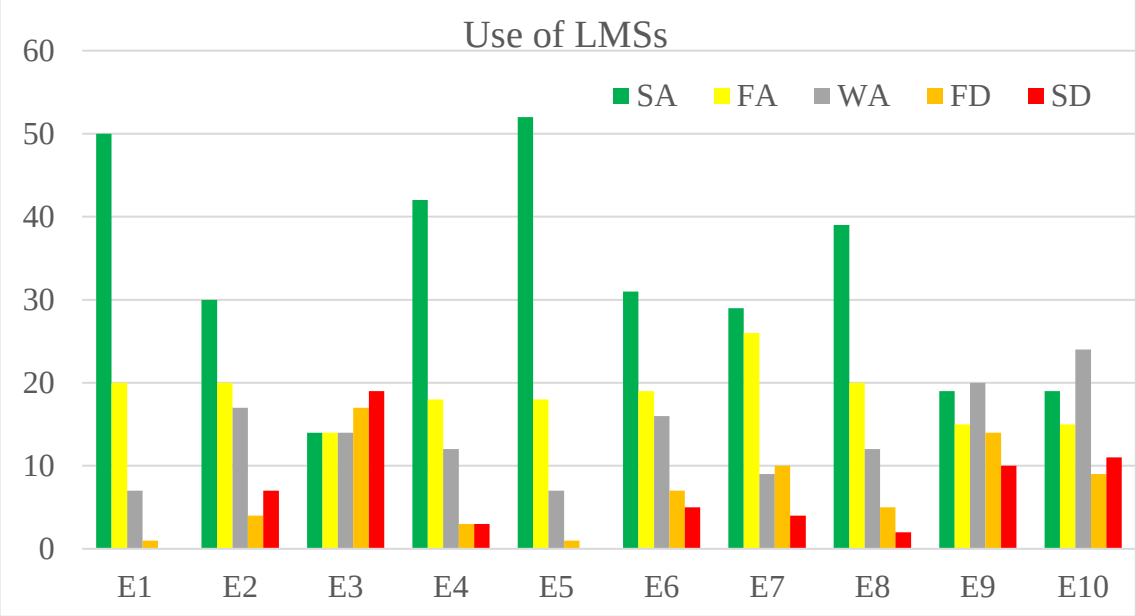
Table 4.10 shows mean values on the pedagogical beliefs of the participants of this study on students' self-ability to learn on their own. According to these mean values, learners' self-ability to discover relevant strategies for new problems (Item D7) was given the lowest rating by the participants of this study (3.44 out 5). On the other hand, learners' self-ability to share knowledge, experience and ideas with others (Item D1) was given the highest rating by the participants of this study (4.18 out of 5). These mean values also

indicate that, on average, learners' self-ability was rated as being slightly above average by the participants of this study (3.6843 out of 5).

Table 4.10 Descriptive statistics for pedagogical beliefs

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
D1	78	2	5	4.18	.879
D2	78	2	5	3.82	.879
D3	78	1	5	3.67	1.002
D4	78	1	5	3.58	1.000
D5	78	2	5	3.65	.978
D6	78	1	5	3.56	.988
D7	78	1	5	3.58	.987
D8	78	1	5	3.44	1.112
D	78	1.63	5.00	3.6843	.83373
Valid N (listwise)	78				

4.2.5 Use of LMSs



SA: Strongly Agree; FA: Fairly Agree; WA: Weakly Agree, FD: Fairly Disagree; SD: Strongly Disagree

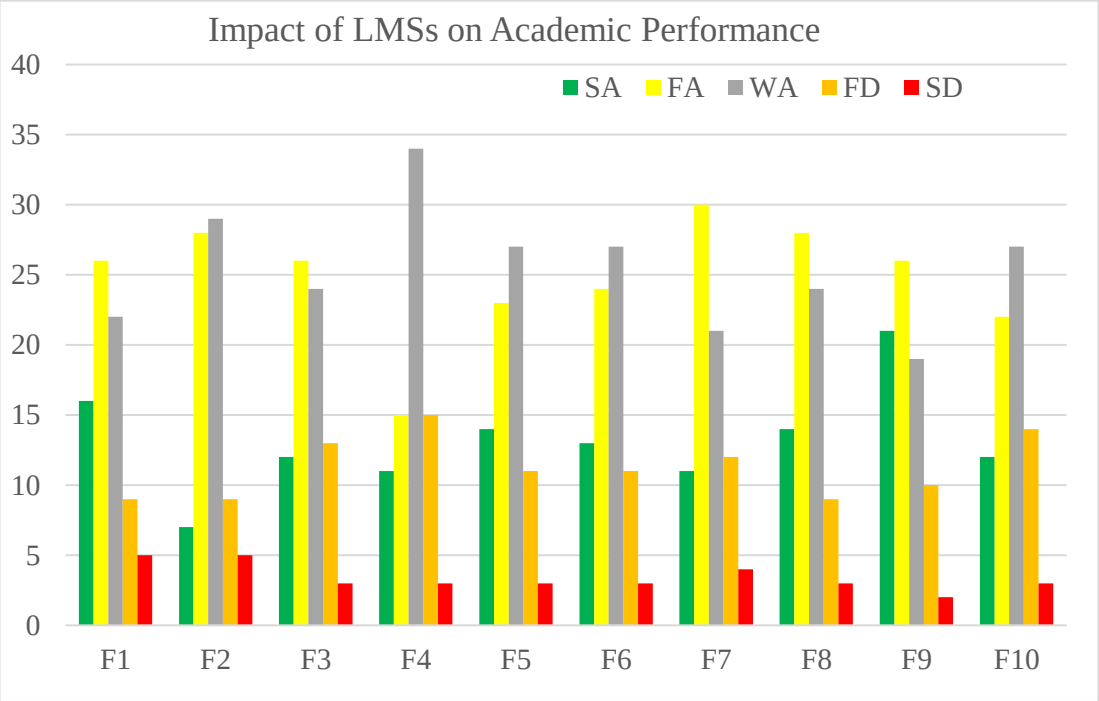
Figure 4.4 Descriptive statistics for use of LMSs

Table 4.11 shows mean values on the use of LMSs by the participants of this study. According to these mean values, the participants of this study acknowledge that the conduct of live interactive teaching (Item E3) is the LMS feature that they use less (2.85 out 5). On the other hand, the participants of this study acknowledge that the broadcasting of messages to students (Item E5) is the LMS feature that they use most (4.54 out of 5). These mean values also indicate that, on average, the overall use of LMSs by the participants of this study can be rated as above average (3.8308 out of 5).

Table 4.11 Descriptive statistics for use of LMSs

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
E1	78	2	5	4.53	.716
E2	78	1	5	3.79	1.262
E3	78	1	5	2.85	1.460
E4	78	1	5	4.21	1.085
E5	78	2	5	4.54	.715
E6	78	1	5	3.83	1.242
E7	78	1	5	3.86	1.203
E8	78	1	5	4.18	1.066
E9	78	1	5	3.23	1.338
E10	78	1	5	3.29	1.349
E	78	1.60	5.00	3.8308	.80587
Valid N (listwise)	78				

4.2.6 Academics' perceptions on the impact of LMSs on academic performance



SA: Strongly Agree; FA: Fairly Agree; WA: Weakly Agree, FD: Fairly Disagree; SD: Strongly Disagree

Figure 4.5 Descriptive statistics for the impact of LMSs on academic performance

Table 4.12 shows mean values on the perceptions of the participants of this study on the impact of LMSs on academic performance. According to these mean values, the participants of this study are of the opinion that LMSs have a slightly positive impact on academic performance.

Table 4.12 Descriptive statistics for academic performance

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
F1	78	1	5	3.49	1.125
F2	78	1	5	3.31	1.023
F3	78	1	5	3.38	1.047
F4	78	1	5	3.23	1.068
F5	78	1	5	3.42	1.051
F6	78	1	5	3.44	1.064
F7	78	1	5	3.41	1.074
F8	78	1	5	3.54	1.053
F9	78	1	5	3.68	1.075
F10	78	1	5	3.33	1.065
F	78	1.00	5.00	3.4231	.91565
Valid N (listwise)	78				

4.3 Inferential statistics (correlations)

This section presents the results of the ANOVA and the Pearson correlation tests that were conducted by this study.

4.3.1 ANOVA test results

ANOVA tests were conducted between each demographic item against the Likert-scale research variables of this study. These results are hereby presented in two groups: i.e., the results without a correlation, and the results with a correlation.

4.3.1.1 ANOVA results without a correlation: Academics' institution, department, age, citizenship, and rank

The following tables show the ANOVA results between the academic institution item (Table 4.13), the department item (Table 4.14), the age item (Table 4.15), the citizenship item (Table 4.16), and the rank item (Table 4.17) against each of the Likert-scale research variables of this study. These results clearly indicate that these demographic items do not correlate with any of the Likert-scale research variables of this study (None of their significant levels is equal to or less than 0.05).

Table 4.13 ANOVA results for academics' institution

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	254.507	3	84.836	2.674	.053
	Within Groups	2348.172	74	31.732		
	Total	2602.679	77			
Self-Efficacy	Between Groups	164.612	3	54.871	1.802	.154
	Within Groups	2252.888	74	30.444		
	Total	2417.500	77			
Pedagogical	Between Groups	202.193	3	67.398	1.547	.209
	Within Groups	3223.256	74	43.558		
	Total	3425.449	77			
Use of LMSs	Between Groups	341.922	3	113.974	1.810	.153
	Within Groups	4658.693	74	62.955		
	Total	5000.615	77			
Academic Performance	Between Groups	483.763	3	161.254	1.998	.122
	Within Groups	5972.083	74	80.704		
	Total	6455.846	77			

Table 4.14 ANOVA test results for academics' department

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	17.664	1	17.664	.519	.473
	Within Groups	2585.015	76	34.013		
	Total	2602.679	77			
Self-Efficacy	Between Groups	80.331	1	80.331	2.612	.110
	Within Groups	2337.169	76	30.752		
	Total	2417.500	77			
Pedagogical	Between Groups	61.603	1	61.603	1.392	.242
	Within Groups	3363.846	76	44.261		
	Total	3425.449	77			
Use of LMSs	Between Groups	133.292	1	133.292	2.081	.153
	Within Groups	4867.323	76	64.044		
	Total	5000.615	77			
Academic Performance	Between Groups	4.523	1	4.523	.053	.818
	Within Groups	6451.323	76	84.886		
	Total	6455.846	77			

Table 4.15 ANOVA test results for academics' age

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	115.253	4	28.813	.846	.501
	Within Groups	2487.426	73	34.074		
	Total	2602.679	77			
Self-Efficacy	Between Groups	113.857	4	28.464	.902	.467
	Within Groups	2303.643	73	31.557		
	Total	2417.500	77			
Pedagogical	Between Groups	78.067	4	19.517	.426	.790
	Within Groups	3347.382	73	45.855		
	Total	3425.449	77			
Use of LMSs	Between Groups	100.031	4	25.008	.373	.828
	Within Groups	4900.584	73	67.131		
	Total	5000.615	77			
Academic Performance	Between Groups	651.075	4	162.769	2.047	.097
	Within Groups	5804.772	73	79.517		
	Total	6455.846	77			

Table 4.16 ANOVA test result for academics' citizenship

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	112.126	2	56.063	1.688	.192
	Within Groups	2490.554	75	33.207		
	Total	2602.679	77			
Self-Efficacy	Between Groups	69.781	2	34.891	1.115	.333
	Within Groups	2347.719	75	31.303		
	Total	2417.500	77			
Pedagogical	Between Groups	162.222	2	81.111	1.864	.162
	Within Groups	3263.227	75	43.510		
	Total	3425.449	77			
Use of LMSs	Between Groups	198.658	2	99.329	1.551	.219
	Within Groups	4801.957	75	64.026		
	Total	5000.615	77			
Academic Performance	Between Groups	348.664	2	174.332	2.141	.125
	Within Groups	6107.182	75	81.429		
	Total	6455.846	77			

Table 4.17 ANOVA test result for academics' rank

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	38.733	5	7.747	.218	.954
	Within Groups	2563.947	72	35.610		
	Total	2602.679	77			
Self-Efficacy	Between Groups	106.883	5	21.377	.666	.650
	Within Groups	2310.617	72	32.092		
	Total	2417.500	77			
Pedagogical	Between Groups	123.656	5	24.731	.539	.746
	Within Groups	3301.793	72	45.858		
	Total	3425.449	77			
Use of LMSs	Between Groups	322.121	5	64.424	.991	.429
	Within Groups	4678.494	72	64.979		
	Total	5000.615	77			
Academic Performance	Between Groups	485.226	5	97.045	1.170	.332
	Within Groups	5970.620	72	82.925		
	Total	6455.846	77			

4.3.1.2 ANOVA results with a correlation: gender, ethnicity and employment type

The following tables show the ANOVA results between the academic gender item (Table 4.18), the ethnicity item (Table 4.19) and the employment type item (Table 4.20) against each of the Likert-scale research variables of this study. These results indicate that there is a correlation between the gender item and the LMSs' use Likert-scale variable (p= .036). In fact, according to Table 4.21, female academics tend to use LMSs more than male academics. There is also a correlation between the employment item and the LMSs use Likert-scale variable (p=.027), and between the ethnicity item and the attitude Likert-scale variable (p=.046). This can be seen on Table 4.22 which shows that academics on a contract position tend to use LMSs more than academics on a permanent position.

Similarly, according to Table 4.23, Black academics tend to have a more positive attitude towards e-Learning compared to other ethnicity groups, especially compared to the academics that did not want to disclose their ethnicity.

Table 4.18 ANOVA test result for academics' gender

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	81.766	1	81.766	2.465	.121
	Within Groups	2520.913	76	33.170		
	Total	2602.679	77			
Self-Efficacy	Between Groups	3.391	1	3.391	.107	.745
	Within Groups	2414.109	76	31.765		
	Total	2417.500	77			
Pedagogical	Between Groups	5.110	1	5.110	.114	.737
	Within Groups	3420.338	76	45.004		
	Total	3425.449	77			
Use of LMSs	Between Groups	283.571	1	283.571	4.569	.036
	Within Groups	4717.045	76	62.066		
	Total	5000.615	77			
Academic Performance	Between Groups	40.410	1	40.410	.479	.491
	Within Groups	6415.436	76	84.414		
	Total	6455.846	77			

Table 4.19 ANOVA test result for academics' ethnic group

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	319.370	4	79.843	2.553	.046
	Within Groups	2283.309	73	31.278		
	Total	2602.679	77			
Self-Efficacy	Between Groups	99.801	4	24.950	.786	.538
	Within Groups	2317.699	73	31.749		
	Total	2417.500	77			
Pedagogical	Between Groups	293.320	4	73.330	1.709	.157
	Within Groups	3132.129	73	42.906		
	Total	3425.449	77			
Use of LMSs	Between Groups	330.712	4	82.678	1.292	.281
	Within Groups	4669.904	73	63.971		
	Total	5000.615	77			
Academic Performance	Between Groups	472.315	4	118.079	1.441	.229
	Within Groups	5983.532	73	81.966		
	Total	6455.846	77			

Table 4.20 ANOVA result for academics' employment type

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	43.647	1	43.647	1.296	.258
	Within Groups	2559.032	76	33.671		
	Total	2602.679	77			
Self-Efficacy	Between Groups	30.643	1	30.643	.976	.326
	Within Groups	2386.857	76	31.406		
	Total	2417.500	77			
Pedagogical	Between Groups	120.155	1	120.155	2.763	.101
	Within Groups	3305.294	76	43.491		
	Total	3425.449	77			
Use of LMSs	Between Groups	312.276	1	312.276	5.062	.027
	Within Groups	4688.339	76	61.689		
	Total	5000.615	77			
Academic Performance	Between Groups	16.052	1	16.052	.189	.665
	Within Groups	6439.794	76	84.734		
	Total	6455.846	77			

Table 4.21 Descriptive of differences between LMSs' use and academics' gender

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Female	32	4.0594	.70567	.12475	3.8050	4.3138	2.60	5.00
Male	46	3.6717	.83975	.12381	3.4224	3.9211	1.60	5.00
Total	78	3.8308	.80587	.09125	3.6491	4.0125	1.60	5.00

Table 4.22 Descriptive of differences between LMSs' use and academics' employment type

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Permanent	56	3.7054	.83870	.11208	3.4808	3.9300	1.60	5.00
Contract	22	4.1500	.62469	.13318	3.8730	4.4270	2.90	5.00
Total	78	3.8308	.80587	.09125	3.6491	4.0125	1.60	5.00

Table 4.23 Descriptive of differences between academics' attitude towards e-Learning and academics' ethnicity

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Black	39	3.7853	.59531	.09533	3.5923	3.9782	2.50	4.88
Coloured	3	3.7083	1.04831	.60524	1.1042	6.3125	2.50	4.38
White	11	3.3523	.67735	.20423	2.8972	3.8073	2.13	4.75
Indian	23	3.2663	.82684	.17241	2.9088	3.6239	1.75	4.50
Prefer Not to Say	2	3.0625	.61872	.43750	-2.4965	8.6215	2.63	3.50
Total	78	3.5497	.72673	.08229	3.3858	3.7135	1.75	4.88

4.3.2 Pearson correlation test results

Table 4.24 shows the Pearson correlation results of each research variable against the other Likert-scale research variables of this study, with a significant level of 0.05 (one

star *) and with significant level of 0.01 (two stars **). These results indicate that all the Likert-scale variables of this study are inter-correlated by Pearson correlations.

Table 4.24 Correlation table of variables not involving demographics

		Attitude	Self-Efficacy	Pedagogical	Use of LMSs	Academic Performance
Attitude	Pearson Correlation	1	.264*	.522**	.606**	.644**
	Sig. (2-tailed)		.019	.000	.000	.000
	N	78	78	78	78	78
Self-Efficacy	Pearson Correlation	.264*	1	.354**	.301**	.301**
	Sig. (2-tailed)	.019		.001	.007	.007
	N	78	78	78	78	78
Pedagogical	Pearson Correlation	.522**	.354**	1	.559**	.560**
	Sig. (2-tailed)	.000	.001		.000	.000
	N	78	78	78	78	78
Use of LMSs	Pearson Correlation	.606**	.301**	.559**	1	.581**
	Sig. (2-tailed)	.000	.007	.000		.000
	N	78	78	78	78	78
Academic Performance	Pearson Correlation	.644**	.301**	.560**	.581**	1
	Sig. (2-tailed)	.000	.007	.000	.000	
	N	78	78	78	78	78
*. Correlation is significant at the 0.05 level (2-tailed).						
**. Correlation is significant at the 0.01 level (2-tailed).						

4.4 The empirically tested model

The results of the inferential statistical analysis performed by this section can be summarised by the empirically tested model of the factors that are affecting the perceptions of computing academics on the impact of LMSs on academic performance (Figure 4.6).

This section will first present the empirically tested model resulting from the empirical findings of this study, only for the purpose of validating the theoretically sound conceptual model from Figure 2.16. It will then expand that empirical model with other correlations that were found by this study, beyond the sole purpose of validating the theoretically sound conceptual model from Figure 2.16.

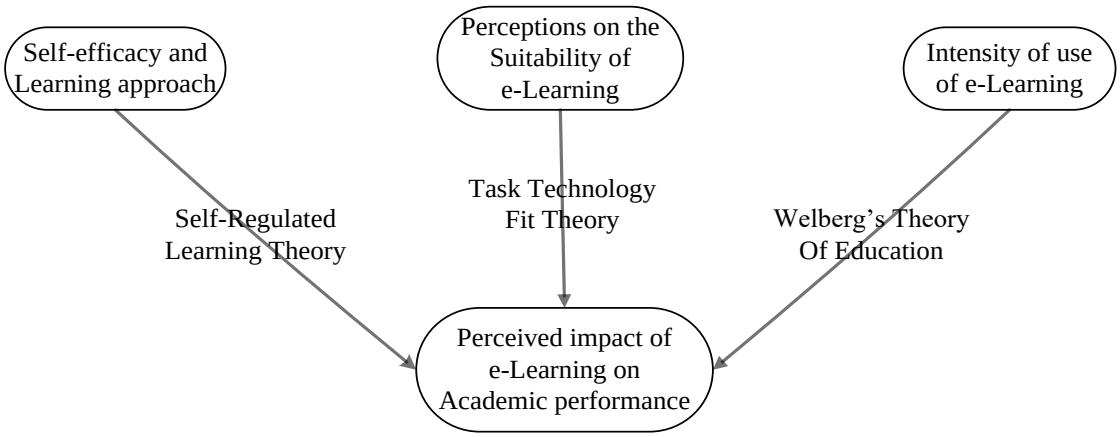


Figure 4.6 Empirical tested model of factors that are affecting the perceived impact of LMSs on academic performance

Figure 4.6 shows that the empirical findings of this study are only confirming half of the factors that were hypothesised by the theoretically sound framework proposed earlier on. However, this study found other relationships amongst its variables, as visible on the expanded model on Figure 3.7. It is important to note that this study used the construct of computer self-efficacy and the one of pedagogical beliefs to represent the self-efficacy and learning approach factor. It also assimilated attitude towards e-Learning with the factor on the perceptions on the suitability of e-Learning. Finally, it simply used the construct of use of LMSs in place of the factor on the intensity of use of e-Learning.

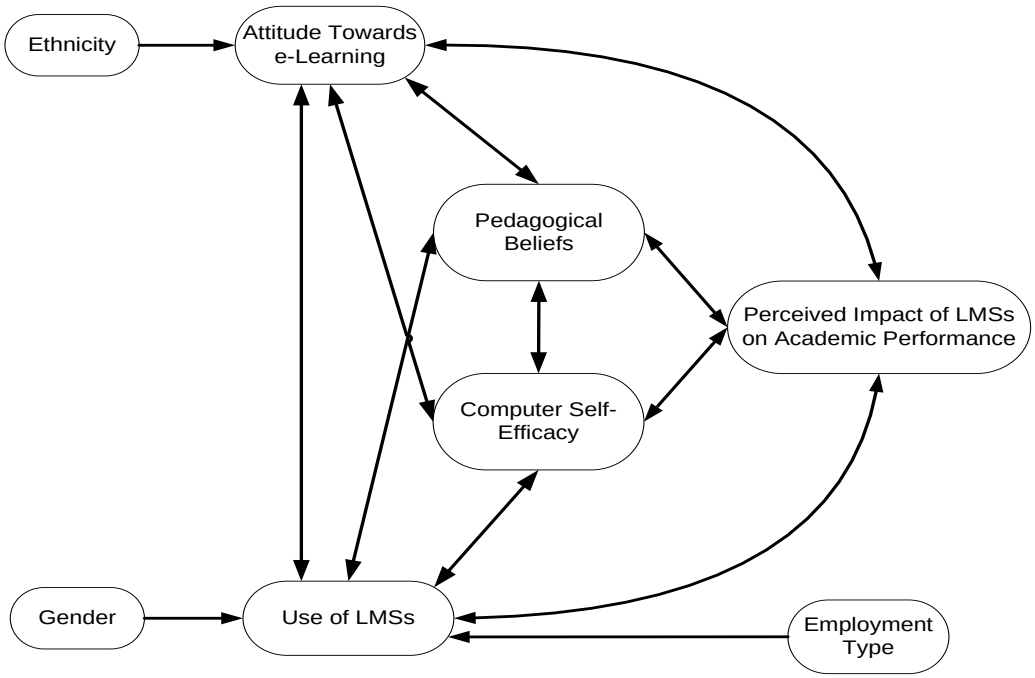


Figure 4.7 Expanded empirical tested model of factors that are affecting the perceived impact of LMSs on academic performance

4.4.1 Linear regression test results

Table 4.25 shows the linear regression and significant of research variables without demographics. On the other hand, Table 4.26 shows the linear regression and significant of the research variables that are also affected by demographic items.

Table 4.25 Linear regression table of research variables.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.344	5.423		-.801	.426
	Attitude	.613	.169	.389	3.633	.001
	Self-Efficacy	.096	.144	.059	.665	.508
	Pedagogical	.305	.144	.222	2.114	.038
	Use of LMSs	.231	.126	.203	1.837	.070
a. Dependent Variable: Academic Performance						

Table 4.26 Linear regression table of research variables that are also affected by demographics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.159	4.137		.038	.969
	Attitude	.761	.153	.483	4.970	.000
	Use of LMSs	.422	.134	.308	3.163	.002
a. Dependent Variable: Academic Performance						

4.5 Summary

This chapter has confirmed the reliability and the validity of the questionnaire of this study. Some of the highlights from the results presented by this chapter are: half of the research sample is made up of Black academics while the other half belongs to other racial groups; the ANOVA results show that there is a correlation between gender and the use of LMSs, with a higher use of LMSs by female academics. Moreover, the results of the Pearson correlation tests conducted by this study indicate that all the factors examined by this study are inter-correlated except for some of the demographic factors, and they all have an effect on the dependent variable. The next chapter will discuss these findings in comparison with those from existing empirical studies on the factors affecting the impact of LMSs on academic performance.

Chapter 5 DISCUSION, RECOMMENDATIONS AND CONCLUSION

The previous chapter presented the findings of this study in terms of the reliability and the validity of its data, as well as the analysis of its inferential statistics and descriptive statistics, as extracted from the survey of academic staff from the computing departments of the KwaZulu-Natal universities in South Africa on their perceptions on the impact of learning management systems on academic performance. The current chapter is devoted to the discussion of these findings compared to the findings from the existing empirical studies, as presented by chapter three, on the impact of learning management systems on academic performance. Noticeable research gaps and recommendations will then be highlighted in this chapter for the improvement of the impact of learning management systems on academic performance, both for future research and for practice, as outlined in the third objective of this study.

5.1 Contribution of the current study with regards to its findings on its independent variables

The research instrument of this study was inspired by other existing research instruments from the existing literature, as presented by section 3.3 in chapter 3. These research instruments have in common many research variables, and it is interesting to compare these different studies in terms of their findings on these common research variables. Readers are reminded that, according section 3.3 of chapter 3, the research instrument of this study was inspired from research instruments from Kay (1990), Christensen and Knezek (1996), Durndell and Haag (2002), Mishra and Panda (2007), Torkzadeh and Koufteros (1994), Obafemi (2015), and Mahdizadeh (2007).

The rest of this section will present the added value of the current study compared to the above listed studies as highlighted by the tables from Table 5.1 to Table 5.9

Table 5.1 shows that this study has a different research population (university academics) compared to the study that was conducted by Kay (1990) (University students). This study found one demographic factor (Ethnicity) that affects the attitudes of academics towards e-Learning, as opposed to Kay (1990) who did not find any correlation between university students' demographics and their attitudes towards computers, even though that study also examined the possibility of the existence of such a correlation. On the other hand,

the current study found that the attitude of university academics towards e-Learning is affected by their pedagogical beliefs, but that factor was not examined by Kay (1990). It is interesting to note that both studies found that the use of technology (computer literacy, use of LMSs) has an effect on attitudes towards technology (attitude towards computers, attitude towards e-Learning). It is also interesting to note that both studies found that users' control of technology (Locus of control, computer self-efficacy) has an effect on their attitudes towards technology (attitude towards computers, attitude towards e-Learning). Finally, this study found a new effect for attitudes towards e-Learning, the one on the perceptions of university academics on the impact of LMSs on academic performance, in addition to the one already found by Kay (1990) on the effect of attitude towards computers on commitment to use computers.

Table 5.1: Contribution of this study compared to Kay (1990)'s study on computer attitude

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Kay (1990)	University students	Computer literacy, Locus of control	Attitude towards computers	Commitment to use Computers
Current study	University academics	Ethnicity Computer self-efficacy, Use of LMSs, Pedagogical beliefs	Attitude towards e-Learning	Perceptions on the impact of LMSs on Academic Performance

Table 5.2 shows that this study has a different research population (university academics) compared to the study that was conducted by Christensen and Knezek (1996) (Junior high school learners). This study found one demographic factor (Ethnicity) that affects the attitudes of academics towards e-Learning, as opposed to Christensen and Knezek (1996) who did not even examine the possibility of the existence of such a correlation. On the other hand, the current study found that the attitude of university academics towards e-Learning is affected by their pedagogical beliefs, but that factor was not even examined by Christensen and Knezek (1996). However, the study by Christensen and Knezek (1996) found that the attitude of Junior high school learners towards computers is affected by their perceived importance of computers, their computer anxiety, and by their perceived computer seclusion, but these factors were not examined by the current study. Finally, this study found a new effect for attitudes towards technology, the one between academics' attitude towards e-Learning , and their perceptions on the impact of LMSs on

academic performance; in addition to the one already found by Christensen and Knezek (1996) on the effect of learners' attitude towards computers on the computer inventory of young children.

Table 5.2: Contribution of this study compared to Christensen and Knezek (1996)'s study on computer attitude

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Christensen and Knezek (1996)	Junior high school learners	Computer importance, Computer anxiety, Computer seclusion	Attitude towards computers	Young Children Computer Inventory
Current study	University academics	Ethnicity Computer self-efficacy, Use of LMSs, Pedagogical beliefs	Attitude towards e-Learning	Perceptions on the impact of LMSs on Academic Performance

Table 5.3 shows that this study has a different research population (university academics) compared to the study that was conducted by Durndell and Haag (2002) (University students). It is interesting to note that both studies each found a demographic factor (Ethnicity by the current study, and Gender by Durndell and Haag, 2002) that affects the attitudes of academics towards e-Learning. On the other hand, the current study found that the attitude of university academics towards e-Learning is affected by their pedagogical beliefs, but that factor was not even examined by Durndell and Haag (2002). However, the study by Durndell and Haag (2002) found that university students' attitude towards internet is affected by their computer experience, but this factor was not examined by the current study. Finally, this study found a new effect for computer related attitudes, the one between academics' attitudes towards e-Learning, and their perceptions on the impact of LMSs on academic performance; in addition to the one already found by Durndell and Haag (2002) on the effect of students' attitudes towards Internet on their perceptions on the impact of Internet on academic performance.

Table 5.3: Contribution of this study compared to Durndell and Haag (2002)'s study on Internet attitude

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Durndell and Haag (2002)	University students	Computer experience Gender	Attitude towards Internet	Perceived impact of Internet on academic performance
Current study	University academics	Ethnicity Computer self-efficacy, Use of LMSs, Pedagogical beliefs	Attitude towards e-Learning	Perceptions on the impact of LMSs on Academic Performance

Table 5.4 shows that the current study and the one by Mishra and Panda (2007) have the same research population (university academics). This study found several factors that affect the attitudes of academics towards e-Learning as opposed to Mishra and Panda (2007) who limited their study to the testing of the reliability and of the validity of their scale for the measurement of the attitudes of academics towards e-Learning.

Table 5.4: Contribution of this study compared to Mishra and Panda (2007)'s study on computer attitude

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Mishra and Panda (2007)	University academics	None	Attitude towards e-Learning	None
Current study	University academics	Ethnicity Computer self-efficacy, Use of LMSs, Pedagogical beliefs	Attitude towards e-Learning	Perceptions on the impact of LMSs on Academic Performance

Table 5.5 shows that this study has a different research population (university academics) compared to the study that was conducted by Torkzadeh and Koufteros (1994) (University students). It is interesting to note that both the current study and the study by Torkzadeh and Koufteros (1994) did not found any demographic factor affecting computers self-efficacy. On the other hand, the current study found that university academics computer self-efficacy is affected by their pedagogical beliefs, their use of LMSs, and their attitudes towards e-Learning, but these factor were not even examined by Torkzadeh and Koufteros (1994). However, Torkzadeh and Koufteros (1994) found that university students' computer self-efficacy is affected by computer training but this factor was not examined by the current study. Finally, this study found a new effect for

academics' computer self-efficacy, the one on the perceptions of university academics on the impact of LMSs on academic performance, in addition to the one already found by Torkzadeh and Koufteros (1994) on the effect of computer self-efficacy on the level of computer usage by university undergraduate students.

Table 5.5: contribution of this study compared to Torkzadeh and Koufteros (1994)'s study on computer self-efficacy

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Torkzadeh and Koufteros (1994)	Undergraduate students	Computer training	Computer self-efficacy	Computer usage
Current study	University academics	Attitude towards e-Learning, Use of LMSs, Pedagogical beliefs	Computer self-efficacy	Perceptions on the impact of LMSs on Academic Performance

Table 5.6 shows that this study has a different research population (university academics) compared to the study that was conducted by Obafemi (2015) (school teachers). The current study did not find any demographic factor affecting the pedagogical beliefs of academics, as opposed to Obafemi (2015) who found that teachers' teaching experience and the grade levels they teach have an effect on their pedagogical beliefs. On the other hand, the current study found that academics' attitudes towards e-Learning, their use of LMSs, and their computer self-efficacy all have an influence on their pedagogical beliefs; but these factors were not even examined by Obafemi (2015). Finally, this study found a new effect for pedagogical beliefs, the one on the perceptions of university academics on the impact of LMSs on academic performance, in addition to the one already found by Obafemi (2015) on the effect of pedagogical beliefs on the perceptions of school teachers on the advantages and disadvantages of e-Learning.

Table 5.6: contribution of this study compared to Obafemi (2015)'s study on pedagogical beliefs

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Obafemi (2015)	School teachers	Grade, Teaching experience	Pedagogical beliefs	Perceptions on the advantages and disadvantages of e-Learning
Current study	University academics	Attitude towards e-Learning, Use of LMSs, Computer self-efficacy	Pedagogical beliefs	Perceptions on the impact of LMSs on Academic Performance

Table 5.7 shows that the current study and the one by Mahdizadeh (2007) have the same research population (university academics). The current study found two demographic factors (gender, employment type) that affect the use of LMSs, as opposed to Mahdizadeh (2007) who did not even examine the possible existence of such a correlation. Moreover, the current study found that academics' use of LMSs is affected by their pedagogical beliefs, their attitude towards e-Learning, and by their computer self-efficacy, but these factors were not also examined by Mahdizadeh (2007). However, the study by Mahdizadeh (2007) found that academics' use of e-Learning is affected by their knowledge construction abilities, their teaching and learning approach, their opinions about computer-assisted learning, their previous experiences with e-Learning, and by their perceptions on the ease of use of e-Learning, but these factors were not examined by the current study. Finally, this study found a new effect for the use of LMSs, the one on the perceptions of university academics on the impact of LMSs on academic performance, in addition to the one already found by Mahdizadeh (2007) on the influence of the use of e-Learning on the perceptions of academics' on the added value of e-Learning environments.

Table 5.7: contribution of this study compared to Mahdizadeh (2007)'s study on the use of LMSs

Study	**Research population**	**Factors**	**Common independent variable**	**Dependent variables from existing study**
Mahdizadeh (2007)	University academics	Knowledge construction Teaching and learning approach, Teachers' opinion about computer-assisted learning, Previous experience with e-Learning, Ease of use	Use of e-Learning	Perceptions of academics' on the added value of e-Learning environments
Current study	University academics	Gender Employment type Attitude towards e-Learning, Pedagogical beliefs, Computer self-efficacy	Use of LMSs	Perceptions on the impact of LMSs on Academic Performance

5.2 Discussion on the findings of this study compared to the findings of the reviewed studies

Out of 75 variables on the intensity of use of e-Learning, this literature analysis found that 49 variables have either positive relationships or negative relationships and 25 variables have no relationship with academic performance in the context of e-Learning. Overall, one can therefore say that more than two-thirds of the reviewed existing studies found that the use of LMSs affects or has an impact on academic performance. On the other hand, the current study found that computing academic staff are of the opinion that the use of LMSs only slightly affects academic performance. Even though the findings of the current study and the ones from existing reviewed studies are both in agreement that the use of LMSs affects academic performance, the findings from the current study are not as overwhelming as the ones from the existing reviewed studies. Why so? In other words, what are the factors that were found by this study to affect the perceptions of academic staff on the impact of the use of LMSs on academic performance? The results of the current study found that computing academics' attitude towards e-Learning, their pedagogical beliefs, their computer self-efficacy and their use of LMSs are the factors that directly affect their perceptions on the impact of LMSs on academic performance. Moreover, this study found that the employment type of academics (permanent or contract) and their gender directly affect their use of LMSs, and their use of LMSs also directly affects their perceptions on the impact of LMSs on academic performance. Similarly, this study also found that the ethnicity of academics directly affects their

attitude towards e-Learning, and such attitudes also directly affects their perceptions on the impact of LMSs on academic performance. One can therefore conclude that the type of employment of academics (permanent of contract), their ethnicity, and their gender indirectly affect their perceptions on the impact of LMSs on academic performance.

5.3 Recommendations for future research and for practice

This section is dedicated to the last objective of this study, which is to suggest recommendations on how to improve the perceptions of academics on the impact of LMSs on academic performance, based on the results of the current study. These results found that academics' computer self-efficacy, their pedagogical beliefs, and their attitude towards LMSs all have an effect on their not so positive perceptions on the impact of LMSs on academic performance, despite the overwhelming evidence from existing literature that students are of the opinion that the use of LMSs have a positive impact on their academic performance (Grabar and Rajh, 2014).

5.4 Recommendations for future research and for practice on academics' computer self-efficacy

This study found that computing academics' computer self-efficacy has a positive effect on their perceptions on the impact of LMSs on students' academic performance, and the reviewed literature did not find any study on that relationship. The current study, therefore, recommends the undertaking of more research on the relationship between academics' computer self-efficacy and their perceptions on the impact of the use of LMSs on academic performance, so as to confirm whether computer self-efficacy influences or does not influence perceptions on the impact of LMSs on students' academic performance. Even though this research found that its sample of computing academics perceive themselves as highly computer self-efficacious, its findings seem to indicate that computing academics with low computer self-efficacy also perceive the use of LMSs as having little impact on students' academic performance, contrary to overwhelming evidence from the reviewed literature. This study, therefore, calls for the need to increase the computer self-efficacy levels of computing academics, where necessary, possibly using the below described strategies, as proposed by Bandura (2000).

According to Bandura (2000), self-efficacy can be improved either through enactive experiences, or through vicarious, persuasive or somatically experiences. Enactive experiences make people resilient by facing them with difficulties from which they ultimately learn instead of them being discouraged by failure as will be the case for people who always expect easy successes. As for vicarious experiences, they improve self-efficacy when showcasing how people similar to oneself succeed by perseverant efforts as it raises the observer's belief in his or her own abilities. Persuasive experiences improve self-efficacy by making people believe that they have the self-ability to be successful if they exert more effort in their endeavours. Finally, somatic experiences aim to enhance people self-efficacy by minimising their anxiety and depression levels, by building their physical strength and stamina and by changing their misrepresentations of their bodily states.

5.5 Recommendations for future research and for practice on academics' pedagogical beliefs

This study found that computing academics' beliefs on the self-ability of their students have a positive effect on their perceptions on the impact of LMSs on students' academic performance, and the reviewed literature did not find any study on that relationship. The current study, therefore, recommends the undertaking of more research on the relationship between computing academics' beliefs on the self-ability of their students and their perceptions on the impact of LMSs on the academic performance of their students, so as to confirm whether academics' beliefs on the self-ability of their students influence or do not influence their perceptions on the impact of LMSs on students' academic performance. Even though this research found that the beliefs of its sample of computing academics on the self-ability of their students are slightly above average, its findings seem to indicate that computing academics with low beliefs on the self-ability of their students also perceive the use of LMSs as having little impact on students' academic performance, contrary to no evidence from the reviewed literature. This study, therefore, calls for the need to increase the belief levels of computing academics on the self-ability of their students, where necessary, possibly using the below described strategies, as proposed by Halpern (2009).

Halpern (2009) suggests ten strategies that can be used to change people's beliefs: a) by offering them information from experts; b) by anticipating and raising counterarguments; c) by avoiding to adopt one-sided positions; d) by being direct towards the desired conclusion; e) by motivating them to speak in support of their position; f) by familiarising them with the advocated conclusion by expressing it in different ways; g) by providing them with as many reasons as possible in support of the desired conclusion; h) by communicating with them in an user friendly manner; i) by convincing them through comprehensive reasoning while avoiding the use of shoddy reasoning; and j) by making use of difficult-to-forget images to represent the desired conclusion.

5.6 Recommendations for future research and for practice on academics' attitude

This study found that computing academics' attitude towards e-Learning has a positive effect on their perceptions on the impact of LMSs on students' academic performance, and the reviewed literature did not find any study on that relationship. The current study, therefore, recommends the undertaking of more research on the relationship between computing academics' attitude towards e-Learning and their perceptions on the impact of LMSs on students' academic performance, so as to confirm whether academics' attitude towards e-Learning influences or does not influence their perceptions on the impact of LMSs on students' academic performance. Even though this research found that the attitude of computing academics towards e-Learning is slightly positive, its findings seem to indicate that computing academics with a negative attitude towards e-Learning seem to perceive that the use of LMSs by students has little impact on their academic performance, contrary to evidence from the reviewed literature. This study, therefore, calls for the need to improve the attitude of computing academics towards e-Learning, where necessary, possibly using the below described strategies, as proposed by Petty and Cacioppo (1996).

Petty and Cacioppo (1996) suggest two routes that can be used to change people's attitudes: the peripheral route; and the central route. In the peripheral route, a person's attitude towards a given phenomenon can be changed by simply exposing her/him to that phenomenon without requesting that person to consider the pros and/or cons of that suggested phenomenon. On the other hand, in the central route, a person's attitude towards a recommended position can be changed by providing him or her with the

relevant information for him or her to carefully and thoughtfully consider the merits of that recommended position.

5.7 Summary

The first chapter of this study presented different e-Learning technologies and compared open source against proprietary e-Learning tools as well as the advantages and the disadvantages of both synchronous and asynchronous e-Learning, especially with regards to academic performance. Thereafter, this first chapter highlighted the persistence of the academic failure problem, despite the numerous claimed advantages of e-Learning, and presented the aim of this study, which is to model the factors that are affecting the perceptions of academics on the impact of learning management systems on academic performance. The problem statement, objectives, research question and sub-research questions were also presented. Lastly, the chapter presented the structure of the dissertation.

Chapter two, which is the research method of this study presented the methodologies used, namely: the content analysis; and the survey. The content analysis method used explained the process of the analysis of the literature analysis conducted by this study, while the survey explained the process used to conduct the study in terms of its population, sampling method applied, its research instrument and scale, and its analysis method.

Chapter three, i.e., the literature analysis of this study, presented literature analysed in terms of the authors of the studies reviewed, the context, the year, the theories or the models, the research methods, the data source or research population, and the sampling techniques. The literature analysed also presented the analysis methods used by reviewed studies, type of the studies (longitudinal or cross-sectional), the validity and reliability tests' methods used by reviewed studies, and, finally, presented that academic performance in the context of e-Learning can be affected either positively or negatively by students' demographics, by their pride and motivation, by their intensity of use of e-Learning, by their self-efficacy and learning approach, by their perceptions on the suitability of e-Learning and by their sense of community and interactivity.

Chapter four, which comprised the results of the study, firstly, confirmed the reliability and the validity of the questionnaire that was used to collect data from 78 computing departments' academics from four universities in the KwaZulu-Natal province of South African. This chapter presented Descriptive and statistics results of the survey. The ANOVA results showed that there was a correlation between gender and LMSs' use with higher use of LMSs by female academics, and the Pearson correlation test results showed that all the Likert-scale variables of this study were all inter-correlated to each other. Moreover, a validated model of the Pearson correlation test results was presented.

Lastly, chapter five discussed the findings of this study compared to the findings of the reviewed studies, and made recommendations for future research and practices on academics' computer self-efficacy, their pedagogical beliefs and their attitude towards LMSs.

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Appendix A: Letter of Information

LETTER OF INFORMATION

Title of the Research Study: Computing departments' academics' perceptions on the impact of learning management systems on academic performance

Principal Investigator/s/researcher: Mr. Lubabalo Mbangata (BTech: Informatics (Business Applications))

Co-Investigator/s/supervisor/s: Prof. S.D. Eyono Obono (PhD: Computer Science)

Brief Introduction and Purpose of the Study: Many higher institutions are adopting the use of eLearning, and there are currently more than 500 commercial eLearning software packages and 300 educational eLearning software packages; but the surprising fact is that academic failure remains high in universities especially for first year students despite all these advances made by eLearning. It is this high failure rate problem in this eLearning era that is at the core of this study whose aim is to model factors affecting the perceptions of academics on the impact of learning management systems (LMSs) on academic performance.

Outline of the Procedures: The aim of this research will be achieved through a literature analysis, and through a questionnaire based survey of academic staff from the computing departments of the universities of the KwaZulu-Natal province of South Africa The population of this survey will be made up of academic staff from the computing departments of the five universities in the KwaZulu-Natal province of the Republic of South Africa (DUT, MUT, UKZN, UNISA and UniZulu). The choice of these universities is justified by their close proximity to the geographical location of the researcher. A simple random sampling method will be applied to this population according to the years or levels of study (e.g. first year, second year, and third year) for the different computing departments. The data for this survey will be gathered by means of a questionnaire (See Appendix B). This survey data will first be tested for reliability using Cronbach's alpha coefficient, and for validity using construct validity and factor analysis. It will then be subjected to a descriptive analysis using means and proportions, and to a quantitative analysis using inferential statistical methods such as means analysis, frequency analysis, ANOVA, ANCOVA, MANOVA, etc.

Risks or Discomforts to the Participant: Participants are not expected to be subjected to any risk or discomfort.

Benefits: The results of this study will be published.

Reason/s why the Participant May Be Withdrawn from the Study: At this stage there are no foreseeable reasons to why the participant(s) may withdraw from the study.

Remuneration: There are no financial incentives or remuneration for the study.

Costs of the Study: The participants are not expected to cover any costs towards the study.
Confidentiality: The questionnaire is anonymous and its confidential data will be stored for five (5) years after the study and it will be **shredded** afterwards.

Research-related Injury: In the event of any research-related injury or adverse reaction, the study participant(s) will be compensated with the aid of the DUT research indemnity cover.

Persons to Contact in the Event of Any Problems or Queries:
Please contact the researcher (Tel No.: +27 73 785 0185.), my supervisor (Tel No.: +27 31 373 5692) or the Institutional Research Ethics Administrator on 031 373 2900. Complaints can be reported to the Director: Research and Postgraduate Support, Prof S. Moyo on 031 373 2577 or moyos@dut.ac.za

General:
Please be re-assured that your participation is voluntary and the approximate number of participants to be included should be disclosed. A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population e.g. isiZulu.

Appendix B: Consent letter

CONSENT

Statement of Agreement to Participate in the Research Study:
I hereby confirm that I have been informed by the researcher, _____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
I may, at any stage, without prejudice, withdraw my consent and participation in the study.
I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____ _____ _____
Full Name of Participant Date Time Signature/Right Thumbprint

I _____ (name of researcher), herewith conform that the above participant has been fully informed about the nature, conduct, and the risks of the above study.

_____ _____ _____
Full Name of Researcher Date Time Signature/Right Thumbprint

_____ _____ _____
Full Name of Witness (If applicable) Date Time Signature/Right Thumbprint

_____ _____ _____
Full Name of Guardian (If applicable) Date Time Signature/Right Thumbprint

Please note the following:
Research details must be provided in a clear, simple and culturally appropriate manner and prospective participants should be helped to arrive at an informed decision by use of appropriate language (grade 10 level use Flesch Reading Ease Scores on Microsoft Word), selecting of a non-threatening environment for interaction and the availability of peer counselling (Department of Health, 2004).
If the potential participant is unable to read/illiterate, then a right thumb print is required and an impartial witness, who is literate and knows the participant e.g. parent, sibling, friend, pastor, etc.

should verify in writing, duly signed that informed verbal consent was obtained (Department of Health, 2004).
If anyone makes a mistake completing this document e.g. a wrong date or spelling mistake, a new document has to be completed. The incomplete original document has to be kept in the participant's file and not thrown away, and copies thereof must be issued to the participant.

References:

Department of Health: 2004. *Ethics in Health Research: Principles, Structures and Processes* http://www.doh.gov.za/docs/factsheets/guidelines/ethnics/

Department of Health. 2006. *South African Good Clinical Practice Guidelines*. 2nd Ed. Available at: http://www.nhrec.org.za/?page_id=14

Appendix C: Questionnaire

A. Demographics (Independent Variable)

A.1. Institution

DUT		MUT		UNISA		UKZN		UniZulu	

A.2. Department

A.3. Age

Under 30 years		30-40 years		41-50 years		51-60 years		Above 60 years	

A.4. Gender

Male		Female		Prefer not to say	

A.5. Ethnic group

Black		Coloured		White		Indian		Other (specify)	

Prefer not to say	

A.6. Employment

Permanent		Contract	

A.7. Citizenship

South Africa		Expatriate		Prefer not to say	

A.8. Rank

Junior Lecturer		Lecturer		Senior Lecturer		Associate Professor		Full Professor	

Other (specify)	

B. Lecturers' Attitude towards eLearning I believe that eLearning:	**Strongly Disagree**	**Fairly Disagree**	**Weakly Agree**	**Fairly Agree**	**Strongly Agree**
B.1. Eliminates a lot of tedious work for academics.					
B.2. Makes learning easer for students.					
B.3. Improves students' academic performance.					
B.4. Reduces copying and cheating.					
B.5. Brings fun to teaching and learning.					
B.6. Creates opportunities for quality jobs.					
B.7. Creates many communication channels in academia.					
B.8. Reduces the costs of education.					

C. Lecturers' Computer Self-Efficacy I believe I am able to:	**Strongly Disagree**	**Fairly Disagree**	**Weakly Agree**	**Fairly Agree**	**Strongly Agree**
C.1. Type fast on the computer.					
C.2. Type fast on mobile devices (e.g. cell phones, tablets, laptops, etc.).					
C.3. Use common computer programs on my mobile devices (e.g. cell phone and tablets).					
C.4. Learn new computer tasks through trial and error.					
C.5. Learn new computer tasks with the help of reference manuals.					
C.6. Troubleshoot common computer programs.					
C.7. Understand computer terminology.					
C.8. Use computer programs to analyse data.					

D. Lecturers' Pedagogical Beliefs I believe that learners have the Self-Ability to:	**Strongly Disagree**	**Fairly Disagree**	**Weakly Agree**	**Fairly Agree**	**Strongly Agree**
D.1. Share knowledge, experience, and ideas with others.					
D.2. Adapt acquired knowledge to different contexts.					
D.3. Self-improve their thinking skills.					
D.4. Take responsibility for their learning.					
D.5. Self-improve their academic performance.					
D.6. Relate educational knowledge to their daily life.					
D.7. Analyse situations from different perspectives.					
D.8. Discover relevant strategies for new problems.					

E. Use of LMSs I usually use LMSs to	**Strongly Disagree**	**Fairly Disagree**	**Weakly Agree**	**Fairly Agree**	**Strongly Agree**
E.1. Upload text based teaching resources.					
E.2. Upload video and audio-based teaching resources.					
E.3. Conduct live interactive teaching.					
E.4. Download students' submissions.					
E.5. Broadcast messages to students.					
E.6. Exchange individual messages with students.					
E.7. Discuss teaching and learning issues with students.					
E.8. Conduct assessments such as quizzes, tests, and exams.					
E.9. Participate in academic newsgroups.					
E.10. Setup time management tasks (e.g. diary, calendars etc.).					

F. Perceptions on the impact of LMSs on academic performance (Dependent variable) I believe that the availability of LMSs improves the academic performance of my students in terms of their ability to:	**Strongly Disagree**	**Fairly Disagree**	**Weakly Agree**	**Fairly Agree**	**Strongly Agree**
F.1. Adapt existing solutions to different domains or ranges.					
F.2. Analyse the complexity of existing solutions.					
F.3. Apply existing solutions to different contexts.					
F.4. Debug, detect, and correct flaws in existing solutions.					
F.5. Design and devise solutions to different problems.					
F.6. Implement a given design into a solution.					
F.7. Model, illustrate, or create an abstraction for a solution.					
F.8. Present or explain a solution to others.					
F.9. Recognise the base knowledge and vocabulary of my subject(s).					
F.10. Refactor, redesign, or optimise a solution.					