Mapping behavioural – related retention factors using a learning community lens: A mixed methods approach.

A Thesis Report
Submitted to the Department of Informatics

of

University of Huddersfield

by

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In Partial Fulfilment of the

Requirements for the Degree

of

Doctor of Philosophy

January 2016

University of Huddersfield

West Yorkshire, England, United Kingdom

For

Petros Chrysikos, Theodora Chrysikos, and Vlasios Chrysikos

for their constant support and for knowing this was possible even during the most challenging moments.

ACKNOWLEDGEMENTS

The current thesis was not a one-man job and it would not be possible without the guidance, support, and love of many people along this journey. To begin with, first and foremost I would like to acknowledge my parents, Petros and Theodora Chrysikos. You were the driving force and you were always there when things did not seem to go right and helped me put things in perspective. You were also there to share in the joy that came with every successful step and encourage me to keep up the good work towards completion. I would like to express my sincere gratitude for being understanding, patient, and mostly for providing wise counsel. Furthermore, I must thank you for providing me with the necessary foundation to constantly pursuit knowledge and appreciate learning.

In addition, Dr. John Bonner, who provided hours of consultation, advice, and council. Dr. James McDowell provided knowledge, understanding, guidance, and support. Special thanks to both of them because they provided sage advice and asked insightful questions to ensure that my research was thorough and complete, and for that I am grateful. Also, I am thankful for your patience and support of this endeavour.

I would also like to thank my supervisor Dr. Rupert Ward for his support, patience, and guidance.

I am indebted to all those who helped me on my doctoral journey, but, in the end, I assume full responsibility for any errors of interpretation or fact.

ABSTRACT

This study investigated the experiences of undergraduate learning communities in a UK Higher Education Institution and the causes that may lead to low retention rates amongst first year undergraduate computing students. Using learning communities as a lens, the authors examined students' perception of teamwork experiences, academic and social integration issues, and knowledge and characteristics that might help students to be successful.

Four research questions guided the current study: (1) How do first year undergraduate computing students perceive their university experience? (2) To what depth and breadth does learning community participation affect social and/or academic integration? (3) What are the identified barriers/limitations to improve retention? (4) What learning characteristics or knowledge do students maintain and how are they accomplished?

The study applied a mixture of quantitative and qualitative research methods using a concurrent triangulation. Firstly, a quantitative data analysis was performed including first year undergraduate students from various departments of the examined UK Higher Education Institution. Tinto's model of student retention connects to behavioural patterns. Behavioural patterns were therefore identified using data collected from students in order to map factors as predictors for low student retention. The data collection was driven by the information collected when students enrol at the university, as well as Pascarella and Terenzini's questionnaire (integration scales). The data was analysed using the Structural Equation Modelling (SEM) technique which offers the opportunity to test various theoretical models, such as Tinto's, through understanding of how sets of variables characterise constructs, and in what ways these constructs are associated to one another. The quantitative data analysis results suggested that the theory of Tinto proved to be beneficial in analysing retention in first year undergraduate students. Not at its maximum potential, though, because the model variables accounted for only a modest amount of variance in retention. Nevertheless, the data analysis discovered important relationships amongst student's initial and later academic goals and commitments. In particular, the results revealed that academic and social integration constructs can have a significant influence on student retention processes. It is recommended that when all or some of these relationships are operating towards students' benefit, it may be necessary to promote them with appropriate services or programmes, such as student support systems.

Secondly, after the quantitative approach was applied to the aforementioned large-scale comparative study within the institution, a qualitative approach was used to further explore student needs. Specifically, during the quantitative phase data from all first year students of the institution studied was collected in order to offer the opportunity for a comparison amongst students from different course divisions, and investigate any major similarities and/or differences regarding factors affecting retention. As this phase identified similar factors amongst all students, the qualitative phase was employed in order to narrow down the research focus. Therefore, the qualitative approach offered the opportunity for a thorough exploration of the first year computing students' reasons for dropping out of university through the use of the 'unfolding matrix'. The matrix was completed during group interviews, in which students were invited, and had the opportunity to read and comment on previous students' experiences. The findings of the qualitative data analysis offered further insights, which were then mixed with the quantitative results and interpreted as one.

The final results, which were an interpretation of both quantitative and qualitative findings, revealed that learning communities critically affect students' academic and social integration. Specifically, the importance of student support and guidance from academic staff were considered important factors which could enhance students' motivation to continue their education. Their relationships with fellow students and academic staff were reported as vital elements in order to become academically and socially integrated. In addition, developing a sense of personal awareness and the need to develop an effective academic skill-set in order to succeed was identified as critical.

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GLOSSARY

The subsequent paragraphs describe significant terms used in the current study:

Academic integration: Includes normative and structural dimensions. Specifically, the normative integration involves an individual's identification with an academic system's normative structure. On the other hand, the structural integration relates to the meeting of a university's specific standards (Tinto, 1993).

Assertion: A statement or declaration that a finding revealed through qualitative and/or qualitative analysis of data that occurs from grouping together prominent themes and codes within the data.

Attrition: It is what occurs when a student decides to leave a university and do not return for further study (ibid).

Code: It is a qualitative research data analysis technique that breaks down, examines, compares, conceptualises, and categorises data (Strauss & Corbin, 1990).

Goal commitment: Addresses a student's level of willingness to access an institution (Tinto, 1993).

Institutional commitment: Describes a student's level of commitment in order to complete his/her studies at a particular institution (ibid).

Learning community: Refers to a group of people who share common academic goals and attitudes, and who meet semi-regularly to collaborate on class-work (ibid).

Persistence: It is the process of a student who remains enrolled at a given university from term to term (HEA, 2015).

Social integration: Indicates the extent of affiliation between the social system of a university and an individual student. Examples of social integration are interactions with faculty and administrators, extracurricular activities, and informal group associations (Tinto, 1993).

Student Retention: Indicates students who enrolled at a university and persisted there until graduation (HEA, 2015).

Theme: It is a construct derived from a data set analysed during qualitative data analysis. A theme is usually collected from the codes that are used in order to define the phenomena being studied (Strauss & Corbin, 1990).

CHAPTER 1: INTRODUCTION

1.1 Introduction

The UK government believes that it will need a future generation skilled and passionate about computing. If the UK wishes to remain a world leader in research and technology, current retention challenges facing computing departments in UK Higher Education Institutions (HEIs) need to be addressed; inspiring more students to study computing and improving skill levels to produce highly employable graduates. There was a significant increase in enrolment numbers in the early years of this century, mirroring a large increase in computing-related jobs within the UK economy, but the overall trend has led to only a modest increase in enrolments, and retention remained disappointingly poor in computing departments.

This study therefore focuses on student retention within UK HEIs as this is seen as vital to helping develop the digital economy. In particular, the computing department at one institution is compared to other departments within the same institution so that greater understanding can be gained of both computing departments in general and how computing relates to other departments.

Previous academic research has shown a relationship between student retention, engagement, social and learning experiences. This study therefore uses these factors to help identify how student retention may improve. In order to do this, a learning community lens is adopted for the study. A mixture of quantitative and qualitative research methods is also employed using a concurrent triangulation strategy. Firstly, a quantitative approach is applied to a large-scale comparative study within the institution. Secondly, a qualitative approach is used to further explore student needs. In particular, during the quantitative phase data was collected from all first year students of the institution studied in order to offer the opportunity for a comparison amongst students from different course divisions, and to investigate any major similarities and/or differences regarding factors affecting retention. As this phase identified similar factors amongst all students, the qualitative phase was employed in order to narrow down the research focus, offering the opportunity for a thorough exploration of first year computing students' reasons for dropping out of university.

The concurrent triangulation strategy indicates that qualitative and quantitative data are simultaneously gathered and it is common practice to give equal priority to both data sets (Creswell, 2013). Nevertheless, the data analysis process is conducted separately and data integration occurs during the data interpretation phase (Hanson et al., 2005, p. 229; Teddlie & Yu, 2007). In the current study the result of the mixed methods process was a set of quantitative data and a completed matrix filled with raw data. The quantitative data served as the main basis for data analysis and the 'unfolding matrix' focused and expanded on areas that the student participants pointed out. Quantitative and qualitative data could then be mixed in order to contextualise the current study's research technique. The author firstly focuses on interpreting the quantitative data, then the qualitative data, and finally, during the data integration phase an analysis of findings from mixing the two preceding interpretations are presented. Finally, quantitative and qualitative findings can be used to answer the study's main research questions. These questions formed the four main pillars that guide the current study. These are:

1. How do first year undergraduate computing students perceive their university experience?
2. To what depth and breadth does learning community participation affect social and/or academic integration?
3. What are the identified barriers/limitations to improve retention?
4. What learning characteristics or knowledge do students maintain and how are they accomplished?

1.2 Study Rationale

For almost six decades, higher education researchers have been investigating the phenomena of undergraduate student retention, persistence and academic success. The first significant studies of student retention by Tinto (1975) and Astin (1975) looked at student drop out characteristics. Tinto (1975) noted that the highest proportion of students that leave an institution do so during their first year of university (Tinto, 1975), a pattern that persists to this day (Tinto, 2012). In addition, Tinto (1993) subsequently discussed how the first year of study helps students connect to their campus as well as influencing subsequent student achievement and graduation rates. A significant factor in building a student's connection to their campus, and their identification with their studies, was found to be through engagement in learning communities (social and learning experiences) (Tinto, 1975, 1993). An in-depth analysis and discussion about learning communities is presented in Chapter 2.

The study was mainly guided by Tinto's (1993) student integration theory, as well as by Padilla's (1991) and Sedlacek's (1999) theories (see Chapter 2). Specifically, this study investigates the first year computing undergraduate students' social and learning experiences through the learning community lens in a UK HEI. Supporting the development of learning communities can promote an environment which facilitates good pedagogic practice, as learning is enhanced by social interaction (Bruner, 1960; Smith, 2003; Daniels, 2005). Learning socially and actively fosters the development and enhancement of learning communities, as these develop through learning activities; including individual and group research, discussion, and collaborative problem solving (Bielacyzc and Collins, 1999). Fostering learning communities has been shown to increase student learning and retention (Shapiro & Levine, 1999).

It has long been argued that the first year university experience has a critical influence on a student's intention to complete their undergraduate studies (Upcraft et al., 1989; Upcraft et al., 2004; Kuh et al., 2005). Most of the recent research in this area builds on Tinto's and Astin's work (Barefoot et al., 2005; Nicol, 2008; Whittaker, 2008, Ryan, 2013; Shea & Bidjerano, 2014; Mertes, 2015), with Tinto's model for early departure of students from HE (Tinto, 1993) a key publication in this area, and widely cited in more recent related work (Lenning & Ebbers, 1999, p. 4; Heaton-Shrestha et al., 2009; Braxton et al., 2011; Thomas, 2012). Tinto has shown through his research over the last forty years that students who become integrated to the campus academically and socially, both in the classroom and as part of study programmes, are more likely to persist through to graduation than those who fail to become fully integrated into the institution (Tinto, 1993).

1.3 Aim of the Study

The general aim of the current thesis was to map behavioural – related retention factors using a learning community lens applied to first year undergraduate computing students of a UK HEI. In particular, this study explored students' social and learning experiences within the context of the Computing Department of a middle-ranked UK institution. In this context the UK learning communities, in which students participate as a cohort, were investigated in terms of supporting their development in order to advance an environment that assists the progress of good pedagogic practice. Who needs to be involved and how? What practical steps can be taken? What recommendations of good practice can be proposed?

The main objective of the current study was:

To map behavioural related student retention factors in first year undergraduate computing students at a UK HEI using Tinto's (1993), as well as Padilla's (1991) and Sedlacek's (1999) theories, through the use of a learning community lens by applying a new mixed methods approach. Behavioural patterns were identified by using student IDs (anonymised) in order to map factors as predictors of student retention of first year undergraduate computing students in a UK HEI.

1.4 Research Approach

In the current study the author employed a new mixed methods approach that combined the Structural Equation Modelling (SEM) method (quantitative) and the 'unfolding matrix' (qualitative). As Creswell (2013) describes, the definition of the current study's research methodology is characterised as a 'mixed methods' approach and the strategy followed as 'concurrent triangulation'. In particular, qualitative and quantitative data are simultaneously gathered and it is common practice to give equal priority to both data sets. Despite that, the data analysis process is conducted separately and data integration occurs during the data interpretation phase (Hanson et al., 2005, p. 229; Teddlie & Yu, 2007). A further reason for selecting this strategy is that it permits findings to be confirmed, cross-validated, and corroborated within the same study (Creswell, 2013). Both quantitative and qualitative methods supported each other as confirmatory techniques. In particular, the SEM (quantitative) was adopted because it employs a confirmatory approach to the data analysis (Confirmatory Factor Analysis), rather than an exploratory one (see also Section 3.6.6) and the 'unfolding matrix' (qualitative) because it allows data confirmation by sharing previous comments and exposing them to an iterative and constructive dialogical process (see also Section 3.7.1.2). The mixed methods concurrent triangulation strategy operated as a confirmatory framework that hosted the aforementioned confirmatory techniques.

In the current study the concurrent triangulation strategy was conducted in three phases. The first phase was the quantitative approach, the second was the qualitative approach, and the third was data integration. In the first phase, quantitative data was collected from 1,017 first year students (of which 171 were first year undergraduate computing students) via the use of two questionnaires distributed and administered, for data confidentiality reasons, by the university's strategic planning office.

The quantitative data analysis was conducted via the use of a SEM method utilising the Analysis of Moments Structure (AMOS) software package. The quantitative approach was used to collect data from all first year students of the examined UK HEI in order to offer the opportunity for a comparison amongst students from different course divisions, and to investigate any major similarities and/or differences on retention issues. Following Tinto's (1993) model of student retention (see Figure 1.1) the list of hypotheses addressed in Table 1.1 was developed by the author.

Figure 1.1: Initial Student Integration Model Based on Tinto (1993)

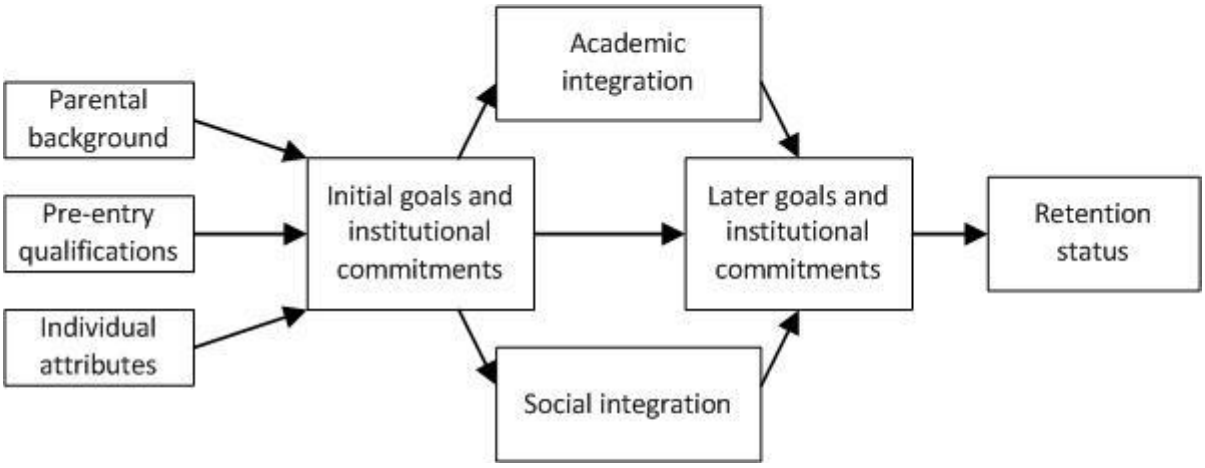


Table 1.1: List of Hypotheses

1st **Hypothesis:** students' parental background will be associated with their initial goals and institutional commitments.
2nd **Hypothesis:** students' pre-entry qualifications (A levels score, skills and abilities) will be associated with their initial goals and institutional commitments.
3rd **Hypothesis:** students' individual attributes (race, age, gender, nationality etc.) will be associated with their initial goals and institutional commitments.
4th **Hypothesis:** students' initial goals and institutional commitments will be associated with their academic integration.
5th **Hypothesis:** students' initial goals and institutional commitments will be associated with their social integration.
6th **Hypothesis:** students' initial goals and institutional commitments will be associated with their later goals and commitments.
7th **Hypothesis:** students' academic integration will be associated with their later goals and institutional commitments.
8th **Hypothesis:** students' social integration will be associated with their later goals and institutional commitments.
9th **Hypothesis:** students' later goals and institutional commitments will be associated with their retention status.

In the second phase, qualitative data was retrieved through the organisation of focus group interviews conducted on-campus. The data was collected from 80 first year computing students only. The qualitative stage helped the author to narrow down the focus on first year undergraduate computing students, as the previously mentioned quantitative phase did not identify any major differences regarding factors related to student retention. Therefore, the qualitative approach offered the opportunity for a thorough exploration of the first year computing students' reasons for dropping out of university.

The result of the mixed methods process was a set of quantitative data and a completed matrix filled with raw data. The quantitative data served as the main basis for data analysis and the 'unfolding matrix' focused and expanded on specific areas that the student participants pointed out. Quantitative and qualitative data were then mixed in order to contextualise the current study's research technique. This was to prove that the technique employed is functional and could be applied in other studies of a similar nature. The author firstly interpreted the quantitative data, then the qualitative data, and finally, during the data integration phase presented an analysis of findings by mixing the two preceding interpretations. Finally, the integrated results were used by the author to answer this study's main research questions.

1.5 Importance of the Study

According to the most recent Higher Education Statistics Agency (HESA) official figures the non-continuation rate for UK HEI computing departments in 2011/12 was 17.8% (HESA, 2014a), a significant increase on the previous three years and counter to a general reduction in non-continuation within UK higher education. Alongside a concerning non-continuation rate, computing courses have shown only modest average growth in enrolments over the last two decades (Matthews, 2014). There was a significant increase in enrolment numbers in the early years of this century, mirroring a large increase in computing-related jobs within the UK economy (Lowenstein, 2004; Anderson et al, 2010), but the overall trend has led to only a modest increase in enrolments. This leads to a problem as the UK is in danger of creating a lost generation when it comes to equipping young people with the skills they need to succeed in the modern workplace, and as such there is a real and direct threat to the future of the UK economy if these issues are not addressed. Therefore, this study focused on studying student retention within UK HEIs because retention is fundamental to promoting the digital economy development (Southworth, 2014). A detailed analysis with non-continuation and student enrolment rates is provided in Section 2.1.

Given the retention challenges facing computing departments (HESA, 2014a), it is important to understand the students' perspective of their studies, the experiences computing students have whilst engaging in their learning and whether the social and learning experiences computing students currently experience in UK HEIs are adequate to meet their academic and non-academic needs. This study therefore explores a range of issues in retention within the context of first year undergraduate students of a middle-ranked UK institution. The current study reviewed the performance of first year undergraduate students in terms of retention across various disciplines of the university studied. This study, though, is one of a family that focuses on issues raised, and how they affect retention to the specific discipline of computing at the university studied. The study considers aspects that reflect discipline specific characteristics, such as the nature of the content, and of the computing student and staff communities. The chief issues considered are: the relatively low level of retention compared to other disciplines; the relatively low level of achievement in terms of degree classification; the effectiveness of the current UK learning communities; the level of computing students' academic and social engagement.

A breadth of academic research on student retention during the last forty years (briefly outlined in Section 1.2) has shown a relationship between student retention, student engagement and the development of social and learning experiences (through learning communities) within higher education. Students' participation is also correlated with student success, especially for first year students (Tinto, 1994; Whittaker, 2008). By viewing the student social and learning experiences through the learning community lens (Harvey et al., 2006; Yorke & Longden, 2008; Knox & Wipper, 2008), this thesis identifies factors influencing students' perspectives on their studies. Consideration of these may help improve the retention of first year undergraduate computing students in UK HEIs.

The current study's main aim was to add extra knowledge to UK higher education regarding student retention issues in first year undergraduate computing students and support the UK government's effort to develop a future generation that is skilled and passionate about computing (HMSO, 2014a). It can be considered significant for several reasons. Firstly, the current study contributes to the existing literature that relates to student retention issues. Even though there are many studies that have investigated factors that affect student retention in HEIs, there are few quantitative studies that have applied the SEM method to test Tinto's model. Specifically, the most cited studies that have tested Tinto's model in US HEIs are Braxton, Vesper, & Hossler (1995), Braxton, Sullivan, & Johnson (1997) and Braxton & Lee (2005). In the UK HEI context, only one study can be found to test Tinto's model predictive validity. This research study was administered by Brunsden, Davies, Shevlin, and Bracken (2000) on two different courses: a) a Bachelor course in Computer Studies at an English HEI and b) a Bachelor course in Psychology at a Scottish HEI. Even though, a large number of these studies evaluated Tinto's model in the first academic year and gathered data at various periods of that year, there is currently no extensive UK study that has:

i. Included first year students from various courses (computing and non-computing),
ii. Offered the opportunity to compare first year students from the computing department of one institution to other departments within the same institution, so that greater understanding can be gained regarding how computing relates to other departments,
iii. Mapped behavioural related student retention factors through a learning community lens for first year undergraduate computing students,
iv. A new mixed methods approach was adopted through the combination of the SEM method (quantitative approach) and the 'unfolding matrix' (qualitative approach).

Secondly, this study may be beneficial for various UK pedagogical agencies through the provision of empirical evidence concerning factors predicting student retention. It may offer them an improved overview of the factors affecting student retention, and as a result, give them the opportunity to develop mechanisms that aim to prevent students from dropping out, such as early intervention systems. Furthermore, it could also benefit individual contributors, such as other researchers, who are interested in improving UK HEIs' teaching quality and efficiency. Finally, this study could be beneficial to the academic staff and faculty of the university that participated.

As presented in the previous section there are only two studies conducted in the UK that tested the predictive validity of Tinto's model in order to investigate factors that affect student retention in UK HEIs. The current study offers a new approach. It is a mixed methods approach that combines for the first time within UK Higher Education, the SEM method (quantitative) and the 'unfolding matrix' (qualitative). This innovative approach guides the current study's effort to track student retention in first year undergraduate students, computing and non-computing, in a UK HEI and then map behavioural-related retention factors.

The aforementioned, quantitative and qualitative, research approaches are found on: Tinto's (1993) student integration theory and the institutional integration scales designed by Pascarella and Terenzini (1980) and Padilla's (1991) 'unfolding matrix' respectively. This is of great importance to this study because these research approaches offer highly effective and efficient means of performing a mixed-methods research. A thorough analysis of each approach is provided in Chapter 3.

1.6 Thesis Structure

The current study is organised in the subsequent chapters. In Chapter 1 the author introduces the current thesis through an overview of the study, presents the study's rationale, aim, research approach, as well as this study's innovative approach and knowledge contribution. In Chapter 2 a review of the literature is undertaken, presenting the theoretical background of this study, including retention and learning community theories, the history of learning communities, retention and transition issues in UK HEIs, together with issues related to diversity within UK Higher Education and a review of the structure equation modelling studies conducted outside and inside of the UK. Chapter 3 addresses the research design and methodology employed and a detailed analysis of both quantitative and qualitative approaches is provided, as well as the reasons for applying these techniques. In Chapter 4 presents the quantitative data analysis, with Chapter 5 providing the qualitative data analysis. Chapter 6 combines the quantitative and qualitative data analysis results and answers the main research questions, with Chapter 7 summarising the current thesis and discussing recommendations for further study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

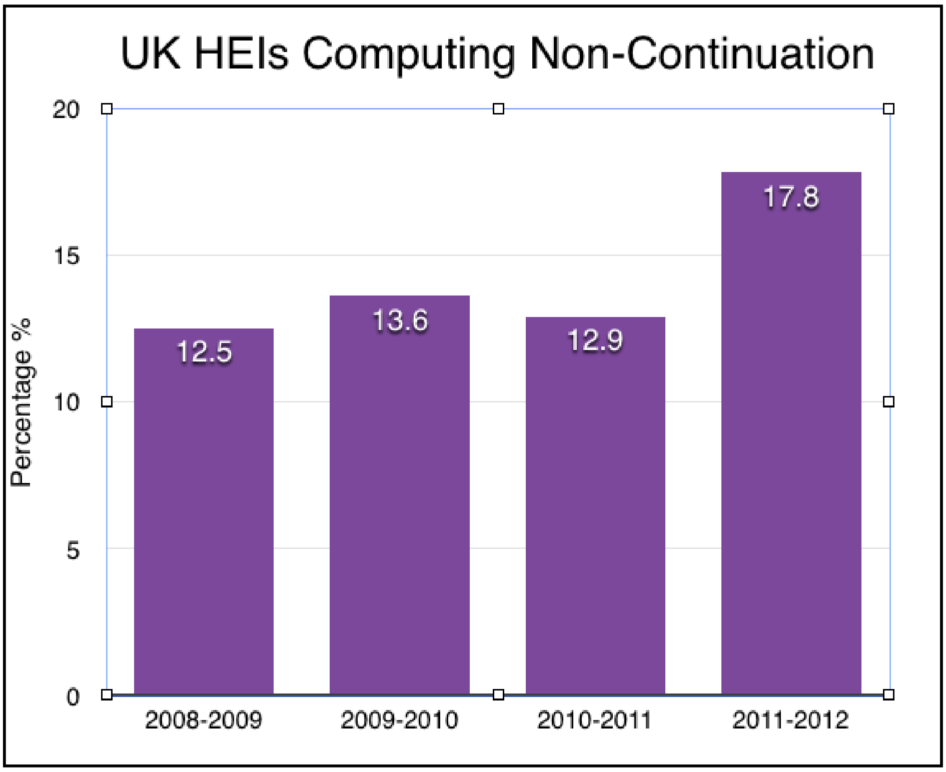
The landscape of UK Higher Education has become increasingly competitive in recent years, raising difficult questions for students and the sector alike. In particular, from the student's perspective, a rise in tuition fees combined with a challenging economic outlook both nationally and internationally means that there has never been greater pressure for students to make the right choice of course and institution in order to successfully enter the graduate employment market. From an institutional perspective, UK Higher Education faces the challenge of understanding and meeting the expectations of more demanding students without additional funds (HEPI, 2013). In this new more competitive environment, UK HEIs are therefore tasked with maintaining, and indeed improving, their academic experience and student engagement at the increasingly high levels demanded by students.

Given the retention challenges facing computing departments (HESA, 2014a), it is important to understand the students' perspective of their studies, the experiences computing students have whilst engaging in their learning and whether the social and learning experiences computing students currently experience in UK HEIs are adequate to meet their academic and non-academic needs. This study therefore explores a range of issues in retention within the context of first year undergraduate students of a middle-ranked UK institution. The current study reviewed the performance of first year undergraduate students in terms of retention across various disciplines of the university studied. This study, though, is one of a family that focuses on issues raised, and how they affect retention to the specific discipline of computing at the university studied. The study considers aspects that reflect discipline specific characteristics, such as the nature of the content, and of the computing student and staff communities. The chief issues considered were: the relatively low level of retention compared to other disciplines; the relatively low level of achievement in terms of degree classification; the effectiveness of the current UK learning communities; the level of computing students' academic and social engagement. Therefore, if learning communities provide a benefit, then investigating the UK HEIs that apply these and a subject where it could and perhaps should provide a benefit, is useful both for understanding learning communities and how to improve retention in computer science in the UK.

In particular, this study explored students' social and learning experiences within the context of the Computing Department of a middle-ranked UK institution. In this context the UK learning communities, in which students participate as a cohort, were investigated in terms of supporting their development in order to advance an environment that assists the progress of good pedagogic practice. Who needs to be involved and how? What practical steps can be taken? What recommendations of good practice can be proposed?

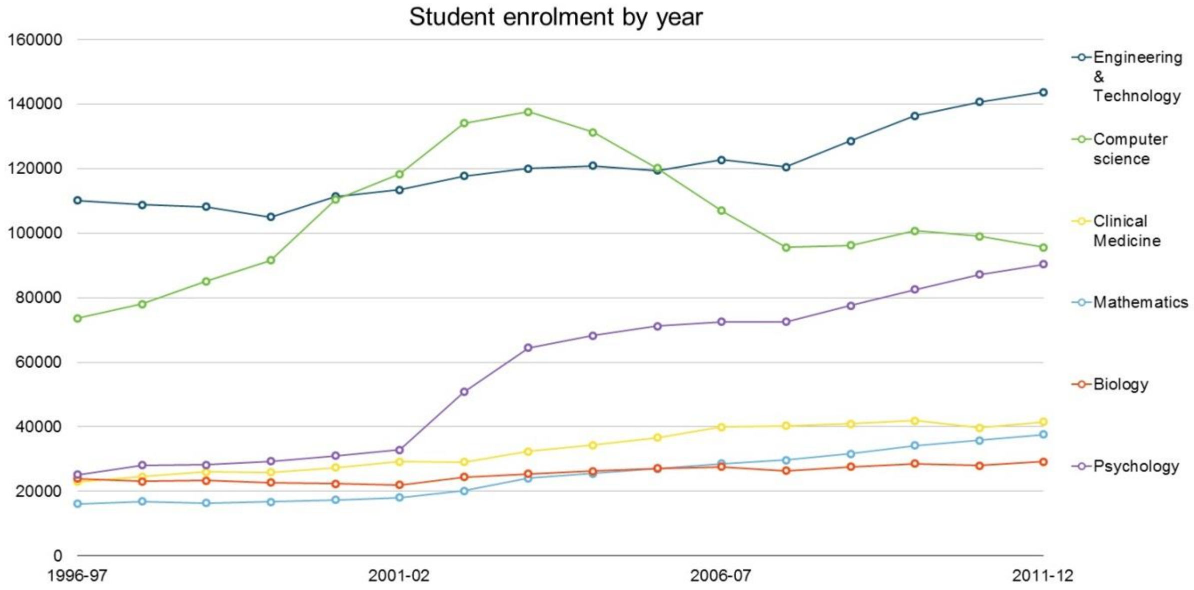
Official figures for 2013 show that more than 27,000 students (one in fourteen) leave HE after less than 12 months (HESA, 2014a), with a further 37,800 students (one in ten) identified as being at risk of failing to complete their course (ibid). Data from the Higher Education Statistics Agency (HESA) showed an improvement in the overall non-continuation rate for the academic year 2012-2013 compared to the previous year (ibid), with an extra 4,500 students retained. The method followed by HESA is based on tracking students from the year they enter a HE provider to the following year (for full-time students), or the following two years (for part-time students) and provides information about where the students are in that year; continuing at the same HE provider (either on the same course or elsewhere in the HE provider); transferring to another HE provider; or absent from higher education completely (HESA, 2014d). In contrast Figure 2.1 shows the non-continuation rate for the computing sector for all UK domiciled entrants to full-time undergraduate courses over a four-year period from 2008-2012. The non-continuation rate for UK HEI computing departments in 2011/12 was 17.8% (HESA, 2014a), a significant increase on the previous three years and counter to a general reduction in non-continuation within higher education. The recently published data for 2012-2013 show the non-continuation rate at 18.9%.

Figure 2. 1: UK HEIs computing non-continuation rate (HESA, 2014b)



Alongside a concerning non-continuation rate, computing courses have shown only modest average growth in enrolments over the last two decades, with a 30% increase from 1996-7 to 2011-12, compared to an average increase of 59% in the other subjects shown in Figure 2.2 (Matthews, 2014). There was a significant increase in enrolment numbers in the early years of this century, mirroring a large increase in computing-related jobs within the UK economy (Lowenstein, 2004; Anderson et al, 2010), but the overall trend has led to only a modest increase in enrolments.

Figure 2. 2: Student enrolment by year (THE, 2014)



The UK government believes that it will need a future generation that is skilled and passionate about computing (HMSO, 2014a). If the UK wishes to remain a world leader in research and technology (HMSO, 2014b), current retention challenges facing computing departments in UK HEIs need to be addressed; inspiring more students to study computing and improving skill levels to produce highly employable computing graduates.

In establishing the scope of the literature review, several matters have been taken into consideration. To begin with, the starting point was specifically focused on learning communities, which has largely been researched since the 1980s, and student retention and transition issues which have been studied since the 1970s. Nevertheless, the author also had to make judgments about which key prior ideas had contributed to the development of the concept and practice of learning communities. Previous studies are therefore referred to where appropriate and only the most significant references indicating critical understandings about learning communities and how they relate to the current study are included.

Until the last few years most of the directly relevant research had taken place in USA, and this is reflected in the literature reviewed here. It should also be noted that the literature examined here is of different types. Some are based on careful empirical research that aimed to understand learning communities, often also trying to develop knowledge that could subsequently be applied to improve student retention and transition. Some, however, either proposed theories about learning communities or provided recommendations for improving retention with limited evidence to back these up. Therefore, the author has tried to include only highly valued research which demonstrates 'reliability', 'rigour,' and ‘robustness'.

Before being able to understand learning community impact, it is important to understand theories associated with student retention and learning communities. Therefore, the background research begins with a review of the underpinning student retention theories that set the foundation of the learning community programmes. Learning community theories and types are then presented followed by a review of learning communities’ history, the outcomes and goals of learning community programmes, the different types of learning communities and the learning communities’ future.

Finally, UK HEIs’ first year undergraduate computing students are considered in a larger context based on this review of learning communities and retention, through a discussion related to retention and transition issues related to UK Higher Education and through a summary of UK and non-UK studies testing Tinto’s model via SEM.

2.2 Theoretical Background

Tinto's (1993) theory states that when students access any university, they incorporate a series of background characteristics. These typical features involve individual attitudes, pre-entry attributes, and parental background. Individual attributes contain gender, race, age, and aptitude. Pre-entry attributes include characteristics such as 'A level scores' and school achievements. Finally, the parental background characteristics incorporate parental formal educational level, parental expectations, and parental social status. The aforementioned student characteristics directly affect students' initial goals and institutional commitments. Specifically, goal commitments address a student's level of willingness to access an institution, whereas institutional commitments describe a student's level of commitment in order to complete his/her studies at a particular institution (ibid).

Initial goal and institutional commitments influence a student's integration level within the social and academic system of a specific institution (ibid). The academic integration includes normative and structural dimensions. Normative integration involves an individual's identification with an academic system's attitudes and values structures (i.e. interacting with faculty members outside of the classroom). Structural integration relates to meeting the university's specific standards, for instance curricular structures. The social integration indicates the extent of compatibility between a university's social system and an individual student. Tinto (1993) also notes that interactions with faculty and administrators, extracurricular activities, and informal group associations are classed as social integration mechanisms.

According to Tinto (1993), students' later goal and institutional commitments are influenced by their academic and social integration. Furthermore, they are influenced by students' initial goals and commitments. Tinto (1993) also mentions that during the final analysis, it is the interaction between the student's commitment to university completion, and his/her commitment to the university that defines whether or not the student chooses to withdraw from university. A further discussion and analysis is presented in the following sections.

2.2.1 Retention Theories

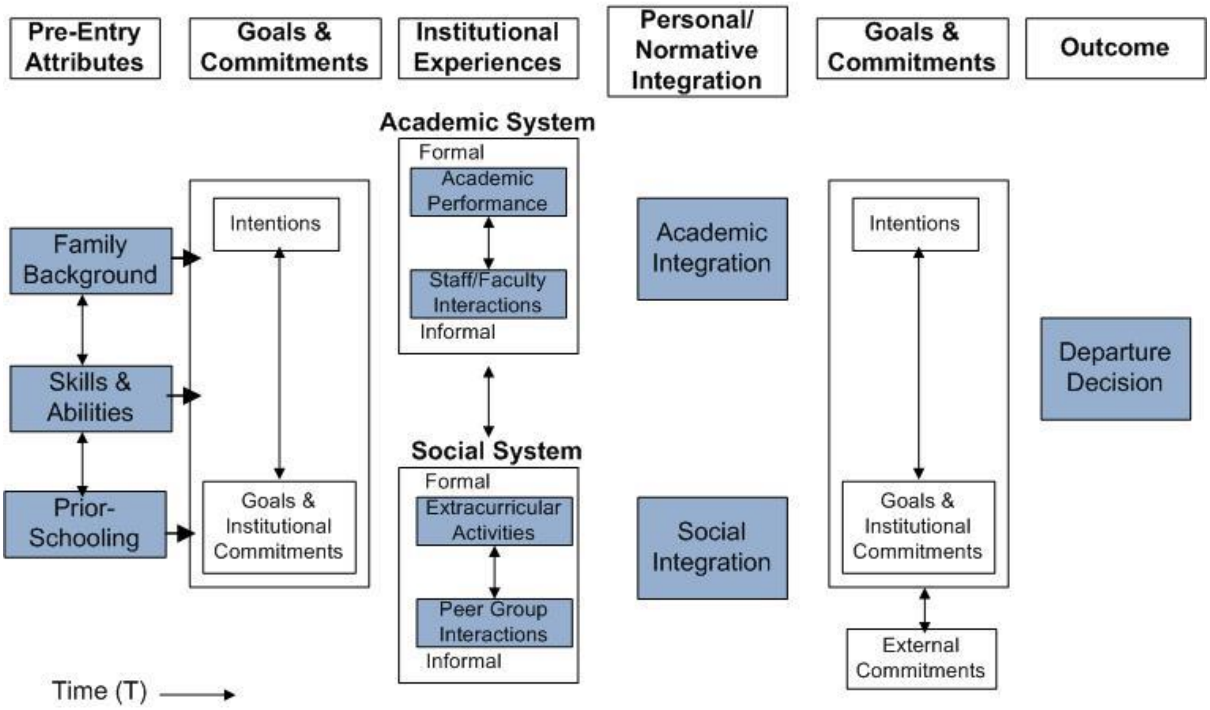
Lack of attrition or academic persistence and retention is a by-product of student success (Noel et al., 1985). Specifically, if a student is successful then he/she is more likely to be retained in the institution of higher education that he/she is enrolled. On the other hand, a lack of success can lead to a student abandoning university studies. According to Tinto, sufficient research has been conducted on the reasons why students leave university but little work has been done on the development of a model for student persistence that could provide programmes to enhance student success (Tinto & Pusser, 2006; Tinto, 2012). Hence, while investigating the causes of student attrition or persistence, it is critical to examine the issues broadly, investigate the academic aspects associated with persistence as well as programmatic instruments affiliated with university life.

There are several theories that define attrition via the lenses of social and academic support, expertise, involvement, and other factors relevant to student success. Such theories are discussed in the following sections. Specifically, two models of student retention are presented: Padilla's Expertise Model of Successful University Students (Padilla, 1991, 1994) and Tinto's (1993) Theory of Student Attrition. Padilla's model discussion is also followed by Harmon and King's (1985) expert systems theory, upon which Padilla's theory is based. Furthermore, an overview of Sedlacek's concept of how non-cognitive variables contribute to student success is provided.

2.2.1.1 Tinto's Theory of Student Retention

Tinto's theoretical model of student retention is the most widely cited theory in other retention studies. According to Braxton (1999, p. 93) it has a nearly paradigmatic stature in the field of higher education. Tinto has suggested three main conditions which need to be convened in order to achieve student persistence (Tinto, 1993). The first condition is that students should have access to retention programmes which aim to support them above the institution's interests. The second condition is that retention programmes need to not only focus on a particular student population such as low-income or minority students, but to all students. Finally, the third condition is retention programming. A successful retention programming of an institution of higher education must offer a degree of integration for students in both social and academic communities (see next page for Figure 2.3).

Figure 2. 3: Tinto's Theoretical Model of Student Retention (Tinto, 1993)



An institution of higher education that puts students' common good above other aims, expresses an institution of values. As Tinto stated, an institution's ability to retain its students exists in the orientation towards students that direct its activities (Tinto, 1993, p.146). In other words, not only the student must commit to an institution, but the institution must also commit and aid student success. In addition, Tinto recommended to institutions to return to their original purpose which is to provide education for students. In order to emphasize his point, Tinto stated that a retention programme can be effective if the institution does not leave learning to chance (ibid). On the contrary, an institution must intentionally create environments which guarantee that learning will ensue (ibid). As long as the last two principles are crucial for student success in HEIs, then it is Tinto's third condition about retention programming on which the following discussion is focused.

The main points of Tinto's Theoretical Model of Student Retention are social and academic integration in relation to a student's commitment to the institution and/or outside efforts. As can be seen in Figure 2.3, students bring to university prior schooling, skills and abilities. When these three things are combined, they lead to a set of commitments, goals and intentions from and to an institution. In other words, students are aware of what they want to achieve prior to their enrolment in the first academic year. This means that institutions must set out student expectations which in turn will aid student success. It is also very important that students have the ability to develop social and academic integration skills in both informal and formal ways.

Formal academic integration includes researching topics in the library, attending labs and classes, and engagement in various activities related to academic success. Informal academic engagement is equally important and includes student interaction with both staff and faculty. Student interaction with staff and faculty members outside the class hours can have a positive effect on student retention. Such interactions can have a normalising effect on students' socialisation to the attitudes and values of their institution. Interactions like these can also lead to an increased bond between students and their university (Pascarella & Terenzini, 2005, p. 147). In terms of the social integration, informal social integration involves interaction with peers, whilst formal social integration involves extra-curricular activities. As Tinto (2012) stated higher levels of interaction can lead to higher levels of student persistence and graduation.

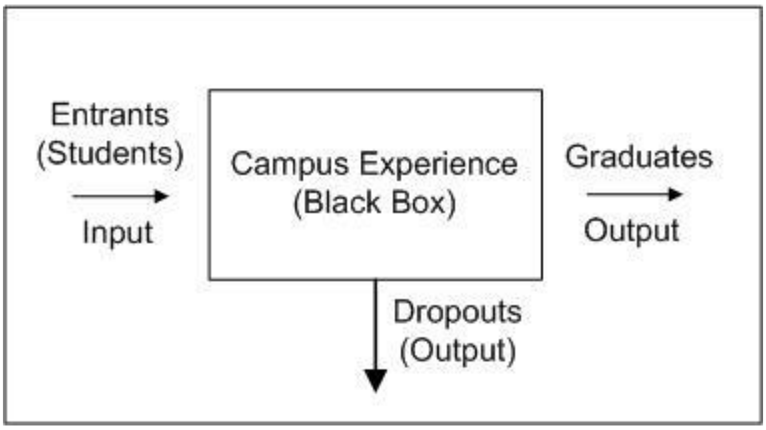
According to Tinto's model, if students manage to have informal and formal social and academic integration, then they will achieve social and academic integration. When social and academic integration is achieved the student can re-examine his/her commitments, goals and intentions from and to an institution, and see them as external commitments. External commitments are considered to be personal desires, family, jobs and peers mainly outside the university environment. Based on these commitments, and levels of success and integration, students can decide if they want to remain in the university, or not. Dropping out, in this context, means the student leaves that particular university, rather than abandoning higher education altogether.

Nonetheless, even if Tinto's model is sound, Guiffrida (2006) stated that Tinto's model requires students to move beyond their past traditions and affiliations in order to accept the associations and traditions of the higher education environment. Students who manage to affiliate with the higher education environment eventually complete their studies and graduate from university. However, not all students are able to affiliate with the higher education environment. Those who do not reach an adequate level of affiliation tend to drop out of university. Padilla conducted research in examining students who were successful in university. In the following section, Padilla's effort to better comprehend students' experience in success is described and the differences identified between successful and non-successful students.

2.2.1.2 Padilla’s Expertise Model of Successful Students

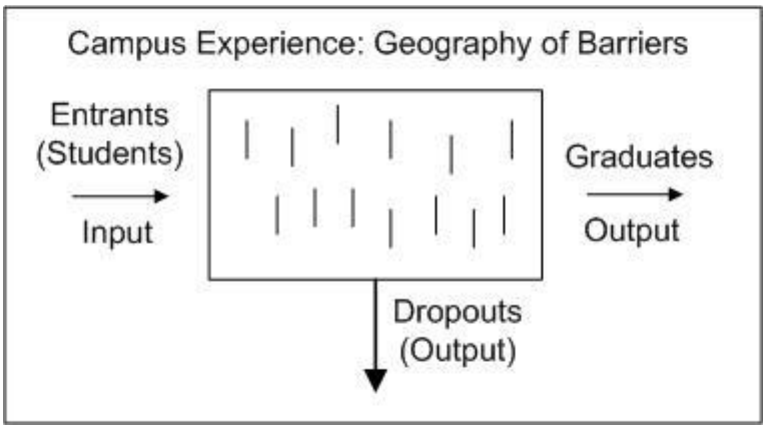
Padilla’s Expertise Model of Successful University Students was an attempt to describe what separates students who successfully complete university from those who do not. The model focuses on the successful university students and the knowledge they have as well as the actions they employ (Padilla et al., 1997). Padilla’s research was conducted on US Hispanic students but his argument is that this could be generally used to analyse minority student retention. Padilla defined university as a “black box”. Students go to the campus (the “black box”) where they experience something and then either continue through to graduation or drop out university (see Figure 2.4) (Padilla, 1999-2000, p. 133).

Figure 2. 4: Padilla’s “black box”- concept of students’ university experience (Padilla, 1999-2000, p. 134)



According to Padilla the campus experience could be seen as a “black box”, which contains many potential barriers and via comprehending what these barriers are, and how they affect students, a person could then learn how to advise students, eliminate barriers and/or overcome some of them (see next page for Figure 2.5) (Padilla, 1999-2000, p. 135).

Figure 2. 5: Padilla's diagram of the geography of barriers that students must overcome in order to be classed as successful (Padilla, 1999-2000, p. 136)



A successful addressing or elimination of the barriers leads to student graduation. On the other hand, failing to counter the barriers would lead the student to drop out of university. As Padilla states, each student's ability to overcome a specific set of barriers is the key to a student's success (Padilla, 1999-2000, p 135). In addition, Padilla considered the factors responsible for the variations between some students' success and some others failure. He concluded that every single student has a degree of expertise and then this level of expertise subsidises a student's failure or success.

Padilla's Expertise Model of Successful Students derives from Harmon's and King's work (Padilla et al., 1997). Harmon and King (1985) stated that individuals carry with them a compiled knowledge that consists of two different types. The first one is the compiled knowledge, and as defined by Harmon and King as information that is organised, indexed and stored in a way that is ready to be accessed as well as useful for problem solving (Harmon & King, 1985, p. 30). Padilla's elaboration on this was his indication that "*the student as expert in being a student can be conceptualized as possessing compiled knowledge that consists of two distinct knowledge components: theoretical knowledge and heuristic knowledge*" (Padilla, 1999-2000, p. 136). Theoretical knowledge is defined as something that is learned formally via studying and coursework. Theoretical knowledge by itself, though, does not guarantee the ability to effectively solve problems. Classroom or book knowledge does not usually directly apply to situations that occur naturally, for instance, one must be able to use the context of a situation and previous experiences in order to overcome issues (barriers) that arise (Harmon & King, 1985; Padilla 1991). In this process heuristic knowledge becomes critical. Heuristic knowledge is established in "*rule of thumb*" experiences which have not been tested in any new context, which in the current case is the university environment. These consist of pieces of information which are learnt from a mentor or experiences specific to a certain environment, for example, a given university campus (Padilla, 1991, p. 82).

While examining the connection between theoretical and heuristic knowledge there must be an imposition of time on the knowledge gathering. As time passes more and more knowledge is accumulated on campus and as a result less is imported from an outside perspective. Therefore, the failure to acquire sufficient heuristic knowledge early enough in as student's university career may result in that student's failure to navigate barriers presented and lead to his/her departure from university. Padilla (1991) stated that when a student fails to acquire sufficient heuristic knowledge soon after his/her arrival at the university it may affect the student's ability to become academically and socially integrated into the institutions environment (Padilla, 1991, p. 84). Academic and social integration is a critical condition for success in Tinto's theory of student persistence (presented in the next section). In addition, theoretical and heuristic knowledge are not independent of one another but create a compiled knowledge that a student can draw upon at any time. Padilla (1991) stated that high levels of theoretical and heuristic knowledge which lead to effective problem solving can be defined as expertise (Padilla, 1991, p. 83). In Figure 2.6 are presented the knowledge types that each knowledge needs to be gained in order to achieve maximum success.

Figure 2. 6: An illustration of the concept of expertise (Padilla, 1999-2000, p. 137)

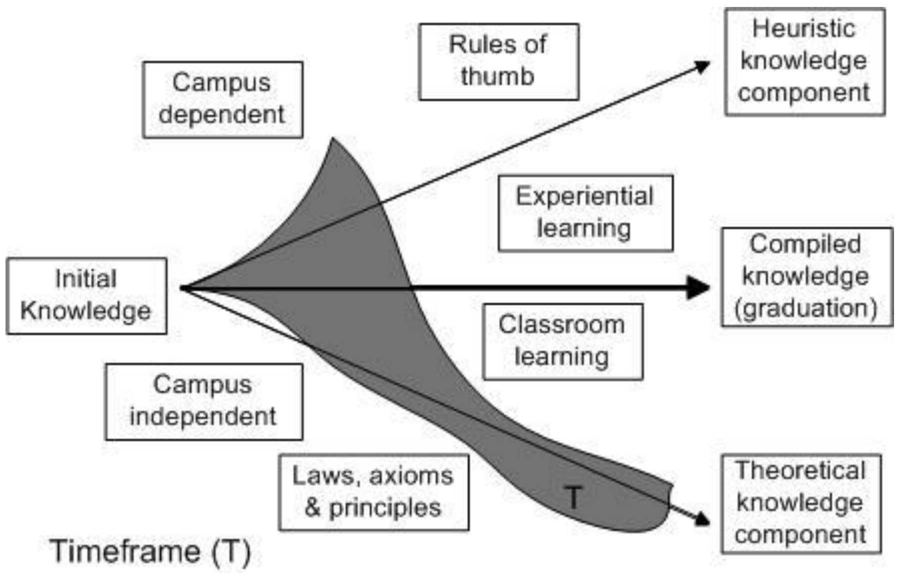


Figure 2.6 illustrates the concept of expertise that relates to students' ability to overcome an institution's geography of barriers. Students need to acquire both heuristic and theoretical knowledge in order to take effective actions and overcome barriers. The black area of the image represents a possible disruption in the acquisition of heuristic and theoretical knowledge over time.

Students are able to work and navigate the barriers during the university experience by using both theoretical and heuristic knowledge. A minimal local model of success is created through the knowledge learned and combined with the successful navigation of barriers. A local model does not take into account interventions or actions conducted by the institution. On the contrary, it depends on the students' ability at a given institution to take appropriate actions in order to successfully complete their study programmes (Padilla, 1999-2000, p. 143). Padilla's local model concept is better comprehended in the institutions' context in which the current research is conducted.

Padilla's model places the success of a student only on the student's shoulders, which is the main difference from Tinto's model. As it was previously stated, Padilla's work is based on Harmon and King's work. Therefore, it incorporates experiences from both before and after university enrolment and requires domain-specific heuristic use as well as classroom or book taught theoretical knowledge. Consequently, a student must work within his/her set of knowledge and expertise in order to overcome the geography of barriers that experiences in the university. If the barriers are too many for the student to overcome, or if the student does not acquire the knowledge in a reasonable amount of time, then the student will most likely drop out. On the other hand, if the student acquires enough heuristic knowledge and expertise, then the student should be able to navigate through the barriers and successfully graduate.

2.2.1.3 Sedlacek's Non-Cognitive Variables

Both Astin (1975) and Tinto (1993) proposed various different variables related to student persistence and success in university. In general, they categorised them as environmental, cognitive and non-cognitive. All three variables work synergistically in order to impact student retention. However, Hyatt (2003) stated that programming and research efforts have been always focused on the cognitive aspects that associate with student persistence (Hyatt, 2003, p.263). Brook (1976), Tracey (1985), and Sedlacek (1999) with their work on non-cognitive aspects of student retention brought a new understanding of the student characteristics which can aid students' academic success. Sedlacek (1999) described eight non-cognitive variables which can be applicable in order to better comprehend student success. All these eight non-cognitive variables are briefly discussed in the following sections.

The first variable is realistic self-appraisal which characterises a student who works hard at self-development and recognises any deficiencies (Sedlacek, 1999, p. 539). The second variable is positive self-confidence and characterised as a student who possesses strength of character, strong self-feeling, independence and determination (ibid). The third variable is related to understanding and dealing with racism. It is based on a student's personal experience with racism and is not limited to the university experience only (ibid). Sedlacek mentioned that the use of that variable is to indicate that students must be neither hostile to society nor submissive to existing wrongs (ibid). Furthermore, a student must be conscious to act "*when it is in their best interests*" (Sedlacek, 1999, p. 540). The fourth variable is labelled as demonstrated community service. It is related with students' involvement with their cultural community (Sedlacek, 1999, p. 539).

The fifth variable is named "*immediate needs or prefers long-range goals to short term*". It classifies students who may or may not put effort in "now" for an achievement later (Sedlacek, 1999, p. 539). The sixth variable relates to students who have a person to support them. In other words, someone to whom they can turn to for guidance and advice (Sedlacek, 1999, p. 543). The seventh variable relates to students who have a successful leadership experience and through that experience they have the ability to influence and organise others (Sedlacek, 1999, p. 539). Finally, the eighth variable involves knowledge acquisition in a given field. As Sedlacek stated the successful implementation of this variable leads to a student who has unusual or culturally related ways of collecting information and demonstrating knowledge (ibid). This concept is related to students who work within the system in order to achieve their aims via non-traditional methods. As soon as they have the ability to work in a given system they gain experience and hence this is directly connected to Padilla's and Harm and King's concept of heuristic knowledge.

2.2.2 Defining Learning Communities

In this section, the literature review continues by defining the term 'learning community'. In Larry Ebbers's and Oscar Lenning's work titled 'The Powerful Potential of Learning Communities', they encourage the higher education community to "*intentionally develop learning communities in order to promote and enhance student learning*" (Lenning & Ebbers, 1999, p. 3; Lenning, et al., 2013). They present four basic learning community categories: student-type, residential, classroom and curricular. The advantages for students who participate in learning communities is greater satisfaction with university life, higher academic achievement, improved retention rates, greater ability to bridge the gap between social and academic areas, improved understanding of self and others and better quality of communicating and thinking (Lenning & Ebbers, 1999, p. 4; Lenning, et al., 2013). Assessments of learning communities frequently examine indicators that are easily quantifiable, such as academic achievement and persistence as well as factors thought to affect these outcomes, like satisfaction and student involvement (Andrade, 2007-2008; Sperry, 2015).

An exact definition of a learning community is described by Vincent Tinto in May 1998 to the National Teaching and Learning Forum. He presented the core of learning communities as a "*co-registration or block scheduling that enables students to take courses together*" (Tinto, 1998). A generative definition of learning communities is offered by Gabelnick et al.:

"*Any one of a variety of curricular structures that link together several existing courses (or actually re-structure the material entirely) so that students have opportunities for deeper understanding and integration of the material they are learning, and more interaction with one another and their teachers as fellow participants in the learning enterprise*" (Gabelnick et al., 1990, p. 19).

This is a US perspective where there is a lot more free choice in the selection of courses and the order in which they are studied. On the other hand, in the UK HEIs the degrees are focussed almost entirely on one subject, which means learning communities are already being adopted (Toman & Caldwell, 2006; Whittaker, 2008).

Despite, that learning communities vary in orientation and scope; all types have some common characteristics. According to Shapiro and Levine (1999) they aim to create integrated learning and teaching experience for the participating students. Specifically, there characteristics are:

- Encouraging integration of the curriculum,
- Organising faculty and students into small-sized groups,
- Providing a setting for students to socialise to the institution's expectations,
- Help students establish social and academic support networks,
- Help faculty and students to focus on learning outcomes,
- Bridge faculty together in more meaningful ways,
- Offer a critical lens in order to examine first year student experience, and
- Provide a setting for community-based delivery of academic support programmes (Shapiro & Levine, 1999).

Having defined the learning community term and its broad characteristics, in the following section the author continues by presenting the learning community theories, as well as the learning communities types.

2.2.3 Learning Community Theories

There are various theories that provide the underpinnings for learning communities. Among the most distinguished are Astin's (1984, 1996) theory of student involvement, Tinto's (1993) model of student persistence, and Boyer's (1990) notion of community. According to Lenning and Ebbers (1999), the use of Tinto's and Astin's models to evaluate and create learning communities is totally justified. As they stated both models "*suggest that learning communities should increase students' persistence, development, and achievement through encouraging the integration of academic and social lives within a college or a university and its programmes, and through quality interaction with faculty members, peers, and campus environment*" (Lenning & Ebbers, 1999, p.49-50; Lenning, et al., 2013). Boyer's theory offers an encompassing notion of what learning communities should contain. In the next sections follows a more detailed description of the learning community underpinning theories.

2.2.3.1 Astin's Theory of Student Development

Astin (1984, 1996) in his theory of student involvement stated that if students are involved with specific aspects of their university lives, then they have more chances to succeed. This concept was included in the 'Input – Environment – Output' impact model (Astin, 1993). In other words, the characteristics (or outcomes) of students who have experienced university life are thought to be based on the initial characteristics that students carry with them to university (i.e. ethnicity, gender etc.) and affected by the overall university experience (i.e. living in student accommodation, attending classes etc.). In 1996, Astin suggested that there were three degrees of student involvement at a given university or college (Astin, 1996). The first degree is related to the students' involvement with academics. It relates to the quality and amount of time spent on assignments, coursework etc. The second degree has to do with faculty involvement. Finally, the third degree associates with students' peer groups involvement. Both, second and third degrees are based on students' inter-group interactions during university life. In conclusion, learning communities offer a more desirable outcome by taking a number of inputs from a set of experiences, and then provides an environment that gives students the opportunity to interact with faculty and with the university in a supportive and positive way.

2.2.3.2 Tinto's Model of Student Departure

Tinto, in his model of student departure, mentioned that it is very important for students to be formally and informally integrated to their social and academic life while they are in university (Tinto, 1993). The formal academic integration happens when a student visits an instructor to discuss class matters during the instructor's office hours, or when a student interacts with an instructor in class. Informal academic integration occurs when students interact about course content outside of class. It can also be seen when students attend other activities, such as field trips, and they further explore topics discussed during normal class time.

The formal social integration occurs when students join student societies, clubs or participate in student government. Informal social integration functions around students while they integrate amongst them, for example, when they socialise in a student accommodation by watching a movie, playing video games etc. Tinto mentioned that persistence is increased for students if they have positive experiences with all the aforementioned types of integration (Tinto, 1996). Learning communities could promote informal and formal academic integration via co-curricular activities and linked course-work designed to enhance in-class teaching. Additionally, by placing students in a common living environment, they can also experience formal and informal social integration.

2.2.3.3 Boyer's Notion of Community

Boyer's notion of community offers the basis for many learning communities, especially those with residential focus (Boyer, 1990). According to Boyer there are six conditions that are necessary to form a true community (ibid). Firstly, Boyer required a purposeful community. A community with purpose is a community where goals for learning are shared among faculty and students. Furthermore, in this community the instructors stimulate active and not passive learning in the classroom (Boyer, 1990, p. 12). Secondly, Boyer mentioned that a community must be open. A community must make sure that every person is valued and the notion of civility is prevailing. Furthermore, the freedom of expression must be fostered. The third condition indicates that communities must be just. Learning communities must be places where intolerance and ignorance is not accepted and diversity is "*aggressively pursued"* (Boyer, 1990, p. 35).

The fourth condition states that the learning community is required to be one of discipline. A place where governance is well-defined with procedures that guide behaviour for the common good and individuals accept their obligations to the community (Boyer, 1990, p. 37). The fifth condition is a caring community which fosters connections among students and their environment. Additionally, Boyer suggested that students should also be brought in touch with those genuinely in need and creates international, intergenerational and intercultural relationships (Boyer, 1990, p. 54). Finally, the sixth condition is that learning communities must be celebrative and cherish traditions, culture and heritage of student and campus life.

After presenting the learning communities underpinning theories the author provides in the subsequent sections a review of the learning communities' types. This is part of the author's effort to equip the reader with the necessary knowledge basis in order to better comprehend the current study's research findings.

2.2.4 Learning Communities' Types

During the last decade, learning communities are far more widespread than in past due to the flexibility they offer (Thomas et al., 2005; Harvey et al., 2006; Whittaker, 2008; Thomas, 2012). Learning communities can be structured in various different forms in order to suit the needs of the institution including both faculty and students. Learning communities can also have different names such as Professional Learning Communities (PLCs) which are school focused (Stoll et al., 2006), Learning Programmes (Inkelas & Weisman, 2003; Stassen, 2003), and residential learning communities or clustered programmes which are higher education focused (Lenning & Ebbers, 1999).

According to Shapiro and Levine (1999), learning communities can take many forms in higher education. Apart from Gabelnick et al.'s definition, already discussed in Section 2.2.2, there are also other definitions that are widely used in academia. Love and Tokuno, based on Shapiro's and Levine's detailed description, presented three models of learning communities that differ in curricular cohesion, class size, and student and faculty members' collaboration (Love & Tokuno, 1999). The first model involves clustered or paired student classes. A small group of students is co-enrolled in all courses associated with the learning community. In general, they are the only students in those classes. Courses are chosen based on a theme and faculty members work together in order to have linked lectures, assignments, and out-of-class programmes that enhance the material taught in-class (ibid). This model promoted the creation of strong connections between faculty members and students, as well as, between courses and their content.

The second model, students in larger classes, gives the opportunity to small student groups to co-enrol in two, three or four courses, but these are not the only students in these particular courses. The most important part of this model is that the small group is consistent across all two, three or four courses (Love & Tokuno, 1999). In addition, this allows students to create intellectual connections (Love & Tokuno, 1999, p. 10). Love and Takuno have also suggested that there could also be a seminar for the co-enrolled students which could further enhance the learning community's material understanding and faculty interaction (ibid).

The third model is the team-taught programme which is also called "*co-ordinated studies programme*" (ibid). The concept is that instead of having two or three classes together for example, students take an entire semester of classes as a cohort. All course content and assignments are integrated and as a result building community and intellectual connections are conjoined (Love & Tokuno, 1999, p. 11).

A fourth type of learning community has been note by Shapiro and Levine (Shapiro & Levine, 1999). It is called residence-based programmes and students have a shared residential experience based on a common curricular programme (i.e. a computing course) or interest (i.e. community service) (ibid). Furthermore, in residence-based programmes, students are not co-enrolled in courses by intention, but they may find that they have common courses with other students.

Professional Learning Communities (PLCs) draw attention to the potential that a range of people based inside and outside of a school can mutually enhance their learning as well as school development (Stoll et al., 2006). PLCs are mentioned because they are a type of learning communities but they have a particular orientation for schools. Thus, a further investigation is beyond the scope of this thesis.

All the aforementioned learning community models incorporate a shared living experience. They allow students, not only to attend courses together, but also give them the chance to share the same student accommodation. This gives students the opportunity to gain the benefits from taking two or more courses with the same group of students in a co-ordinated curriculum, as well as the opportunity to live and study with classmates (Shapiro & Levine, 1999). In addition, it creates a living-learning environment where students can integrate their out-of class and in-class experiences, which can promote fostering of faculty interaction, community, social and academic support structures (Gabelnick et al., 1990; Lenning & Ebbers, 1999; Stassen, 2003). Finally, Inkelas and Weisman (2003, p.336) stated that living learning programmes have become popular especially at institutions with large enrolments that try to create a more personalised and intimate student environment.

2.2.5 What is missing?

In summation, all the aforementioned models are associated with students who have some level of efficacy or expertise that relates to university retention. Tinto's first model is based on intentional institutional involvement and programming in students' life in order to help them integrate socially and academically. Padilla's second model theorises that the campus experience is firstly overcome by the student themselves. Otherwise, Padilla believes that only after a student achieved success at an institution could that student use his/her strategies in order to intervene and address occurring situations. Finally, Sedlacek suggested that students should have a set of experiences during and prior to the university years, which can help their non-cognitive skills further develop. An appropriate application of these skill-sets could lead to higher retention while a lack of them would lead to lower attrition (Sedlacek, 1999).

An important part that is missing from the previous models/theories is to understand how student retention and persistence applies at various types of institutions. Braxton at al., (2004) questions Tinto's model validity at non-residential institutions for example. Furthermore, Padilla's (2009) research is based on only one university in the US. The interpretation of the existing student persistence theories to non-residential institutions is therefore quite vague. In addition, none of the aforementioned theories defines the institution-size. For instance, what might be an effective intervention in a small institution with 1,500 students and focuses on architectural studies might not be applicable for a large scale institution with a more computing-oriented focus. Similarly, a small size institution might lack appropriate resources that could help administer a successfully applied intervention implemented at a larger institution. This variety of differences will have to be further investigated and analysed, but this is not the purpose of the current study.

So far, there is no complete explanation that defines students' attrition aspects. Sedlacek, Tinto and Padilla proposed sound theories but they can be applied in a specific context for a group of students. An incorporation of more than one theory could be a possible solution in order to better comprehend student persistence at different institutions. Finally, regardless of which model is adopted, university administrations should embrace that they have an important responsibility in student persistence, success and graduation from university. An important programme that could aid student integration into university life is learning communities. Therefore, in the following section is provided a review of the learning communities' history. Before doing this though, the author addresses this study's relation to literature review.

2.2.6 Research Questions’ Relation to Literature Sources

Table 2.1 relates each of the current study’s research questions to the relevant or applicable research that serves as a foundation of inquiry. Most of the research in this area builds upon and focuses on Tinto’s and Astin’s work. The literature source column presents the initiators work on first year university students in US HEIs, as that is where the research first started. Furthermore, references related to the first year experience in UK HEIs are also addressed, including computing departments as part of the research focus. Specifically, Whittaker’s, and, Meyer and Land’s references incorporate examples from UK computing departments.

Table 2.1: Research questions' relation to literature sources

Research Question:	**Literature Source:**
1. How do first year undergraduate computing students perceive their university experience?	Tinto (1975, 1993, 2005, 2012) stated that students’ experiences in university can greatly affect the way they perceive their universities and, as such, decide whether to persist or leave university (ibid). In addition, Whittaker in 2008 performed a study that aimed to study student enhancement and engagement through the examination of student transition issues to the first academic year in UK Higher Education (Whittaker, 2008). The study identified many institutional attributes that influenced student perceptions of their university experience (ibid).
2. To what depth and breadth does learning community participation affect social and/or academic integration?	According to Tinto (1975, 1993, 2005, 2012) social and academic integration are integral. Briefly, Tinto states that if a student is socially and academically integrated to an institution, it is more likely that (s)he will be retained form year to year. Furthermore, the student’s persistence to graduate is greatly increased (ibid).

3. What are the identified barriers/limitations to improve retention?	In 1999-2000 Padilla presented a geography of barriers that successful students learn to identify, negotiate and overcome (Padilla, 1999-2000). He has also stated that academically successful students are those who become experts at being successful on a given campus (Padilla, 1999-2000; Meyer & Land, 2006). In addition, Sedlacek advised that students are able to apply non-cognitive skills in an effort to engage with their surroundings and be more successful (Sedlacek, 1996, 1999; Meyer & Land, 2006).
4. What learning characteristics or knowledge do students maintain and how are they accomplished?	Padilla stated that "*three specific factors – pre-university experience and knowledge; support systems in university; and, internal and external awareness – contributed to students' expertise and, as such, overall success in university*" (Padilla, 1999-2000). Furthermore, Sedlacek's (1999, 2004) non-cognitive skills are used by students in order to develop characteristics that will help them in their academic success.

2.3 Learning Communities in Practice

Learning communities are in general defined as curricular structures that link together various existing courses (Tinto, 1993; Whittaker, 2008). A curriculum link will possibly lead to increased interactions between instructors and students, and by achieving social and academic integration student persistence towards an undergraduate degree can improve. The following sections therefore discuss the history of learning communities, their underpinning theories and a demonstration of various different types of learning communities. In addition, aims and outcomes of the first learning community programmes which were developed in the USA and their future directions are presented in order to provide a solid informative basis before literature review is focused on retention and transition issues in UK Higher Education.

2.3.1 The History of Learning Communities

The concept of a community of learners originated in the United States in 1727 (Hugo, 2002). Benjamin Franklin organised *Junto*, a group of elite learners, which was established in order to promote knowledge in and around Philadelphia. In the mid-19th century, lyceums started developing in all over the United States. US-lyceums gave the opportunity to people to come together and discuss about religion, politics, science, promote morality and temperance, and exchange useful knowledge (ibid). Later, in 1916, Dewey proposed in his landmark "*Democracy and Education*" that learning in school systems should occur in an associated and connected manner (Dewey, 1916). Subjects should not be taught without any connection but in relation with other subjects as well. In addition, Dewey recommended that learning should be student-centred and that teacher and student should have a close relationship which leads to a desire for more learning. Furthermore, in 1933, Dewey revised his theory and noted that collaborative learning could foster community and make the teacher's role more of a facilitator in a learners group than merely being an outside authority (Dewey, 1933, p. 59).

A professor at the University of Wisconsin, Alexander Meiklejohn, who is acknowledged as the father of the learning community movement in Higher Education, developed the Experimental College which is widely recognised as one of the first learning community programmes (Meiklejohn, 1981). Meiklejohn (1981) defined the Experimental College as something which could provide a scheme of reference and operate via instructors' lesson plans (Meiklejohn, 1981, p.3). Furthermore, Meiklejohn with Dewey stated that the community ideal was the key way to prepare adults to govern themselves (Hugo, 2002, p. 15).

Later in 1965-1969, Joseph Tussman while he was conducting the Experiment College at Berkeley altered Meiklejohn's idea (Meiklejohn, 1981). Tussman's focus was on the related nature of concepts rather than a related curriculum, with faculty teams from various disciplines offering programmes for first and second year students (Pistilli, 2009). The outcome was a learning communities programme at the University of California, Berkeley which showed that only 75% of the first year students participated in these programmes. In the 1960s, the University of Michigan also created their learning community programme, which led other institutions to follow (ibid).

In 1969, the Evergreen State College in Olympia, Washington was formed. It was created on the ideal that the curriculum should be based on inter-disciplinary co-ordinated studies (Shapiro & Levine, 1999; Smith et al., 2004). This programme followed Meiklejohn's and Tussam's theories with individual courses from different disciplines connected through a seminar which is co-ordinated by faculty that teach other courses. Gebelnick et al. (1990, p. 30) stated that a seminar, offered as intellectual and social core of co-ordinated studies, could provide students with the opportunity to create relations between lectures, texts and other material.

Later, in 1976, the State University of New York developed its Federated Learning Communities programme (Pistilli, 2009). In this programme they followed the same structure as the one suggested by Meiklejohn and Tussman. Students were co-enrolled in two or more courses focused on a contemporary issue within an interdisciplinary context. The students were also enrolled in a seminar led by a "*master faculty learner*". The "*master faculty learner*" participated in all courses along with the students, identifying and providing resource opportunities for learning, interpreting expectations of students and faculty and modelling critical thinking (Hill, 1984, p. 283).

In 1984, Patrick Hill stated that learning communities offered faculty and students the opportunity to co-operate, learn from each other and release the "*powers of association"* (Hill, 1984, p. 4). In the same year, in the United States, the National Institute of Education issued the report *Involvement in Learning*. In this report, the authors mentioned that every HEI should try to develop learning communities that are organised around certain intellectual tasks or themes (Hill, 1984, p. 33).

In 1987, Resnick gave a clear definition of the Communities of Practice that addresses the differences of in-school learning versus out-of-school learning, such as in institutions (Resnick, 1987). Addressing this definition will help the reader to clarify the difference between learning communities and communities of practice. The design of practice fields is consistent with implications of situativity theory forwarded by many psychologists (Jonassen & Land, 2012). The practices that the learner engages in are still 'school tasks' abstracted from the community, and this has important implications for the meaning and practices being learned. The cultural context of schools and colleges mainly focuses on grades and learning, but not in participation and use of learning, as it is required in HEIs (Jonassen & Land, 2012). The identity being developed by Communities of Practice is one of students in school, not as a contributing member of the community who values and uses the content being taught (Jonassen & Land, 2012). The main problem with Communities of Practice is that they occur in schools rather than in the community through schools (Lave & Wenger, 1991, pp. 99-100). This creates a bracketing off of the learning context from the social world through which the practice being learned is of value and of use (Jonassen & Land, 2012). Even if Lave (1991) brought a much focused attention to the Communities of Practice concept, this has been done through an anthropological approach, via the examination of practices in everyday society and not environments intentionally designed to support and promote learning such as at university level (Lave & Wenger, 1991). The main reason for not including Communities of Practice in the current study is because it mainly focuses on the learning community approach within HEIs, which is a concept, described in the previous sections. In 1999, Levine and Shapiro reflected Dewey's (1933) suggestions and note that the learning environments should be structured in order to apply collaborative and co-operative approaches to emphasize learning (Shapiro & Levine, 1999).

Learning communities continued to expand around the world as methods of helping students to be successful in their first academic year and successfully carry on with their studies until graduation (MacGregor & Smith, 2005). The learning community movement in HEIs, globally as well as in UK HEIs, is at a crossroads (MacGregor & Smith, 2005, Whittaker, 2008, HEPI, 2013; HESA, 2014b; Dunne, 2014). HEIs struggle to meet the aims of learning communities, whilst at the same time attempt to overcome the challenges of a changing economic environment and demographic of students pursuing graduation and direct access to employment market (HEPI, 2013). This outline of pressures, of issues, and of change does not only pertain to UK HEIs (Dunne, 2014). The USA has been grappling with such features over a much longer period (ibid). South Africa, Australia, and parts of Europe are coming to terms with similar issues and debate (ibid).

2.3.2 First Learning Community Programmes' Outcomes

As discussed in the previous sections, Dewey (1916, 1933) and Meiklejohn (1981) were the first to discuss formal connections between students, faculty members and curricula. Mieklejohn developed a connected curriculum at the University of Wisconsin, in the United States, that had the goal of giving students a theme which ran through all their courses and prepared them to govern themselves as adults (Mieklejohn, 1981). Tussman, took that idea a step forward by creating learning communities at the University of Michigan (ibid). Later on, after 2000, other higher education innovators such as Vincent Tinto, Jodi Levine Laufgraben, Patricia Cross, John Gardner, Jean MacGregor, Leigh Smith and Nancy Shapiro developed connections that can span the first semester or the whole first academic year, or, in other cases all undergraduate years (Shapiro & Levine, 2000; Smith et al., 2000, Laufgraben et al., 1987; Koch & Pistilli, 2005, Tinto, 2012).

Even if learning communities existed for many years, conducting and publishing research on learning communities has been a relatively new phenomenon. The majority of the research has been conducted on the outcomes and efficacy of learning communities, and dates back to the mid-1980s. The main focus of that period was Gabelnick et al.'s research on learning community models (Gabelnick et al., 1990). Furthermore, during the same period MacGregor conducted a six-year data collection (from 1984 to 1990) in order to show the success of learning communities (MacGregor, 1991). However, since then, there is a great deal of more research that has surfaced in the USA and beyond. In 2005, MacGregor and Smith stated that there is a significant increase in presentations, publications and resources on learning communities (MacGregor & Smith, 2005, p.2). After 2005 research activity kept increasing with publications and reviews, in the USA, UK and beyond (Pistilli, 2009). Notable publications from important innovators came from Whittaker (2008) in the UK and Tinto (2012) in the USA. Nevertheless, the current research tries to investigate and reveal positive and negative outcomes associated with student participation in learning communities in UK HEIs.

Continuing with the literature review, learning communities can create an enriched and efficient environment for student learning (Smith et al., 2004). As explained in the following section, learning community outcomes can lead to an increase in student learning and retention of students from the first to second academic year. In addition, it can lead to increased active, effective, and collaborative learning.

Most of the studies in learning communities have been conducted in US institutions. The examination of the empirical evidence from several US institutions, such as University of Massachusetts (Stassen, 2003), University of Wisconsin-River Falls (Pots et al., 2003-2004), Indiana University (Zhao & Kuh, 2004) and other Midwest institutions, has shown that there is a clear impact for students participating in learning communities (Pistilli, 2009). However, there are several key outcomes which are directly related to institutions offering learning communities. Lenning and Ebbers stated that learning communities are defined by seven distinct outcomes in undergraduate education (Lenning & Ebbers, 1999). These outcomes include the creation of:

- A culture of explicit, broadly shared standards, goals and criteria,
- A culture of evidence and inquiry,
- A more inclusive vision of scholarship,
- A teaching culture which implements relevant knowledge to improve practices,
- A culture that promotes collaboration for individual advancement and the common good,
- An academic culture that makes effort to realistically account for costs, and,
- A model of higher education which is transformative and qualitative (ibid).

It is clear that the aforementioned outcomes reflect on the impact of learning communities at the institutional level. This result is a compelling argument for the continuation of learning communities, as well as for the development of new communities that would be able to meet the needs of a changing academic and student environment. As briefly stated by Zhao and Kuh (2004), learning communities qualify to be added to the list of effective educational practices (Zhao & Kuh, 2004, p. 131).

2.3.3 Learning Communities Future

Learning communities have come a long way since Benjamin Franklin's *Junto* in the late 18th century. Nowadays, students are far more diverse than they have ever been in the higher education history. Universities are at times overwhelmed with the sheer magnitude of students entering higher education, and are struggling to find methods to aid a generation of students succeed in university. Learning communities can offer opportunities for success by promoting student connection to class material, student-to-student association, as well as student-to-faculty members and student-to-institution connections. The future of learning communities is in the hands of administrators, staff and faculty members who have to diagnose the changing university environment and adapt to it, in order to draw students to their institutions, and aid their success, retention, and, finally their successful graduation.

Since the time of Meiklejohn and Dewey to the innovations of Smith, Levine, Matthews, Gabelnick and others, learning communities have promoted increased contact and collaboration between faculty members and students. Furthermore, learning communities promoted co-curricular experiences and programming which enhance in-class learning, and have also focused on teaching pedagogy as a discipline at the university level. Most likely the future learning communities will continue all these processes, but will also be altered and influenced by the student needs that will possibly occur over the following decades (Lenning & Ebbers, 1999; Smith et al., 2004).

Learning communities as curricular entities will continue to impact institutional change, in particular the way that administrators, staff, and faculty think about students (Smith et al., 2004). In addition, in the coming decades more students will be attending university and the population will be extremely diverse (HEPI, 2013; HESA, 2014b). The rising student population, combined with the current economic environment, will force institutions to re-think about scaling programmes in order to meet student expectations and demands. In 2000, Howe and Strauss had noted that the current education style will not be effective for the Millennial generation (Howe & Strauss, 2000). The Millennial generation students tend to ask for more team-based learning, more interaction, more activities, and fewer lectures and learning by memorising information (Pistilli, 2009).

Furthermore, learning communities will also have to change by developing new and innovative types and then offer them to the new incoming students. For example, multicultural learning communities that were created to address an increasing number of minority students leaving an institution after the first academic year (Koch & Pistilli, 2005). In the coming years, similar models will see increasing popularity and growth. Many UK HEIs, as well as international institutions, are interested in creating new opportunities for students in order to satisfy their demands and increase retention rates. Specifically, in the UK, during the last years, the landscape in higher education has become increasingly competitive, which raises difficult questions for students and institutions (HEPI, 2013; HESA 2014b). From the students' point of view, the economic challenges and the fees rise, has put great pressure on them to make the right choice of institution and course, as well as leaving students searching for the best position in order to successfully enter the graduate employment market (HEPI, 2013). Antithetically institutions face the challenge of comprehending and implementing the expectations of a new demanding student cohort, without additional funds (ibid). A broad discussion about retention and transition issues in UK Higher Education is conducted in the following sections.

2.4 Retention and Transition Issues within Higher Education

2.4.1 Specific Issues related to Diversity within UK Higher Education

In the following section the transition issues that may be related to various modes of learning, learner groups, types of institutions and subject areas are discussed. In addition, the increasing student heterogeneity, as well as factors affecting the retention of various learner groups, is discussed. The importance of understanding the student population heterogeneity and avoiding single solution approaches and generalisations are also highlighted. The first specific issue related to diversity is a learner's profile.

2.4.1.1 Learner Profile

The growing numbers of mature students such as part-time studies via campus-based, work-based, distance-learning and other blended-learning techniques started to promote the 'non-traditional' type of student concept. This concept is common in political and academic dialogues and is employed in order to define students without a traditional engagement in higher education for reasons involving socio-economic, ethnicity, nationality, age, and pre-educational background factors. Engagement techniques lead to growing numbers of 'non-traditional' students who may be unprepared for or unfamiliar with traditional university teaching, learning and assessment approaches (Thomas et al, 2005; Harvey et al., 2006; Thomas, 2012).

Previous research in social transition pointed-out that first-generation, mature and working class students are likely to have reduced peer-support (Toman & Caldwell, 2006). It is usual for mature students to have confidence in interactions with their tutors when they seek advice and support for their studies, rather than younger students who tend to prefer gaining support and advice from other students. Younger students, though, prefer to have immediate answers in academically related issues that are usually more readily available from their fellow students. Despite the fact that this is not always the best source of guidance. In addition, it has also been highlighted that there is a lack of confidence usually experienced by mature students when they seek guidance and support. It has also been observed that mature students tend to be highly motivated and work hard, but they also seem to be more concerned about their performance than younger students (ibid).

It is very often observed that first generation students expect to receive constant support and guidance from their tutors. On the other hand, mature students do not have high expectations and can better handle issues within the university environment, even without support from peers or university staff (Yorke, 2000).

In 1998, Yorke presented the significance of the gender factor as a success determinant (Yorke, 1998). He stated that male students are highly likely to address experiencing complications with their studies than female students. Examples of such difficulties can be low motivation to study, lack of engagement and learning skills, as well as poor academic progress or difficulties with academic study (ibid).

International students, apart from geographic transition and social challenges, also require adapting to various educational learning and assessment techniques, and culture. For instance, the plagiarism concept is often not very familiar to international students (Whittaker, 2008).

Finally, disabled students might not be always engaged in normal transition forms, for instance personal tutoring. Specifically, their disability becomes the primary focus of support, instead of other issues related to successful first year retention. In addition, Bolt (2004) spotted that a number of university websites, that are the first point of contact for many students, refer directly to ethnicity, gender, class and sexuality but not to disability.

2.4.1.2 Student Population Diversity

Support services and academic staff who plan and operate retention strategies need to have a clear understanding of the factors that possibly affect different learner groups. Nevertheless, stereotyping or generalising based on factors such as age, gender, class, educational background, disability, and ethnicity should be avoided. Alternatively, support services and academic staff must better comprehend the student group main diversity, which is more complicated than these factors alone. Single targeted solutions for specific student types are not enough and as the student population becomes more diverse an effective solution will become increasingly crucial.

In 2001, McInnis stated that "*while recognising the importance of the specific needs of particular student groups in transition support, there is a danger that institutional strategies may define and relate to students as members of their particular target group, when students themselves would rather be defined as members of the wider university learning community*" (McInnis, 2001).

In 2007, in a survey of the first year experience for the Higher Education Academy, Yorke and Longden, proposed that students from broad participation backgrounds experience higher education in a very similar way with those from more traditional backgrounds (Yorke & Longden, 2007). The Higher Education Academy survey highlighted that the more ‘risk factors’ in a student’s experience, the higher the probability that the students will have considered dropping out from the course attending. The main influencing factors in the decisions to drop out were highlighted as the inadequacy of quality information regarding the institution or the programme and financing concerns (ibid). Nevertheless, Yorke and Longden did not recognise any important variations of student experience in relation to socio-economic or gender background. This advocates that any fundamental alterations in order to improve first year empowerment and engagement need to be focused on all students, and not just on the ‘non-traditional groups’ or those ‘at risk’ (ibid).

2.4.1.3 Learning Mode

Another specific issue that is related to diversity, and is rather extensive, is the learning mode. In the subsequent sections, the impact of different learning modes on university retention and transition is considered. Specifically, the focus is on the workplace learning, the condensed delivery model of modular-based programmes, technology-enhanced learning, distance-learning online programmes and work-based learning.

Modular-Based Programmes: A barrier in enhancing student engagement via assessment strategies is the more compacted delivery model issue that is entailed by modular-based programmes. In 2000, Yorke noted the inadequacy of short formative assessments within modularised programmes. The reason was due to a necessity for module completion during a semester, and the following risk of ‘failing and trailing’ modules from the first academic year (Yorke, 2000). As Yorke mentioned, such an early failure could cause great discouragement to a student and lead her/him to an early course withdrawal. Thus, Yorke proposed that the first academic year could focus on skills developments that are needed in order for a student to be successful in the following academic years. As a result, this could lead to less summative assessments and more formative assessments and tutorial/practical support. A recommended strategy from Whittaker which could support such developments is the introduction of ‘thin, long’ modules that could take place over the course of two semesters (Whittaker, 2008).

Workplace Learning: Students who engage in workplace learning can at first discover the two-fold character of being student and employee. This direction is supported by placement programmes offered in a university programme and are frequently considered as the best part of a course programme. However, the relation between workplace and university should be enhanced, for instance via seminar-sessions that could be conducted during the placement period (Fuller & Unwin, 2003; Whittaker, 2008). In general, the sense of belonging in students has to be enhanced, even when they spend time away from campus.

Work-Based Learning: Work-based learning programmes promote students' reflective skills development (Ainley & Rainbird, 2014). This can always be a great challenge for students, particularly for those who may have been out of the education environment for a long time. In addition, students' anticipations regarding the lecturer's role in such programmes might lead to relationship issues between staff and students. Students are expected to alter their approach towards their tutors. Tutors' main purpose is to facilitate learning, as well as support and develop students' reflective skills (Boud, Cohen & Sampson, 2014).

Additionally, in these programmes students cannot have the same level of access to student services and academic support as full-time students (Whittaker, 2008). Better support, such as e-mail guidance, workplace visits by university staff, evening access to support services, is required for off-campus based students. Furthermore, sometimes university programmes do not properly consider student priorities that are related to family and work commitments (Boud & Solomon, 2001; Whittaker, 2008).

Technology-Enhanced Learning: E-learning offers a different mode of learning for all students, whether they are distance or campus based (Goodyear & Retalis, 2010). Students need to adapt to e-learning environments that integrate online technology via Virtual Learning Environments (VLEs). They also have to use the e-learning platforms in order to interact with fellow students and academic staff (Whittaker, 2008; Beetham & Sharpe, 2013). It is usual for younger students to have highly developed information technology skills, which leads to a smoother transition. Nevertheless, there are a number of students who require support in order to develop information communication technologies (ICT) skills, as well as mature learners (ibid). In this case work-based learning offers a great opportunity for students to acquire and further develop their information literacy and ICT skills (ibid).

Distance Learning: In 2004 Parkinson and Forester investigated the induction experiences of students who started studying in three different distance-learning online programmes (Parkinson & Forrester, 2004). Their approach included the application of gap analysis in order to define if there are any variations between student perception and experiences, or not. The results suggested a blended approach application for teaching and learning, with an important element of active student participation (Parkinson & Forrester, 2004; Harvey et al., 2006). The approach included encouraging social cohesion within the group, pre-course evaluation of students' IT skills, establishment of a peer-support network, and promoting a sense of belonging to the university and the programme (ibid). Based on the research outcomes, alterations and improvements were employed to the programmes and as a result the student perceptions and experiences gap was reduced (Parkinson & Forrester, 2004).

Subject – Inter and Multi - Disciplinary Programmes: Toman and Caldwell, in their 2006 student evaluation project, referred to the impact of subject discipline on student retention/transition in terms of multi-disciplinary and inter-disciplinary programmes. Specifically, they discussed variations in teaching and learning methods, differences in assessment approaches between university and school based programmes, and students' non-similar starting points within a course (Toman & Caldwell, 2006). The inter-disciplinary and multi-disciplinary structure of various study-programmes necessitates from students to cope with a variety of assessment and teaching styles, as well as in culture, although modules are delivered from different departments, faculties or schools within universities (ibid). In addition, the adjustment challenge to academic expectations may evolve into an even more challenging situation for students who participate on such programme types (ibid). Finally, this might also affect students' social cohesion, as well as their sense of belonging to the university.

Different Starting Points of Students within a Subject: The students' dissimilar starting points while entering first year UK university courses were addressed by Toman and Caldwell (2006), as well as Whittaker (2008). Some programmes, especially in science fields, have been characterised by students who have completed A Levels, as insufficiently challenging and repetitive. Lecturers usually educate to the lowest average level in order to make sure that the necessary skills and knowledge are accomplished by all students (Whittaker, 2008). However, the inadequate engagement can result to inadequate studying, de-motivation, lack of success and departure. Toman and Caldwell (2006) suggested that such students must be encouraged and supported to develop the ability to recognise and reflect on new learning, possibly by emphasising discovery and enquiry learning approaches.

Having reviewed a number of specific issues associated with the diversity of the student population in UK HEIs, the following section examines various techniques that support student retention and transition. Specifically, it addresses the necessity to support retention and transition of all students, and not only those 'at risk'. In addition, it addresses retention and transition support services that are accessible by all students as a factor of their daily university involvement and not only at periods of emergency situations. Furthermore, supporting via social networks and via programme delivery and curriculum design are also discussed.

2.4.2 Other General Key Issues related to Retention and Transition within UK Higher Education

In the following section the researcher explores the general issues related to retention and transition to UK Higher Education within the integration context that is provided by the learning communities' concept. The changing nature of the university experience, the principal forms of retention and transition, and personal and social retention issues are discussed. Finally, academic retention via adaptation to the UK Higher Education experience, and administrative and geographic retention issues are also discussed.

2.4.2.1 Integration and Retention

As discussed in previous sections the theoretical models of student retention and transition are strongly influenced by Tinto's student integration theory (Evans, 2000; QAA, 2005; Harvey et al., 2006). Progression and retention are interpreted as mainly defined by the students' capability to integrate with the social and academic forms of university life. Toward acquiring total integration students should successfully apply three steps. Firstly, disengagement from their former environment; secondly, transition (student adapts to the new environment), and, thirdly incorporation (student fully accepts and integrates in the new environment) (Tinto, 1993). Tinto's theory was developed in a traditional campus-based university experience in the USA, instead of the diverse environment of the student experience and student population of the 21st century. The student experience of this environment is influenced by a range of economic, social, and personal factors that are not in the control of the university. As Yorke (2007) stated, a HEI can only strive in order to '*change the odds to benefit student-success'*. The wrong choice of institution or course, as well as a lack of preparation can prevent a student from successfully achieving integration (Ozga & Sukhnandan, 1997; Yorke & Longden, 2007). Furthermore, an inadequate social and academic integration with academic staff and other students can also lead to non-successful student integration (Krause, 2005). Nevertheless, the consideration of student integration continues in a later section when retention issues are investigated.

2.4.2.2 Principal Retention and Transition Areas

The principal transition areas to the first year of university are four-fold. In general, they are recognised as administrative, academic, geographic and social and personal (McInnis et al., 2000). These areas had been identified by Williams and Pepe (1983), through their survey-work on first year students' academic experience in Australian HEIs (Williams & Pepe, 1983). Their study identified 'classroom interaction', academic involvement', 'goal direction', social isolation', 'alienation', and 'institutional belongingness' as the most important motivational and environmental factors that affect students.

2.4.2.3 The Changing Nature of the University Experience

Higher Education, internationally and in the UK, continuously revise the university experience character. The 'massification' of higher education is creating a set of different expectations, needs and goals for a progressively diverse student experience and population (Thomas et al., 2005; Thomas, 2012). In addition, the 'de-personalisation' generated by large size classes, for instance, and the individual's inadequate support and attention have affected most students, either traditional or not (Thomas and Hixenbaugh, 2006; Thomas, 2012). Harvey et al. (2006) mentioned that the factors related to the *'mass experience of being a first year as opposed to the differentiated experience of later year'* demands additional research to promote transition in the first academic year. Furthermore, the integrated use of technology and the technologically empowered learning, for social and academic purposes, have greatly changed the experience of the students (Creanor et al., 2006).

2.4.2.4 Academic Retention and Transition

The literature review identified that issues surrounding academic retention and transition mainly focus on students' need to adapt to learning and teaching styles which differ from their previous understandings at school, college or any other community based learning. Academic staff expects students to exhibit a new level of independence. Lowe and Cook (2003) identified that students' study habits from school, for instance, endure until the end of the first university semester. This indicates that students do not quickly or effectively bridge the gap between school and university. The volume, pace and level of study is probably higher than previously experienced or expected, and grades might be decreased as a consequence of the various marking systems at university.

Harvey et al. (2006) mentioned that the first academic year associates learning behaviour development and important cognitive growth. In addition, they indicated that conceptual growth may be obstructed by previous approaches to learning. Also academic staff needs to define if the teaching and learning methods applied in their programmes can help this growth. Katanis (2000) suggested that traditional teaching staff interpret teaching as a subject and teaching students as equivalent processes. Moreover, they do not make the necessary philosophical and cultural change in order to acknowledge and employ the nexus between learning and teaching (ibid).

However, the relation between successful assessment results and learning techniques in the first academic year cannot mirror the academic staff's expectations, such as first year students' development and usage of deep and autonomous learning methods. Regulation is needed not only to various experiences and anticipations of teaching and learning, but also to a new academic culture and discourse related to university. Professional development support programmes for new academic staff have addressed such issues. In 2006, The Open University conducted a survey of such programmes and recommended that their effect is going to be accomplished through effective assessment methods, as well as through when their participants (students) start to participate in curricular design and review (Knight, 2006).

2.4.2.5 Personal and Social Transition

Personal and social transition is addressed in the bibliography as a critical area related to progression and retention. In general, institutions continuously develop techniques in order to identify this issue mainly through academic and social activities. Implementing peer groups, but also a sense of belonging to an institutional programme, is considered as important in helping social and personal adaptation to university life (Katanis, 2000; Harvey et al., 2006; Yorke & Longden, 2007).

Young students may also have to deal with emotional challenges of the transition to adulthood, as well as being responsible for their personal and academic life. The lack of familiar support networks might generate feelings of isolation. Students living at home may experience greater difficulty in integrating into campus life and developing friendship networks than campus-based students, because they are unlikely to participate in social and/or extracurricular activities (Lowe & Cook, 2003). Nonetheless, students usually prefer to discuss and share concerns and problems with their friends instead of asking for guidance from the professional support services offered by an institution.

Developing time management skills as well as finding balance between study-time, part-time work, social life, finance management and family are necessary while a student adapts to the university experience. The employment effect when a student attends a university is addressed in the bibliography, as well as highlighted in the focus group interviews with students of the current study (see Chapter 5). McInnis (2001) proposed a major re-assessment of research questions towards students' life in university that complies with students' personal lives. Research of student experience usually tends to target areas that academics recognise as the most important factors for a successful student retention and transition. But, as McInnis argued, in-depth research requires to be conducted and investigate these factors relative importance in relation to students. Finally, such research could be proved critical for institutions, especially if they seriously aim to support areas that can have a significant influence on first year student experience.

2.4.2.6 Administrative and Geographic Retention

The geographic-transition issues are related to the possibly overwhelming and alienating influence of high volumes of students and large campuses (Whittaker, 2008). These are much related to students who live away from home and deal with geographical adaption to new living arrangements such as a new country or a new city. Administrative transition focuses on issues related to timetable management, enrolment, maintaining contact with academic staff and keeping track of submission due dates and general information (ibid).

The student population's growing diversity needs universities that evolve and perform methods that highlight students' engagement and empowerment, but also those particular to various learner group types. The current study explores how student engagement can be promoted via an apparent explanation of students' expectations, experiences, and reflections during their first academic year in a UK HEI. As Harvey et al. (2006) stated, '*there is no first year experience; there is a variety of first year experiences*'. Having discussed the general key issues that are related to student retention, the author continues the current study's literature review by presenting a discussion about specific issues that are associated to UK Higher Education.

2.5 Supporting Student Retention and Transition to UK Higher Education

The link between successful student retention and transition that prevails in all bibliography revealed a tendency to a technique to transition support based on a deficit model. It addresses the necessities incorporated by students 'at risk' and/or focuses on the issues related to the university environment adaptation (Harvey et al., 2006). The students 'at risk' are usually considered to be non-traditional students as in prior-educational experience or context and/or socio-economic background. Nevertheless, if the successful retention/transition concept is examined according to empowerment and engagement of all students, then a change to a model that focuses on 'enhancement' is necessary. Such a model should measure and be based on students' acquired knowledge, skills, and strength regardless of learner profile.

In case both social and academic integration fails, retention shall not only be examined as in student drop out, but also based on the student personal and intellectual goals. Lowe and Cook (2003) mentioned that a significant number of students who do not drop out may finish their studies, but it is possible that they may have under-performed as a result of disengagement from university social activities and educational mechanisms. As Lowe and Cook (2003) stated: *'It is those students who struggle quietly with the changes involved in entering higher education who present the biggest and subtlest challenges for universities'* (Lowe & Cook, 2003). These researchers identified that an inadequate preparation for higher education from earlier educational experiences was a main reason that lead to this disengagement. Furthermore, they identified that many teaching staff have not changed their teaching and learning methods in order to emphasize the importance of self-directed enquiry or skills development (Katanis, 2000; Lowe & Cook, 2003; Krause, 2005). According to the literature review on the first year experience, so far, the following aspects of effective retention and transition are highlighted:

- Effective personal tutoring systems (Thomas & Hixenbaugh, 2006; Thomas, 2012).
- Peer support networks (McInnis et al., 1995).
- Recognising induction-students' diverse needs (Whittaker, 2008).
- Integrating support within curriculum delivery and design (McInnis, 2001).
- Considering induction as a long-term mechanism instead of just an event (Thomas & Hixenbaugh, 2006; Thomas, 2012).
- Emphasise on team-working development from early stages in order to promote social integration as part of an academic framework (Whittaker, 2008).

- Student-collaboration aids them to develop and enable transferable skills that can enhance learners' efficiency within a university context (Thomas & Hixenbaugh, 2006; Thomas, 2012).
- Common awareness and clear sharing of anticipations by teaching staff and students (McInnis, 2001; Whittaker, 2008).

In the subsequent sections is presented a review of support services through the use of social networks and through programme delivery and curriculum design.

2.5.1 Retention and Transition Support Services

Support services have to be 'normalised' and visible in order to be accessible to all students as an element of their normal experience, instead of being viewed as a reaction to crisis or failure situations. In addition, visible notifications of this support at certain periods of the academic semester through planners, student logs, seminars and lectures or Virtual Learning Environments, could improve learning support (Toman & Caldwell, 2006). These actions could also activate early-intervention and enhanced communication before a problem evolves into a critical situation. Furthermore, it is critical to accept that early-intervention might not certainly provide a sufficient solution to a first year student whose experience is considered problematic (Whittaker, 2008). In general, as presented in the previous section, there are many variables regarding student attitude and experience that are beyond university control. However, early-intervention could offer improved and successful engagement.

Katanis (2000) argued that students who are actively involved in learning communities via social networks growth, outside and within classes, is a highly successful strategy in order to facilitate social and academic retention. The implementation of peer support and learning communities is gradually empowered via VLEs and the promotion of virtual learning communities (Creanor et al., 2006) and the development of virtual communities such as VLEs (Krause, 2005; Krause & Coates, 2008).

Retention and transition support is to a greater extent being tackled within programme delivery and curriculum design. Social and academic integration are defined via a more holistic, long-term approach in relation to induction that leads to an increased adoption of discovery and enquiry, and small-group and team working (Whittaker, 2008). Good practice is usually addressed through the learning strategies integration, personal development, information literacy and study skills included in subject-based modules (Krause & Coates, 2008). In addition, group activity to empower student and staff interaction is an important approach in order to support academic retention and transition (Krause, 2005).

In addition to the aforementioned retention and transition support approaches the literature review has also identified that the need for cross-institutional working and improved communication needs should be improved. Student and admissions services, IT support staff, library staff, academic staff and student association representatives are required to operate collaboratively in order to offer a thorough induction into higher education (Campbell, 2007; Krause & Coates, 2008).

A number of approaches highlighted via the author's internet research and literature review endorse the empowerment and engagement of students in different phases of the transition/retention period, from pre-entry until the end of the first academic year (Whittaker, 2008). In the following section a list of successful approaches developed in order to support student retention and transition are provided.

- **Co-ordinated approach to university transition methods.** In 2003, Krause produced a model that maps how first year student support actions developed in Australia (Krause, 2003). It is a continuum model that was also cited in Quality Assurance Agency (QAA) for Higher Education 'Responding to Student Needs' student feedback and evaluation toolkit (QAA, 2005; QAA, 2012). The induction process included in the QAA's report addressed a series of case studies regarding co-ordinated institutional strategies in order to support retention/transition. In 2007, Campbell and Morrison employed Krause's framework in order to develop a method that could identify the importance of an integrated strategic approach to induction (Campbell & Morrison, 2007). Furthermore, they also wanted to define how the process of change continues. In this model, these researchers addressed the need for an 'institutional' induction and first-year actions in order to invigilate and review activities incorporated in an institution and promote 'good practice' sharing (Campbell & Morrison, 2007). In addition, Campbell and Morrison (2007) suggested that transition/retention programmes should be part of a common university-policy. Similar strategies have been established in other UK HEIs such as University of Teeside, University of Ulster and University of Strathclyde (Whittaker, 2008).
- **Pre-entry support.** This approach informs students about university preparation issues and expectations and offers them informed choices. Students feel it is very important that they can have the opportunity to compare courses based on realistic information before making their final course choice. UK HEIs have a responsibility to support students to make informed choices in order to reduce the likelihood of drop out or course changes during their academic studies. The introduction of the Key Information Set (KIS) in 2012 was intended to help students compare courses based on key pieces of information, supporting students to make informed choices and raising standards in the sector. However, the information in KIS about

student experience is limited (Unistats, 2014). Students can access student satisfaction scores from National Student Survey (NSS) but they do not have the opportunity to compare differences in academic experience. KIS only relates academic experience to students' supervised/unsupervised study hours and placements, and does not include information on total workload and particular course delivery methods for example. However, students are still unclear on what exactly they are going to be doing at university and are not therefore as prepared as they could be for their university studies.

- **Longitudinal approach to induction.** It includes orientation that focuses on social integration and information provision in order to prevent overload.

  Universities increasingly use the induction period as a method that initiates before entering university and is not completed before the student is integrated into the higher education environment (Campbell, 2006). Usually, a university's initial period orientation processes are concentrated on 'promoting friendship relationships' and 'induction activities' instead of providing students with a large amount of information. These processes may involve lab-group and small-group challenges, quizzes and 'treasure hunt' style activities that help students to learn more about the university campus. A longitudinal approach can aid first year students to engage in a process of adaptation and continuous change during the first academic semester and indeed in the first year. It is also recognised that what students need in terms of support will change accordingly.

  Information provision related to an extended or long-term approach to student-induction is a way to provide information on a more regular basis in order to prevent information overload (Whittaker, 2008). In 2012, QAA highlighted the significance of staging the information provision in ways that are suitable to students' needs (QAA, 2012). University of the Highlands and the Islands, for instance, has been working on a 'timeline' that defines all information that is necessary and when it should be available to students. In addition, information has to be accessible to students through personal-contact sessions and a series of formats such as paper-based, web-based (Campbell, 2006).

- **Social integration.** This includes a focus on peer support networks. As discussed in previous sections, social integration is characterised as significant in supporting transition/retention, as well as to promote student empowerment and engagement (Tinto, 1993). In general, UK HEIs have supported a number of approaches in order to engage students in advance via social and academic activities. This can help them to integrate with fellow students and into university life. In the literature it has been stressed that there should be a focus on establishing supportive peer groups as a method to enhance the first year students experience in the initial phases of the transition/retention process (McInnis et al., 1995; Yorke & Longden, 2007). But developing a sense of belonging in these groups it has become gradually challenging due to increased size of classes increase and student numbers, and as course-programmes follow a more multidisciplinary character. This means that such programmes have no consistent student group or single departmental home, and as such, this can be a very disengaging experience (Peat, Dalziel & Grant, 2001).

  Social integration is also promoted through e-learning approaches. For this purpose, the pedagogy strand of JISC e-learning Development Programme funded the Learner's Experience of e-Learning (LEX) research project. The aim was to investigate students' expectation and experiences of e-learning throughout a wide range of higher, further, community, adult and work-based learning education (Creanor et al., 2006). The results of this study showed how important networking skills are in order for a student to be an effective (e-)learner, as well as the use of technology towards accessing e-learning facilities.
- **Progressive skills development and Personal Development Planning (PDP).** This is implemented via support services and programme modules. Continuous study skills can be added into the programme or offered via tutorials or workshops that are coordinated with important periods such as first examination, first assignment or first feedback (Miller et al., 2008). Two good cases of central support that is available to students and offers close cooperation between teaching staff and learning support are: The Effective Learning Service at GCU that provides one to one workshops and tutorial support, and the Centre for Teaching, Learning and Assessment at the University of Edinburgh that provides procrastination workshops and other resources workshops (Whittaker, 2008). Embedding skills development into PDP is a commonly used approach by a number of universities. This promotes a diagnostic method in order to determine areas for additional development in the early stages of the programme (Miller et al., 2008). The challenging part is to employ as many as possible features of a student's programme in the PDP mechanism.

- **Learning, teaching and assessment strategies.** This approach helps first-year students to successfully adapt to the university experience. Additionally, this approach assists them to incorporate empowerment and engagement, which is as key factor of teaching staff. Specifically, it promotes:
    - The provision of an inspiring learning environment via a series of various teaching, assessment and learning approaches and mechanisms,
    - The levels and nature of teaching staff interaction with students, and
    - Comprehending the issues that first-year students have during the transition process period (Whittaker, 2008).

  The most significant factors in order to provide students with a stimulating, engaging, and motivating learning experience involve: peer support or enquiry in dealing with assessment tasks, for instance, written assignments; increased small-group working; increased application of peer-assessment and self-assessment in order to promote student responsibility about their learning process; and finally, increased application of formative assessments in order to offer constant feedback regarding student development (Bovill, Mors & Bulley, 2008).

- **Pro-active student support.** This approach enhances a student sense of belonging. In 2006, Thomas and Hixenbaugh argued that due to the higher education expansion and the depersonalisation of the educational experience in many institutions, the challenge for constant development in terms of students' sense of belonging has expanded (Thomas & Hixenbaugh, 2006; Thomas, 2012). In addition, they mentioned that personal tutoring may be a key factor that could guide students to develop stronger connections with the academic staff and peers in the university context. They also stated that students who are not confident to contact their personal tutors could be benefited though a system that is more structured, proactive and with more prioritized relationships (Thomas & Hixenbaugh, 2006; Thomas, 2012). Group models are constantly being employed as a result of resourcing issues. Furthermore, these models offer the benefit of enabling students to get to know each other and their tutors, and as a result promote social integration (ibid).

- **Student control and choice.** Student development is achieved by promoting students to control elements of their university experience (Whittaker, 2008). This could be generated by enabling student participation in decision-making and to alter curriculum structure via:
    - Engagement in team-working and problem-solving that influences them to implement and formulate approaches in order to accomplish a series of goals,
    - Involving in extra-curricular activities that are student-driven instead of institution-driven, and
    - Initiatives like staff-student committees and student representative panels (Krause, 2003).

  Genuine partnership and dialogue between student-associations and university leaders are critical for accomplishing critical priorities, such as the direct engagement of student-representatives in student recruitment, retention and transition. Finally, students must realise that they have their own role in ensuring successful transition and subsequently be actively encouraged to act as 'co-producers' of the university experience rather than just be 'consumers' (Whittaker, 2008).

Students who can take control and make choices were key deductions derived though Creanor et al's (2006) LEX research project. Learning that is enhanced via technology empowered students to have better control of their study, personalisation of their physical and virtual environments, the technology types they used, and their learning activities approach (ibid). Students highlighted that it was important to have control of their learning environment. It was also identified that a stronger sense of ownership of the learning process leads to higher engagement and motivation (ibid). In addition, the development of learning communities and friendship networks also empowered students' sense of control and self-worth, which are essential pre-conditions for enhancement (ibid).

2.6 Overview of Student Retention and Transition to UK Higher Education

Student retention and transition in first year students requires not only support via coordinated and strategic approaches by UK HEIs, but also support during the pre-entry university period, which extends during the first semester, as well as the first academic year. Appraisal of the effect of transition supportive techniques should be quantitative and qualitative, as well as measured in relation to student retention and student achievement.

Transition and retention support need to be related to institutions' processes, but should also be integral to students' learning experience. Therefore, efficient techniques and approaches that support retention and transition are based on the pro-active engagement of academic staff and should to be included in institutional programmes in relation to learning, teaching and assessment approaches.

Approaches that support retention and transition aid UK HEIs readiness and ease of, academic and social, integration within the university environment. Furthermore, these approaches help promote the development of independent learning. The literature review has shown that most of the research done on first year transition has been based on student retention issues. Therefore, these are related to the effects of the increasing diversity of the student population and the learning and teaching experience of mass higher education system.

In the subsequent sections the author reviews the most cited studies, so far, that tested Tinto's model using SEM. The information is presented in two separate sections with the first one focusing on studies conducted in US HEIs and the second one in UK HEIs. The purpose of the following sections is to provide comparative context between the most cited studies that followed a similar approach and the current one.

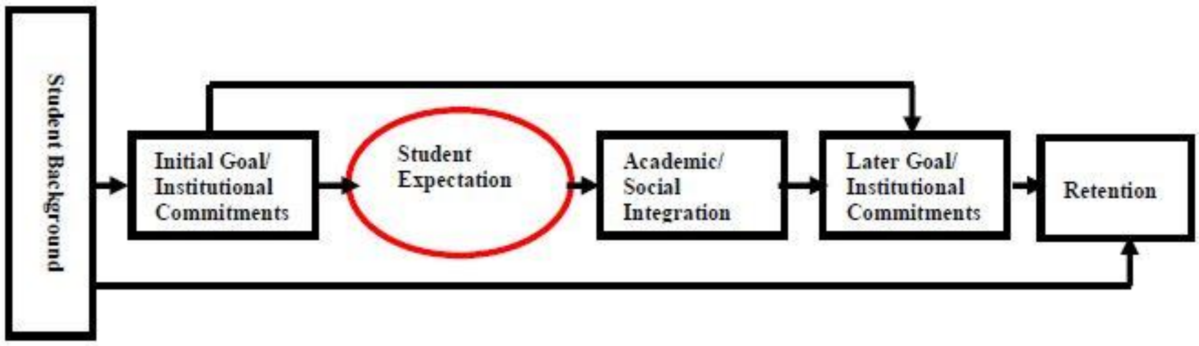
2.7 Structural Equation Modelling Studies

2.7.1 Non-UK Studies Testing Tinto's Model using Structural Equation Modelling

In this section the author presents a list of the most cited studies that tested Tinto's (1993) model using SEM in US HEIs. The subsequent studies are presented in chronological order as follows:

Braxton, Vesper, and Hossler (1995): Another study that evaluated Tinto's (1993) model using SEM was conducted by Braxton, Vesper, and Hossler, in 1995. Specifically, these researchers evaluated Tinto's (1993) model by adding one more item: students' expectation for the institution attended. According to Tinto (1993), students enter university with expectations. In case their expectations are covered, then students appear more eager to integrate into the institution's academic and social communities. As a result, the aforementioned researchers decided to add an expectation item between 'initial goal/institutional commitments' and 'academic and social integration' in Tinto's (1993) model (see Figure 2.7).

Figure 2.7: Braxton, Vesper, and Hossler's item (Braxton, Vesper, & Hossler, 1995)



The data collection process included two questionnaires completed by 263 first year students who entered four year US universities and colleges. With the first questionnaire the researchers obtained data from students while they were in high school. The aim was to gather data related to students' initial commitments and their background characteristics. The second questionnaire was used in order to evaluate students' expectations from university, their commitments and integration, as well as their intention to persist and continue with their studies as second year students. This questionnaire was conducted during the second semester. Similarly to the previous study, in Braxton, Vesper, and Hossler's study, Tinto's (1993) model constructs measurement was based on the application of Pascarella and Terenzini's (1980) scales. Moreover, student retention was defined through the participant students' intention to persist or not.

The data analysis was conducted using SEM and the outcomes revealed that the model interpreted a variance of 23 percent regarding students' persistence. Moreover, Tinto's (1993) model expressed good data fit. Most of the statistics indicating the model's fit were found to be within the acceptable values.

The background characteristics variables expressed significant effects on initial commitments, while only students' parental social and economic background positively affected initial goal commitments. On the other hand, initial goal commitments did not indicate any indirect or direct impact on social or academic integration. Despite that, students' initial institutional commitments did express indirect effects on academic and social integration. Furthermore, initial goal commitments did not express any impact on later goal commitments. Antithetically, initial institutional commitments revealed direct and indirect effects on later institutional commitment.

The participant students' academic integration indicated a direct positive impact on later goal and institutional commitments. Nevertheless, social integration showed a positive direct impact only on later institutional commitments. Finally, later commitments revealed positive prediction on students' intention to persist.

Concerning student expectations effects, the outcomes predicted that students, whose aspirations for university were covered, appeared to easier integrate into social and academic communities. Nevertheless, these researchers' study involved two restraints: firstly, retention was not directly measured, and secondly, students' grades from high school were not contained in the model.

Braxton, Sullivan, and Johnson (1997): In 1997, Braxton, Sullivan, and Johnson developed fifteen items that were based on Tinto's theory (1993). These items are presented In Table 2.2.

Table 2.2: Braxton, Sullivan, and Johnson's items (Braxton, Sullivan, & Johnson, 1997)

1. Student entry characteristics affect the level of initial commitment to the institution.
2. Student entry characteristics affect the level of initial commitment to the goal of graduating from college
3. Student entry characteristics directly affect the student's likelihood of persistence in college.
4. Initial commitment to the goal of graduating from college affects the levels of academic integration.
5. Initial commitment to the goal of graduating from college affects the levels of social integration.
6. Initial commitment to the institution affects the level of social integration
7. Initial commitment to the institution affects the level of academic integration
8. The greater the level of academic integration, the greater the level of subsequent commitment to the goal of graduating from college.
9. The greater the level of social integration, the greater the level of subsequent commitment to the institution.
10. The initial level of institutional commitment affects the subsequent level of institutional commitment.
11. The initial level of commitment to the goal of graduating from college affects the subsequent level of commitment to the goal of college graduating.
12. The greater the level of subsequent commitment to the goal of college graduation, the greater the likelihood of student persistence in college.
13. The greater the level of subsequent commitment to the institution, the greater the likelihood of student persistence in college.
14. A high level of commitment to the goal of graduation from college compensates for a low level of commitment to the institution, and vice versa, in influencing student persistence in college.
15. A high level of academic integration compensates for a low level of social integration, and vice versa, in influencing student persistence in college.

Braxton, Sullivan, and Johnson (1997) categorised those items into: primary and secondary. In particular, 1 to 13 were characterised as primary due to their relation in accounting student departure decisions. Items 14 and 15 were characterised secondary due to their intersection with Tinto's theory constructs. Furthermore, items 3, 12, and 13 of the 13 primary items were classified as essential to Tinto' theory as they expressed a direct impact on decisions related to student. Items 8 and 9 had the same classification due to interactions between students and university social systems that were found to be critical in defining student retention.

In addition, Braxton, Sullivan, and Johnson (1997) analysed previously conducted peer reviewed studies that employed Tinto's (1993) model theory in order to define items that were supported by empirical studies. These studies took place at multiple or single institutions. The analysis methods applied were multivariate statistical approaches such as SEM, path analysis, or logistic regression. These approaches were used because they help indicate independent and non-independent effects of every item beyond the effects of other constructs.

The researchers' classification was based on five categories that were used to support every item. These five categories were: strong, moderate, weak indeterminate, and no support. Specifically, an item was considered strong when one or more of the previously mentioned test-approaches would give 66 percent or more. Similarly, when the outcome was between 34 and 65 percent then the item it was considered moderate. On the other hand, the item was characterised as weak when the result was 33 percent or less. Continuously, an item was considered indeterminate when a single test was conducted, regardless whether the outcomes were statistically significant or not. Finally, in these researchers' study when two or more tests were identified to be statistically non-significant, then the item was characterised as 'no support'.

This study's results revealed that two primary items from Table 2.2, 10 and 11, were supported by multiple and single institutions tests. Moreover, two other items, 2 and 12, where by multiple institutional tests, whereas 1, 9, 13, 14, and 15 were supported by single institutional test. This study was continued in 2005 by Braxton and Lee's study, which is presented in the following case study.

Braxton and Lee (2005): Based on the previous research Braxton and Lee tried to define which items were 'reliable knowledge' supported. Specifically, 'reliable knowledge' is described 'as the consistency in variables measurement and replication studies results' (Braxton, Sullivan, & Johnson, 1997). The researchers used a regulator of ten or more tests for every item as a filter to define authenticity. Additionally, they recommended seven out of the ten tests to produce a similar outcome for acquiring 'reliable knowledge'.

For their study the used multivariate statistical procedures as SEM, path analysis and logistic regression because these research tools helped them define the effects of the items studied. Furthermore, due to student retention process may differ in different types of institution (Braxton, Hirschy, & McClendon, 2004), the researchers reviewed similar studies administered in various universities. They excluded, though, studies administered in two-year institutions due to "*the indeterminate nature of empirical research testing Tinto's proportions in this institutional setting*" (ibid). Moreover, these researchers used studies that were administered at individual universities as Tinto's model can predict student retention in a given institution and not in system of models of departure (Tinto, 1993).

The outcomes of the study showed that only three items, 9, 10, and 13, passed the threshold and as a result were supported. The remaining items did not meet the standard of ten tests that would confirm reliability.

In the subsequent section the author's interest focuses on the only study conducted in the UK that followed a similar research approach with the current study, which is testing Tinto's model using SEM.

2.7.2 UK Studies Testing Tinto's Model using Structural Equation Modelling

So far, there was only a single study that evaluated Tinto's model predictive validity at UK Higher Education. In 2000, Brunsden, Davies, Shevlin, and Bracken (2000) administered a research on two different courses: a) a Bachelor course in Computer Studies at an English HEI and b) a Bachelor course in Psychology at a Scottish HEI. The data collection included 264 first year students who were asked to complete a questionnaire that was released early after their enrolment. The purpose of this process was to gather information related to students' background characteristics, evaluate their initial goal and later commitments, as well as collect data regarding their academic and social integration. In particular, student characteristics involved gender, self-esteem and personality, A-level scores, life-satisfaction, and an item that measured if the participant student was the first member of her/his family to enter a HEI. The researchers used the following evaluation constructs:

Academic integration:

1) Do you prefer to rely on handouts or on the notes you take yourself? and
2) On your course, what do you expect the percentage split to be between self-directed study and taught input? (Brunsden, Davies, Shevlin, & Bracken, 2000)

Social integration:

1) Do you prefer to study alone or as part of a group? and
2) Do you prefer to be assessed individually or as part of a group? (ibid)

Initial goal commitment:

1) How sure are you that you made the right choice in attending this university? And
2) How satisfied do you think you will be with the final outcome of your degree course? (ibid)

Initial institutional commitment:

1) Was the degree subject that you are currently studying your first choice? (ibid)

Student retention was determined based on whether a student re-enrolled or persisted on the course, or not, with these data gathered at the end of the first academic year. The data analysis was conducted by employing SEM. The goodness of fit indices revealed to the researchers that this model did not offer an acceptable data interpretation. As a result, the researchers noted that Tinto's model might not be the most suitable in order to predict student retention.

Nevertheless, the outcomes should be explained with caution due to two important limitations. A first limitation was that academic and social integration data were gathered only in the first two weeks of the course. Inevitably, there were certain integration levels that were not included. A second limitation was that later goal and institutional commitments were not measured. Lastly, SEM was applied with a small sample of 264 participant students. As Hair et al. (1998) indicated this method necessitates a large sample in order to yield reliable parameter estimates.

A number of points can be addressed regarding the methodology applied in the aforementioned studies. First of all, all studies evaluated Tinto's model in first year students and used Pascarella and Terenzini (1980) scales in order to measure Tinto's model constructs. Secondly, it appears that the path analysis and SEM are good methods to evaluate Tinto's model because they allow testing relationships among the model's constructs, as well as permitting the use of multiple measures to represent constructs. Nevertheless, SEM could be considered more beneficial than path analysis due to its ability to estimate specification and measurement errors, while path analysis ignores both. Also, not taking into account these errors may lead to systematic bias in parameter estimates (Hair et al., 1998).

Finally, as it can be seen in all previous studies, there is a wide variety of how researchers can evaluate Tinto's model in universities. For instance, a researcher may choose to evaluate the whole model, while another may decide to evaluate it by adding other constructs. Additionally, one researcher may just evaluate parts of the model, or test these parts through the addition of other constructs.

In summary, the following conclusions could be made in relation to Tinto's model. To begin with, it seems that Tinto's model can offer a reasonable predictive validity towards the explanation of variance in student retention. Secondly, students' background characteristics have an indirect influence on student retention, but also affected by their level of academic and social integration. Thirdly, it seems that students' later commitments and integration (academic and social) are more critical in predicting student retention than students' initial commitments and background characteristics. As a fourth conclusion, academic and social integration appear to be the most critical predictors that can aid in predicting student retention. Furthermore, there are differences related to students' gender. In particular, social integration appears to be a stronger retention predictor for females, while academic integration appears to be stronger for males. The fifth, and final conclusion, is related to later goal and institutional commitments. They seem to be the most critical student retention predictors amongst Tinto's model constructs.

2.8 Conclusion

Mass higher education continuously changes the character of the university experience. Therefore, the increasing heterogeneity of the student population related to the mass experience of being a first year student affects all students, either traditional or not. Furthermore, the integrated applications of technology for social and academic reasons, as well as the technologically-enhanced learning, have also affected the student experience.

Student diversity in university learning communities has a significant matter in the current thesis and is a crucial theme for a successful retention support. The depersonalisation of students, which includes various groups of learners, pre-educational experience, attitudes to motivational and learning levels, and work and personal circumstances, necessitate a flexible support system and a range of approaches. The answer on what could be an adequate resolution to issues related with retention is contingent on the character of a particular learning community (i.e. a particular student group, in a particular programme, in a particular university).

Institutions' support and academic services that design and operate transition and retention approaches need to have a clear comprehension of factors that may impact different learning communities. UK HEIs need identify, analyse and comprehend students' patterns of behaviour in terms of progression and retention, across faculties, schools and departments, in order to develop and apply appropriate strategies. One-fold solutions focused on specific student types are not adequate. This seems to evolve critically, while students' diversity increases.

Effective approaches to improve student retention support, and consequently student transition, might as well require pedagogical, philosophical and cultural and alterations in relation to the purpose and character of first year students. Provided that the aim of the first year of university is to promote student engagement and enhance students with the necessary skills for successful undergraduate studies, a first year reshape might also be required. Such an effort, though, is out of scope of the current study.

As the literature review has shown, a great deal of research remains to be done on the performance of student retention programmes in UK HEIs, especially via the learning community lens. The current research is designed to provide a level of explanation as to the conditions that can help students succeed in the environments presented in the literature. The manner in which this research occurred is described in the following chapter.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In this chapter an analysis of the research design and methodology is presented. The following section starts by presenting the research paradigm employed in the current study, and then continues by describing the research methodology, as well as the theoretical framework and the quantitative and qualitative approaches applied.

3.2 Research Paradigm

Prior to the selection of an appropriate research methodology, the author selects an appropriate paradigm for the current study. The research paradigm, that a researcher chooses to follow, influences each research step, from the decision of the research problem to be investigated, to data analysis and interpretation (Johnson & Onwuegbuzie, 2004; Mertens, 2014). A research paradigm can be characterised as a '*fundamental set of assumptions or benefits that direct a research process'* (Creswell, 1998, p. 74). In social sciences there is a range of paradigms that express variations in their underpinning philosophical hypotheses. Therefore, before a researcher defines an appropriate research paradigm it is important to study its philosophical assumptions and clarify that it is suitable for his/her research. So far, there are three main philosophical assumptions: methodology, epistemology, and ontology (Guba & Lincoln, 1994; Koulaidis & Ogborn, 1995; Myers & Avison, 1997; Newman, 1998; Creswell, 2013). Methodology refers to research methods or techniques used in order to obtain knowledge (Newman, 1998). Epistemology describes the kind of relationship between the knower and what can be known. Finally, ontology indicates the type of reality and what can be known about it (Bunge, 1977). In the subsequent paragraph the author presents the paradigm applied in the current study and justifies why it is followed.

3.2.1 Pragmatist Paradigm

In the social sciences, there have been many efforts to create a common ground between constructivism and positivism (Rescher, 1977). In 1988, Howe suggests the application of a new paradigm that was titled as 'pragmatism' in order to counter the link between method and epistemology (Howe, 1988). He stated that the pragmatism concept considers that qualitative and quantitative methods are compatible (Howe, 1988). Researchers employing pragmatism believe that the research question is more crucial than either the paradigmatic assumption, which underpin the research method, or the methodology approach (Tashakkori & Teddlie, 1998; Tashakkori & Teddlie, 2010). Furthermore, they consider that qualitative and quantitative methods are both beneficial. As Tashakkori and Teddlie (1998, p. 24) stated '*decisions regarding the use of either qualitative or quantitative methods, or both, depend upon the research question'*. A pragmatist can be both subjective and objective in terms of his/her epistemological position. Again, as Tashakkori and Teddlie (1998, p. 26) stated '*at some points the knower and known must be interactive, while at others, one may more easily stand apart from what one is studying*'. A pragmatist complies with a positivist in the opinion that there is an external reality, but a pragmatist argues that there must be some absolute reality or truth (Tashakkori & Teddlie, 1998; Creswell, 2013). As a result, the use of this paradigm is in accordance with the current study, as the author applies both quantitative and qualitative methods.

3.3 Research Methodology

According to Sarantakos (1998, p. 32), research methodology involves theoretical principles and a framework, which offers instructions regarding research process in particular paradigm' context. In general, three different approaches can be found that guide data collection in any research. These are: quantitative, qualitative, and mixed methods approaches (Tashakkori & Teddlie, 2010; Creswell, 2013). Before describing and justifying the research methodology followed in the current study the author presents its characteristics and possible application.

3.3.1 Mixed Methods Approach

Mixed-methods approach is characterised as the combination of a quantitative and a qualitative method. Creswell (2013) stated that the concept of combining dissimilar approaches is possibly introduced in 1959 by Campbell and Fiske. Campbell and Fiske employed numerous methods in order to investigate the psychological traits efficacy (Campbell & Fiske, 1959; Creswell, 2013). Their approach incorporated a number of terms such as convergent validation, convergent methodology, mutlitrait – multimethod matrix, integration, synthesis, triangulation, and quantitative and qualitative methods (Campbell & Fiske, 1959; Creswell, 2013). However, later on, researchers started using the term mixed-methods (Creswell, 2013).

Due to the many variations of mixed methods studies and the different terms used for this approach, there is a debate amongst researchers regarding its precise definition (Greene et al., 1989; Johnson et al., 2007; Creswell, 2013). Some of them give emphasis on the philosophical assumptions, while some other researchers focus on the data collection and analysis methods/techniques (ibid). Nevertheless, so far, the most widely accepted definition, which is also adopted in the current study, has been stated by Creswell (Creswell, 2013). He defines mixed-methods approach through a broad definition that focuses on the philosophical methods and assumptions. Specifically, he defines mixed-methods approach as:

'*An approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks. The core assumption of this form of inquiry is that the combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone.* '(Creswell, 2013, p. 4)

The mixed-methods approach has one main goal, which is to get benefited by the advantages and to lessen the flaws of both quantitative and qualitative approaches (Johnson et al., 2007). In general, there are five major rationales or purposes in order to conduct the mixed-methods approach: (1) triangulation, (for instance, trying to corroborate and converge results from different designs and methods of investigating the same phenomenon); (2) complementarily, (for instance, trying to enhance, illustrate, elaborate, and clarify one method's results with results from another method); (3) initiation, (for instance, discovering contradiction and paradoxes, which lead to the review of the research question); (4) development, (for instance, applying findings from one method in order to help inform another method); (5) expansion, (for instance, trying to expand the range and breadth of a research through the use of various methods in order to inquiry different components) (Greene et al., 1989; Johnson et al., 2007; Creswell, 2013). In the current study, the main reason for applying the mixed-methods approach is triangulation, in order to seek corroboration, convergence, as well as, analogy of outcomes from two dissimilar methods, by investigating identical phenomena.

Mixed-methods approach involves one main benefit. This is that includes both, quantitative and qualitative, methods. In particular, these methods have advantages and disadvantages, but the disadvantages of one can be compensated or remedied by the advantages of the other (Creswell, 2013). Furthermore, the mixed-methods approach can explain a wider and more extensive set of research questions (Johnson et al., 2007). In addition, the mixed-methods approach application can enhance the investigation and understanding of data, which could be ignored while using a single approach. Finally, it can be used to improve the ability of generalising a study's results (ibid). On the other hand, the application of mixed-methods approach might be proved to be time-consuming because it requires resources in order to gather and analyse data (quantitative and qualitative). Additionally, it necessitates that a researcher should be acquainted with the data collection and analysis techniques of both, quantitative and qualitative, methods (Creswell & Clark, 2007).

There are various strategies that can be applied in order to mix the aforementioned methods. In particular, Creswell (2013) proposed six techniques in order to combine quantitative and qualitative methods. These are depended on the following four factors: (i) the implementation sequence, (ii) priority, (iii) the integration stage of quantitative and qualitative data collection and analysis, and (iv) the role of theoretical perspective of the research study (ibid). Creswell's (2013) strategies are: (1) Sequential explanatory strategy, (2) Sequential exploratory strategy, (3) Sequential transformative strategy, (4) Concurrent triangulation strategy, (5) Concurrent nested strategy, and (6) Concurrent transformative strategy. In the current study the author decided to employ the concurrent triangulation strategy.

Having presented and analysed the approaches followed in this study, the author presents in the subsequent section an in-depth analysis and justification of the research tools used.

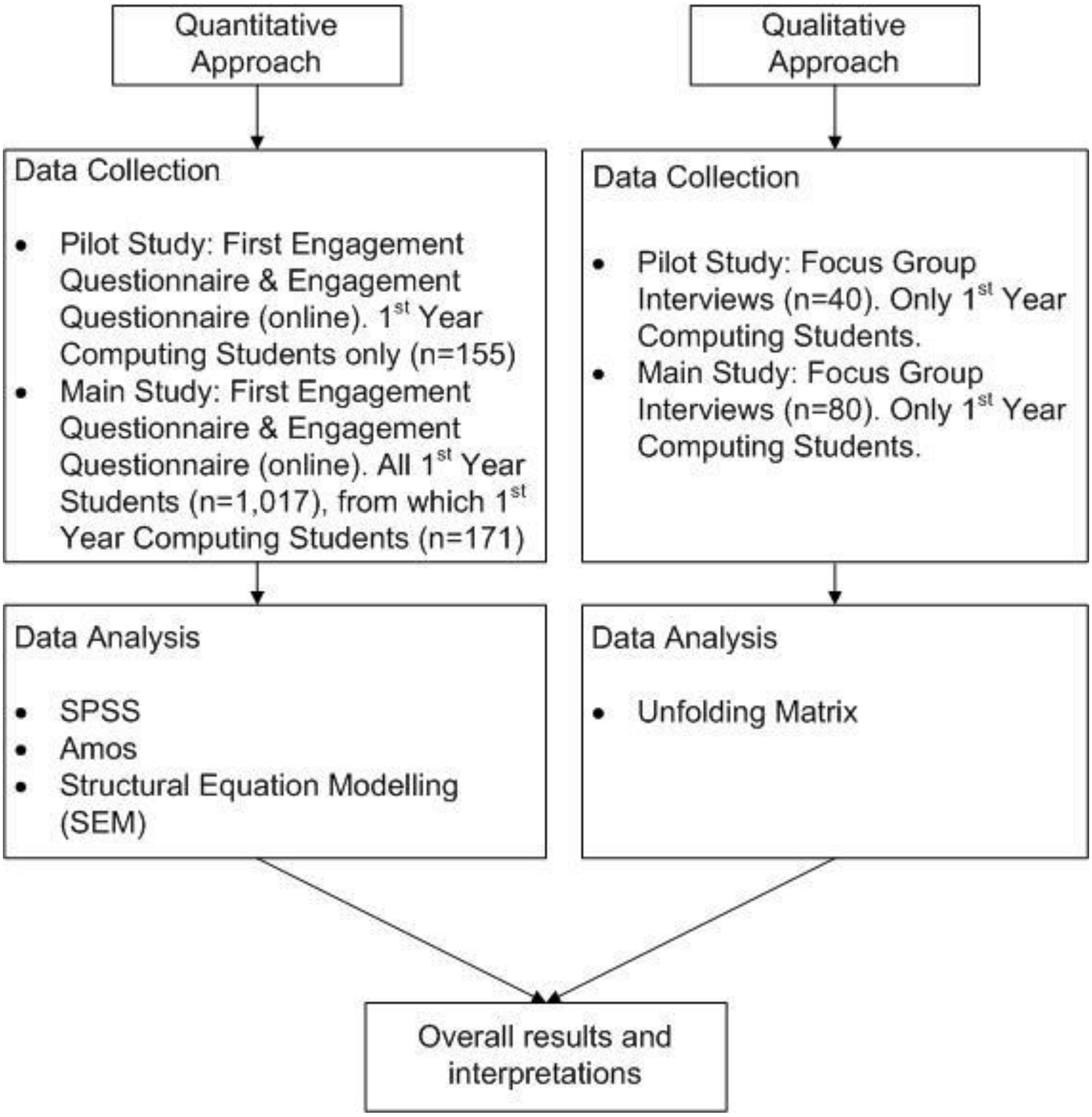
3.4 Research Design and Setting

In the current study the author chooses to use the mixed-methods approach. The choice of such an approach can be explained for a series of reasons. Firstly, the integration of quantitative and qualitative approaches can overwhelm the disadvantages and use the advantages of each approach. Secondly, the integration of quantitative and qualitative data can offer solid evidence for final outcomes. Thirdly, the data triangulation from separate approaches enhances the findings authenticity. A fourth, and final, reason is that the advantages of one approach can be applied in order to improve the disadvantages of another method.

An appropriate overall description of the research design followed in this study, based on Creswell's (2013) terminology, is titled as a mixed-methods approach and the strategy applied as concurrent-triangulation. Specifically, this indicates that the data collected through the quantitative and qualitative processes are gathered and analysed in a synchronous process. Also, the priority is equally given to quantitative and qualitative data forms, the analysis of data is conducted separately, and the integration of the data is developed at the data integration phase (Hanson et al., 2005, p. 229; Teddlie & Yu, 2007). As Creswell (2013) states, this approach is very common to researchers and can produce substantiated and strongly justified results. According to Morse's (2005) characters for mixed-methods strategies the research design of the current study would be described as: 'QUANtitative + QUALitative' strategy. In particular, the '+' symbol declares that both approaches are utilised concurrently, while the 'capitalisation' signifies that there is equal priority in-between the two approaches.

The aforementioned strategy has been preferred for two specific reasons. Firstly, it provides the opportunity for cross-validated, corroborated, and confirmed findings within a single study. Secondly, this strategy allows the researcher to collect data in a shorter time period, when in comparison to other mixed-methods strategies, such as the sequential strategy (Creswell & Clark, 2007). The mixed-methods concurrent triangulation strategy followed in this study is graphically represented in Figure 3.1, using the Creswell and Park's (2007) recommendation.

Figure 3. 1: Visual Diagram of the Mixed-Methods Concurrent Triangulation Strategy followed in the current study (Creswell & Clark, 2007)



The current study was conducted at a UK HEI, a medium size UK HEI. Specifically, its Department of Informatics is one of the 105 UK HEIs computing departments (TheCompleteUniversityGuide, 2015). The current study's UK HEI was selected as a case study because it is a typical medium ranged UK HEI with a medium number of first year computing student enrolments (ibid).

The strategy was initially tested with a Pilot Study that was conducted during the academic year 2013-2014. The quantitative data was collected from 155 out of ~300 first year students from the Department of Informatics of the university studied using two questionnaires, the ‘First Engagement Questionnaire’ and the ‘Engagement Questionnaire’ (see Appendix 3: First Engagement Questionnaire and Appendix 4: Engagement Questionnaire). The ‘First Engagement Questionnaire’ was conducted at the beginning of the first semester in order to collect information about all first year undergraduate students’ parental background education, pre-entry qualifications (A level scores, skills and abilities) and individual attributes (race, age, gender, nationality etc.) based on their student ID, as well as appraise their initial goals and institutional commitments. The ‘Engagement Questionnaire’ was developed in order to appraise students’ social and academic integration, as well as their later goals and institutional commitments. The questionnaires’ design method is thoroughly explained in Section 3.6.2. The platform used was Qualtrics an online questionnaire software and insight platform (Qualtrics, 2014). The questionnaires were distributed and administered by the university’s central services, specifically the strategic planning office; due to data confidentiality issues (see Appendix 1: Engagement Questionnaire Introduction and Appendix 2: Engagement Questionnaire Explanation). At the same period the qualitative data collection was conducted. Specifically, the process included 5 focus group interviews with 8 participants in each group (40 students in total).

In the academic year 2014-2015 the author conducted the main data collection of the study based on the Pilot Study successful results. In the academic year 2014-2015, there were 5,557 students enrolled at the first year undergraduate level, including 315 computing students. Specifically, the quantitative data were collected from 1,017 first year students from the current study’s UK HEI during the 2014-2015 academic year, including 171 computing students, using again the previously mentioned questionnaires. Again, the questionnaires were distributed and administered by the university’s central services, specifically the strategic planning office; due to data confidentiality issues (see Appendix 1: Engagement Questionnaire Introduction and Appendix 2: Engagement Questionnaire Explanation). At the same period a qualitative data collection was conducted only for first year computing students. The participant students were 80 in total and the author allocated them in groups of 10 in order to achieve fair numbers of group allocation. Furthermore, the author tried to keep a fair ratio of female/male students. Therefore, the process included 10 focus group interviews with 8 participants in each group.

In both cases, Pilot Study and main study, the author followed all necessary professional methods through a detailed informative consent form and a descriptive introduction before completing both the online 'First Engagement Questionnaire' and 'Engagement Questionnaire' (see Appendix 1: Engagement Questionnaire Introduction and Appendix 2: Engagement Questionnaire Explanation). The 'Engagement Questionnaire Introduction' and 'Engagement Questionnaire Explanation' was the author's effort to keep high research standards by covering all possible professional issues, such as Code of Conduct, Professional, Ethical, and Social issues, as well as the current study's UK HEI Terms and Conditions (see Appendix 8: PGR - Project ethical review form). Finally, the author issued the university with an 'Institutional Approval Form' following the Code of Conduct of a professional researcher (see Appendix 10: Institutional Approval Form).

The aim of the previously described setting was to collect information about all first year undergraduate students' parental background education, appraise students' social and academic integration, as well as their initial and later goals and institutional commitments. In particular, students' parental background education information, pre-entry qualifications, individual attributes (race, age, gender, nationality etc.), and retention status were identified by using their IDs, which were anonymised, and then made available to the author, by the university's administrative authorities (see Appendix 8 and 10 for permission evidence). Then, the first year undergraduate computing students' data were compared against every other department's first year students. Consequently, the analysed data were studied in order to identify similarities and differences in behavioural patterns that lead in potential reasons for student retention in first year undergraduate computing students. Behavioural patterns are identified by using student IDs (anonymised) in order to map factors for student retention.

Before the in-depth and breadth application analysis of the quantitative and qualitative pilot and main studies, the author provides the guiding qualitative theories. This emphasis is given due to the importance of the qualitative approach in the focus of the current study.

3.5 Guiding Qualitative Theories

The collected data analysis was guided by two different theories, phenomenology and ecological psychology. Phenomenology explains a given experience and aids towards defining it as what it is (Farber, 1943, p. 516; Husserl, 1970, 2012; Smith, 2007; Marshall & Rossman, 2014). In the current study, it was used in an effort to fully comprehend the learning community participation phenomena. Ecological psychology has particular focus on the interaction between a person and the environment (Barker, 1968). In this study it was used in order to comprehend how first year undergraduate computing students interact within the university environment. Both theories are analysed in depth in the sections that follow.

3.5.1 Phenomenology

Phenomenology is mainly concerned about making meaning from human experience (Farber, 1943, p. 516). Its main goal is to comprehend the intent and impact surrounding one's experience (Spiegelberg, 1960, 1981). Consequently, phenomenology was selected due to the researcher's interest in the participants' experiences while being part of a learning community during their first academic year. According to van Manen (1990, p. 9) phenomenology is described as a technique that "*aims at gaining a deeper understanding of the nature or meaning of our everyday experiences*". Furthermore, he mentioned that phenomenology must be applied in order to examine a past experience. Specifically, he noted that "*a person cannot reflect on lived experience while living the experience*", and that "*reflection on lived experience is always re-collective*" because it is reflection on experience that is already lived or passed through" (van Manen, 1990, p. 9).

In the late 19th and early 20th century, Husserl used phenomenology as a mean to study how experiences and things could be represented by people using their senses (Husserl, 1970, 2012). Husserl (1970, 2012) believed that people can only describe what they can touch, taste, see, hear, or feel. It was within these descriptions that interpretations of meaning could be made and applied within our individual realities (ibid). During the first half of the 20th century Schutz (1971, 2012) broadened these ideas, but due to the World War II outbreak he and other phenomenologists fled from Europe to the USA. Schutz's contributions to phenomenology incorporated taking subjective meanings of events and attributing them to the broader world, and he took the field very much into the area of sociology (ibid). Nowadays, the field of phenomenology is led by van Manen and involves the examination of the essence of experiences, from the point of view of those who lived through a given experience towards an effort to comprehend that experience, or phenomenon (van Manen, 1990). Alternatively, it theorises that there are experiences within a given phenomenon that are shared by all those going through the phenomena.

A critical aspect of applying phenomenology as a guiding theory is the notion of epoche. When a researcher starts to research (s)he generates a set of pre-conceived notions regarding the phenomena (s)he is going to investigate or the participants with whom (s)he will be interacting. The epoche concept includes dismissing biases, notions, beliefs, or judgments related to the phenomena examined or those experiencing the phenomena. As a result, it allows the examination of the phenomena without the imposition of the researcher's influence (ibid). Bracketing is better examined by the researcher through journaling about the population and the experience being investigated (Tufford & Newman, 2012). Through the elimination of pre-conceived thoughts, the researcher is then aware of possible biases and can operate to "*restrict*" them and get a clear picture of the phenomena.

3.5.2 Ecological Psychology

As it was previously mentioned, ecological psychology includes comprehending how an individual behaves, or interact, within her or his environment (Patton, 2014). Patton (2014) stated that the researchers who use ecological psychology as an analysis framework tend to focus on "*behaviour settings or particular constellations of things, places, and times that constitute a definitive environment*". Finally, an in-depth understanding of the ecology of an environment could aid to clarify the experiences sustained by those within a certain environment.

Schoggen (1989, pp. 2-3) defined that ecological psychology includes investigating the purposeful behaviours in which people engage while in the ecological environment. This environment includes specific sequences of people's behaviour that regularly occur with particular settings (Schoggen, 1989, pp. 2-3). The ecological environment when compared to the psychological environment is different. Specifically, the psychological environment relates to the manner in which people perceive environments and their interactions with those environments (Schoggen, 1989). On the other hand, the ecological environment is entirely concerned about how the environment itself affects behaviour. In addition, environments are generally outlined to extract specific behaviours, for instance people generally cook in kitchens and sleep in bedrooms. The ecological psychology is concerned about the manner in which spaces are or are not being utilised for their designed purposes. Furthermore, it is concerned about how those spaces permit or inhibit the behaviours they should invoke.

Within the context of the current study, the broad environment being examined was the university's campus. The current study's focus was centred on the specific behaviours engaged in by first year undergraduate computing students participating in learning communities, which includes campus processes, positive experiences that have contributed to success and learning, and obstructions encountered along the way. The qualitative analysis was guided by Padilla's (1991) navigation barriers notion, as well as Tinto's (1993) concept of getting integrated with the campus. These created an appropriate lens through which learning community participants' behaviour were investigated.

3.5.3 Mixing Phenomenology and Ecological Psychology

Using phenomenology and ecological psychology simultaneously allowed for the researcher to comprehend the psychological process used by successful students. Furthermore, it permitted the investigation of the interaction between the focus groups participants and the campus environment. Additionally, it offered the possibility to determine whether the campus environments were contributing to students' success or not. These ecological factors were examined within their own context as part of the 'unfolding matrix' process, while personal experiences and feelings were investigated via the use of the phenomenological lens. Mixing phenomenology and ecological psychology provided a more complete picture of the students' experiences.

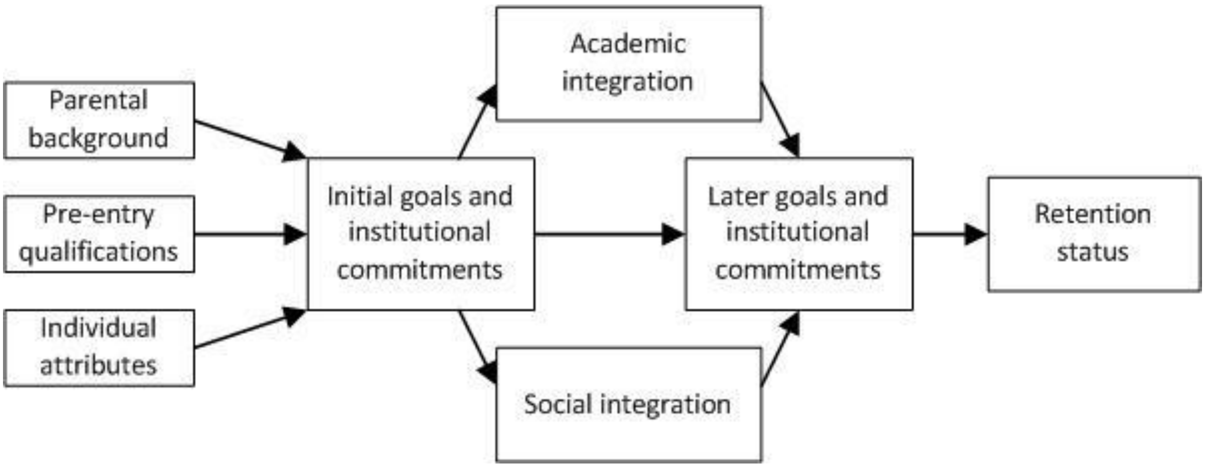
3.6 Quantitative Approach of the Current Study

3.6.1 Hypotheses and Model

Tinto’s model of 1993 (Tinto, 1993), indicated in Chapter Two, is a modification of his 1975 model (Tinto, 1975). The quantitative approach of the current study was directed by Tinto’s model (1993). Firstly, because Tinto’s (1975) original model was designed specifically to analyse student retention at four-year institutions, whilst the model modified in 1993 is developed to include other types of institution, such as two-year institutions (Tinto, 1993). The current investigation is conducted in a UK HEI that offers undergraduate academic studies for a period of three to four years. A four-year study period covers students who decide to follow a sandwich course, which includes a placement year. The second reason is that Tinto’s modified model (1993) considers the importance of finance in student retention, which is a matter that is relevant to the UK Higher Education (Brunsden et al., 2000; Whittaker, 2008).

The model used in the current study is presented in Figure 3.2, and is derived from Tinto’s (1993) ‘Model of Student Retention’. It has already been tested by researchers in similar studies (Braxton, Vesper & Hossler, 1995; Brunsden et al., 2000; Braxton & Lee, 2005). According to this model, parental background, pre-entry qualifications (A level scores, skills and abilities) and individual attributes (race, age, gender, nationality etc.) affect initial goals and institutional commitments. Initial goals and institutional commitments then affect academic and social integration (institutional experiences). These two types of integration, alongside initial goals and institutional commitments, have a direct effect on later goals and institutional commitments. Later goals and institutional commitments then have a direct effect on a student’s decision to drop out or persist with their studies.

Figure 3. 2: Initial Student Integration Model based on Tinto (1993)



Based on the 'Initial Student Integration Model' (see Figure 3.2), the subsequent list of hypotheses was developed (see Table 3.1):

Table 3.1: List of Hypotheses

1st **Hypothesis:** students' parental background will be associated with their initial goals and institutional commitments.
2nd **Hypothesis:** students' pre-entry qualifications (A levels score, skills and abilities) will be associated with their initial goals and institutional commitments.
3rd **Hypothesis:** students' individual attributes (race, age, gender, nationality etc.) will be associated with their initial goals and institutional commitments.
4th **Hypothesis:** students' initial goals and institutional commitments will be associated with their academic integration.
5th **Hypothesis:** students' initial goals and institutional commitments will be associated with their social integration.
6th **Hypothesis:** students' initial goals and institutional commitments will be associated with their later goals and commitments.
7th **Hypothesis:** students' academic integration will be associated with their later goals and institutional commitments.
8th **Hypothesis:** students' social integration will be associated with their later goals and institutional commitments.
9th **Hypothesis:** students' later goals and institutional commitments will be associated with their retention status.

3.6.2 Data Collection, Methods and Participants

The basic criterion to choose the main study's participants was to be first year undergraduate students of the university studied during the academic year 2014-2015. The main reason for selecting first year undergraduate students was because research has shown that the majority of students drop out in their first year (Astin 1993; Tinto, 1993; 1996; Johnson, 1994; Yorke, 1999; Blythman and Orr, 2003; Fitzgibbon & Prior, 2003; Pascarella & Terenzini, 2005; Yorke & Longden; 2008; Tinto, 2012). The potential first year student population was 5,557 from which 315 were computing students (see also Section 3.4).

The data was collected using two questionnaires. In both questionnaires the institutional integration scales items designed by Pascarella and Terenzini (1980) were applied in order to measure the four foundations of the current study. These foundations were initial goals and commitments, social integration, academic integration, and later goals and institutional commitments. The 'First Engagement Questionnaire' was focused on collecting information about students' initial goals and institutional commitments. The 'Engagement Questionnaire' included 29 items from the Institutional Integration Scales that measured students' 'academic and social integration', as well as 'later goals and institutional commitments'. The scales used a five-point Likert scale, ranging from strongly disagree, with a value of one, to strongly agree, with a value of five. Copies of both questionnaires are included in Appendix 3 (First Engagement Questionnaire) and Appendix 4 (Engagement Questionnaire).

Information such as first year undergraduate students' parental background education, pre-entry qualifications (A level scores, skills and abilities) and individual attributes (race, age, gender, nationality etc.), was collected based on their student identifier. All participant data was combined with their responses via the student identifier and this was then removed to anonymise responses before analysis. It also important to note that the author following the code of conduct before the start of any questionnaire administration, students were asked for consent in order to use information from their university records for the study's purpose (see Appendix 1: Engagement Questionnaire Introduction and Appendix 2: Engagement Questionnaire Explanation).

The process followed was the following. Before releasing the 'Engagement Questionnaire' an initial engagement questionnaire was developed to measure the variables. This was the 'First Engagement Questionnaire', which was developed in order to collect information about all first year undergraduate students' parental background education, pre-entry qualifications (A level scores, skills and abilities) and individual attributes (race, age, gender, nationality etc.) based on their student ID, as well as to assess their initial goals and institutional commitments. Specifically, students' parental background education, pre-entry qualifications, and individual attributes (race, age, gender, nationality etc.) information was identified by using their IDs, which were anonymised, and then made available to the author, by the university's administrative authorities. The 'First Engagement Questionnaire' was also accompanied by the introduction and explanation documents used for the 'Engagement Questionnaire' and student consent was requested.

In both questionnaires Pascarella and Terenzini's (1980) institutional integration scales were applied in order to evaluate the main constructs of the current study. These were: 1) initial goals and commitments (First Engagement Questionnaire), 2) social integration, 3) academic integration, and 4) later goals and institutional commitments (Engagement Questionnaire). The five-point Likert scale was employed to measure scales. Specifically, each scale ranged from 'strongly disagree' to 'strongly agree', with values from 1 to 5, respectively. These scales primarily consisted of 43 items, but the number of items was eventually reduced to 30. This occurred after Pascarella and Terenzini (1980) discovered that *'four of the items failed to load 0.35 or above on any of the five factors extracted based on the results of an exploratory principal components analysis with orthogonal rotation, such as varimax'*. Pascarella and Terenzini (1980) labelled the five scales as follows: (1) Peer-Group Interactions (7 items), (2) Interactions with Faculty (5 items), (3) Faculty Concern for Student Development and Teaching (5 items), (4) Academic and Intellectual Development (7 items), and (5) Institutional and Goal Commitments (6 items) (French & Oakes, 2004). In Table 3.2 are presented the scales' items.

Table 3.2: Institutional Integration Scales' Items (Pascarella and Terenzini, 1980, pp 66-67)

Scales	Items
Peer Group Interactions (7 items)	1. Since coming to this university, I have developed close personal relationships with other students. 6. The student friendships that I have developed at this university have been personally satisfying. 11. My interpersonal relationships with other students have had a positive influence on my personal growth, attitudes and values. 16. My interpersonal relationships with other students have had a positive influence on my intellectual growth and interest in ideas. 21. It has been difficult for me to meet and make friends with other students. 26. Few of the students I know would be willing to listen to me and help me if I had a personal problem. 29. Most students at this university have values and attitudes different to my own.
Interactions with Faculty (5 items)	2. My non-classroom interactions with faculty have had a positive influence on my personal growth, values and attitudes. 7. My non-classroom interactions with faculty have had a positive influence on my intellectual growth and interest in ideas. 12. My non-classroom interactions with faculty have had a positive influence on my career goals and aspirations. 17. Since coming to this university, I have developed a close, personal relationship with at least one faculty member. 22. I am satisfied with the opportunities to meet and interact informally with faculty members.
Faculty Concern for Student Development and Teaching (5 items)	3. Few of the faculty members I have had contact with are generally interested in students. 8. Few of the faculty members I have had contact with are generally outstanding or superior teachers. 13. Few of the faculty members I have had contact with are willing to spend time out of class to discuss issues of interest and importance to students. 18. Most of the faculty I have had contact with are interested in helping students grow in more than just academic areas. 23. Most of the faculty I have had contact with are genuinely interested in teaching.
Academic and Intellectual Development (7 items)	4. I am satisfied with the extent of my intellectual development since enrolling in this university. 9. My academic experience has had a positive influence on my intellectual growth and interest in ideas. 14. I am satisfied with my academic experience at this university. 19. Few of my courses this year have been intellectually stimulating. 24. My interest in ideas and intellectual matters has increased since coming to this university. 27. I am more likely to attend a cultural event (for example, a concert, lecture or art show) now than I was before coming to this university. 30. I have performed academically as well as I anticipate I would.
Institutional and Goal Commitments (6 items)	5. It is important for me to graduate from college. 10. I am confident that I made the right decision in choosing to attend this university. 15. It is likely that I will re-enrol at this university next fall. 20. It is not important to me to graduate from this university. **25. I have no idea at all what I want to major in.** 28. Getting good grades is not important to me.

The scales were utilised in the current thesis, firstly, because Pascarella and Terenzini (1980) designed these scales in order to evaluate Tinto's model items, and secondly, because these scales offer to the researcher validity and reliability that has been previously tested (French & Oakes, 2004). For instance, Pascarella and Terenzini (1980) discovered that *'the internal consistency reliability of the scales was adequate, with coefficient alpha reliabilities on scales ranging from 0.71 to 0.84'*. In addition, a series of research studies revealed that *'the internal consistency reliability of the scales is adequate, with* *average coefficient alpha reliability values above 0.7'* (Terenzini et al., 1981; Pascarella & Terenzini, 1983; Bers & Smith, 1991; Mallette & Cabrera, 1991). Pascarella and Terenzini (1980) also investigated the efficacy of these scales and discovered that a five-factor answer accounted for 44.45% of the variance. Again, the results of their investigation were supported by a series of additional studies, with most cited being Terenzini et al. (1981), Bers & Smith (1991) and Mallette & Cabrera (1991). At this point is important to define the alpha coefficient. In statistics coefficient alpha (Cronbach's alpha) is used as an estimate of reliability on scales ranging from 071 to 0.84, as it previously explained (Cronbach, 1951). It has been proposed that alpha can be viewed as the expected correlation of two tests that measure the same construct. By using this definition, it is implicitly assumed that the average correlation of a set of items is an accurate estimate of the average correlation of all items that pertain to a certain construct (Nunnally, 1978).

3.6.3 Pilot Study of Quantitative Approach

Prior to the beginning of the main study the author conducted a Pilot Study. The reason for operating a Pilot Study was to validate the questionnaire's accuracy, as well as to eradicate any ambiguities or difficulties in phrasing. Furthermore, the author wanted to validate the required completion time of the questionnaire which had to be relatively short, as required by Pascarella and Terenzini model requirements (Pascarella & Terenzini, 1980; Cohen et al., 2000).

The Pilot Study was conducted in early October (First Engagement Questionnaire) and early December (Engagement Questionnaire) 2013 of the academic year 2013-14 in the Department of Informatics at the university studied and included 155 out of ~300 first year computing students, for both questionnaires. The author generated a questionnaire link using Qualtrics which included both questionnaires (First Engagement Questionnaire and Engagement Questionnaire). It was then posted in all first year computing modules and the author visited all first year classes in order to promote it. The average length of time a participant took to complete the questionnaire was approximately 10 minutes (Pascarella & Terenzini, 1980). In addition, some alterations were made in order to follow the UK Higher Education context. Specifically, from the 'Institutional and Goal Commitments' scale, item: "25. I have no idea at all what I want to major in", had to be removed as students in UK Higher Education do not select a major module (pre-defined in their first year). At the start of the administration, students were asked for electronic consent in order to use information from their university records for the study's purpose.

3.6.4 The Main Quantitative Study

After the Pilot Study was completed, the author carried on with the main study. The main study's data collection was conducted in early October (First Engagement Questionnaire) and early December (Engagement Questionnaire) 2014 of the academic year 2014-15 and included data from first year undergraduate students from almost all departments of the university studied, as well as anonymised case sensitive data from the university's admissions office. The questionnaires used for data collection was the same questionnaires as the ones used in the Pilot Study. Again, using Qualtrics individual links for every first year student were generated and then e-mailed to all first year students' e-mail accounts. The author then visited as many classes as possible in almost all university departments in order to introduce and promote the questionnaires. In the first part of both questionnaires it was requested the student's ID. This helped the author to collect data that measure students' parental background education, pre-entry qualifications (A level scores, skills and abilities), individual attributes (race, age, gender, nationality etc.), and retention status (see also Section 3.6.3).

The author, in his effort to maximise students' response rates administered the engagement questionnaire in their computer-based classes. Furthermore, the questionnaire was verbally introduced and promoted by the author in lecture theatres with assistance from the university's academic staff. The author approached academic staff members who were willing to aid his effort and requested permission to use time during their classes for administration and promotion of the 'Engagement Questionnaire'. At the start of the administration, students were asked for electronic consent in order to use information from their university records for the study's purpose (see Appendix 1: Engagement Questionnaire Introduction and Appendix 2: Engagement Questionnaire Explanation). The number of student in each class varied from 10 to 20 and 20 to 40, due to each department's differences in class sizes, such as computer-based and lecture theatres class size.

3.6.5 Constructs and Measures

In the previously presented 'Initial Student Integration Model' there are eight constructs (see Figure 3.2, Section 3.6.1). Specifically, these are identified parental background, pre-entry qualifications (A level scores, skills and abilities), individual attributes (race, age, gender, nationality etc.), initial goals and institutional commitments, academic integration, social integration, later goals and institutional commitments, and retention. The aforementioned constructs' measurement was conducted as described in the subsequent sections:

Parental background: It was evaluated via previous education declared by students during the enrolment period. Again this construct was collected by the university admissions office (based on student ID).

Pre-entry qualifications: This construct was measured by student UCAS tariff points (A level scores, skills and abilities) and it was collected from the university admissions office (based on student ID).

Individual attributes: This construct was measured by entry information provided by the students (race, age, gender, nationality etc.) and it was also collected from the university admissions office (based on student ID).

Initial goals and institutional commitments: This construct was measured by 'Institutional and Goal Commitments' of Institutional Integration Scales (Pascarella & Ternzini, 1980). This scale comprised of five items, which were included in the **'**First Engagement Questionnaire'**.**

Academic integration: In accordance with Tinto's model, academic integration is defined initially by student's level of intellectual development and academic performance (Tinto, 1993). Nevertheless, Cabrera, Castaneda, Nora, and Hengstler (1992) discovered that student's academic performance might not load effectively as an academic integration construct. Consequently, in this study it was evaluated by using two of the Pascarella and Terenzini's (1980) scales. These were: 'Academic and Intellectual Development' and 'Faculty Concern for Student Development and Teaching'. The 'Academic and Intellectual Development' included seven items, while the 'Faculty Concern for Student Development and Teaching' scale included five items and. The academic integration construct was included in the 'Engagement Questionnaire'.

Social integration: Again, in accordance with Tinto's model, social integration measures the degree and quality of peer-group interaction, as well as students' associations with members of academic staff (Pascarella & Ternzini, 1980). Consequently, this construct was evaluated by using two of the Pascarella and Terenzini's (1980) scales. These were: Interactions with Faculty and Peer-Group Interactions. The 'Interactions with Faculty' scales included five items and the 'Peer-Group Interactions' scale included seven items. This construct was also included in the 'Engagement Questionnaire'.

Later goals and institutional commitments: This construct was evaluated by using the 'Institutional and Goal Commitments' scale from the Pascarella and Terenzini (1980) Institutional Integration Scales. Again, this was collected from the 'Engagement Questionnaire'.

Retention: It was based on whether a student re-enrolled, or not, for the second year of his/her academic studies. It was collected from the university admissions office and was coded as: 1 = persistent and 0 = voluntary drop out.

3.6.6 The Structural Equation Modelling (SEM)

The data analysis process was conducted by using the SEM a multivariate analysis technique (Kaplan, 2008; Kline, 2015). In particular, it is a method that utilises different types of models in order to present relationships amongst observed variables and aims on testing a theoretical model that is hypothesized by a researcher (Ullman & Bentler, 2003; Kaplan, 2008). Thus, this offers the opportunity to test various theoretical models and comprehend in what way sets of variables characterise constructs, and in what manner these constructs are connected amongst them (Lomax & Schumacker, 2012; Kaplan, 2008). The very first developments of SEM are acquired from Karl Jöreskog and his associates work (1976, 1993), and are considered as one of the most influential and important statistical revolutions (Cliff, 1983; Bagozzi & Yi, 1988).

The reasons for adopting SEM in the current study were fourfold. Firstly, SEM offers the opportunities of estimating and testing the relationships amongst constructs. Secondly, SEM is capable of assessing and correcting measurement errors. If a researcher ignores measurements errors, it may lead to bias in estimating parameters (Stage, 1988). The third reason is that SEM permits multiple measures usage in order to describe constructs. Finally, the fourth reason is because SEM employs a confirmatory approach to the data analysis (through Confirmatory Factor Analysis), rather than an exploratory one (Byrne, 2001; Kaplan, 2008; Lomax & Schumacker, 2012; Brown, 2014).

Towards preparation for data analysis, the items that are were negatively phrased from the Institutional Integration Scales were reverse scored, in order to achieve an all item response that represents positive student integration. Furthermore, the data sample was inspected and screened for any outliers, missing values, and normality distributions. This process was conducted by using IBM SPSS Statistics v20, as well as based on the guidelines offered by some of the most cited authors such as, Hair et al. (1998), and Tabachnick & Fidell (2001).

SEM provides two essential variable types, such as latent and observed variables. The latent variables cannot be observed or measured directly, but derived from measured variables. In addition, latent variables are described as non-observed variables, factors, or constructs (Bollen, 2014). In the current study there are examples of latent variables, such as academic and social integration, and commitments. The other type of variables is the observed variables. These are a set of variables that are utilised in order to infer or define the latent variables. Furthermore, they are described as manifest variables, measured variables, or indicators (ibid). In the current study, observed variables cases are items from Pascarella and Terenzini (1980) questionnaire evaluating three latent variables, such as social and academic integration, as well as commitments.

Furthermore, latent variables can be categorised as either endogenous or exogenous variables. An endogenous variable is affected by another variable in the model. On the other hand, exogenous is a variable that is not affected by another model variable (Bollen, 2014). In an SEM analysis is critical to know the proportion of variables accounted for in the endogenous and exogenous variables (Schreiber et al., 2006). In the current study, there are five endogenous and two exogenous variables. The five endogenous variables are: Initial goals and institutional commitments, later goals and institutional commitments, social integration, academic integration, and retention behaviour. While, the three exogenous variables are: parental background, pre-entry qualifications, and individual attributes.

As proposed by Anderson and Gerbing (1988), Jöreskog (1976, 1993), Castaneda (1993), and Brown (2014) a two-fold SEM procedure was applied in order to estimate the model parameters (further explained in the following paragraphs). This was an evaluation model accompanied by a structural model. Firstly, the evaluation model was a Confirmatory Factor Analysis that defined the connections between observed and latent variables. This model also offered a validity assessment, as well as reliability of the observed variables for every latent variable. The software programme used for the conducted Confirmatory Factor Analysis was the AMOS (Arbuckle, 2007; Byrne, 2004, 2013). The Confirmatory Factor Analysis process is explained in detail in Section 4.4. Secondly, a structural model analysis indicated the relationships amongst latent variables. In other words, it helped define the latent variables that directly or non-directly cause alterations in the values of other latent variables in the model studied (Schumacker & Lomax, 2004, Lomax & Schumacker, 2012). The structural model analysis is presented in Section 4.5.

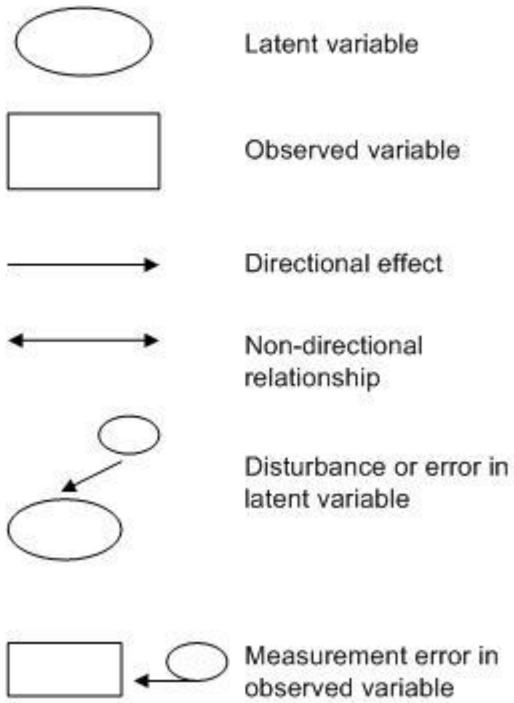
The majority of SEM models can be conducted in five steps. Specifically, these are: (1) model specification, (2) model identification, (3) model estimation, (4) testing model and (5) model modification (Bollen & Long, 1993, Bollen, 2014).

In its first step, SEM starts with the model specification to be estimated. It is a statistical statement about the relationships amongst variables, and models are defined in accordance with prior research or a theory (Bollen, 2014). The model specification step is possibly the most difficult and crucial, as a miss-specified model may lead to biased parameters estimates (Bernstein, 1990; Byrne, 2001; 2013). In the current study, the model followed is in accordance with Tinto's theory, which is presented in Figure 3.2 (see also Section 3.6.1).

In general, there are two relationship types amongst the aforementioned variables. These are non-directional and directional. Specifically, non-directional associations express hypothesized co-relational associations between variables. On the other hand, directional associations express hypothesized linear directional influences of one variable or another (MacCallum, 1995; Chin, 1998; Byrne, 2013). Every one of these directional, or non-directional, relationships can be described as possessing a numerical value related with it. The numerical values that are related with directional effects are values of regression coefficients, whereas the numerical values that are related with non-directional associations are correlation or covariance values. All these regression coefficients and covariance values are named model parameters (MacCallum, 1995; Chin, 1998; Byrne, 2013). A main reason for using SEM in the current study was to estimate these parameters' values (see Chapter 4).

The use of path diagrams is a very common and useful practice in order to specify models. In addition, the use of rectangles or squares is a standard convention to symbolise observed variables and ovals or circles to symbolise latent variables, involving error terms. The directional effects between variables are defined by applying a one-headed arrow. While, non-directional associations are symbolised by applying a two-headed arrow (Jöreskog, 1976; 1993; Byrne, 2013). In the following figure are presented the symbols that are usually employed in SEM.

Figure 3.3: Path Diagram symbols in SEM



SEM continues with it second step which is the model identification. Model identification addresses if there is a particular set of parameters that is in accordance with the data sample, or not. Furthermore, every model parameter needs to be defined in order to be a constrained, a free, or a fixed parameter. An unknown parameter is called a constrained parameter, but is constrained to one or more other parameters. A parameter that is unknown and must be estimated is called free parameter, while a fixed parameter is a non-free parameter but is intended to a specific value, usually either zero or one (Lee & Hershberger, 1990; MacCallum et al., 1993; Raykov, 2004).

Traditionally, there are three levels of model identification in order to estimate the parameter(s) of a model (Lomax & Schumacker, 2012). Firstly, a model is ‘under-identified’ when one or more parameters may not be specifically defined due to lack of information. Secondly, a model is ‘just-identified’ when all of the parameters are specifically defined because there is just enough information. Finally, a model is ‘over-identified’ when there is more than one way to estimate a parameter (or parameters) because there is more than enough information (Lomax & Schumacker, 2012).

Regardless, whether a model is ‘just-identified’ or ‘over-identified’, it is classed as ‘identified’. Nevertheless, when a model is ‘just-identified’ the parameter estimates are not to be trusted, because it has no degrees of freedom. It is not scientifically interesting and as a result it should be not be accepted (Byrne, 2013). In order for a researcher to estimate a model, it must be ‘over-identified’. But, when a model is ‘under-identified’, it cannot be ‘identified’. Nevertheless, when a model is ‘under-identified’, it could be converted into ‘identified’ by appointing extra constraints (Lomax & Schumacker, 2012).

According to Byrne (2013), one condition in order to establish model identification in AMOS software programme is the ‘order-condition’. The ‘order condition’ necessitates that the free parameters number to be calculated needs to be less than or equal to the data points number (variances, covariance values, and regression coefficients). Specifically, this number is equal to k * (k+1) /2, in which k is the number of observed variables. As later presented, in the current study, all measurement models and structural models were over-identified (see Chapter 4).

Right after the model specification and identification, the third step is to assess model parameters. SEM parameters are known as variance/covariance values of exogenous variables and regression coefficients. Specifically, the three most common measurement methods are: Maximum Likelihood (ML), Generalised Least Square (GLS), and Asymptotic Distribution Free (ADF) (Anderson & Gerbing, 1988; Byrne, 2013). The approach followed is defined by the characteristics of the data, as well as the size and distribution of the sample. To begin with, ML is one of the most commonly used approaches in SEM. Nevertheless, it has been identified by many researchers that ML assessments are fairly resilient to the normality violation (Huber, 1967; Browne, 1982; Anderson & Gerbing, 1984; Muthen & Kaplan, 1985, 1992; Chou, Bentler, & Sattora, 1991; Hu & Bentler, 1999; Hoyle, 1995; Mueller, 1996; Boomsma & Hoogland, 2001; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Chen, 2007; MacKenzie, Podsakoff, & Podsakoff, 2011, Markus, 2012). The second approach is GLS in which multivariate normality is assumed. Jöreskog and Goldberger (1972), though, discovered that GLS assessments are quite possible to be non-positively biased. Finally, in the ADF approach multivariate normality is not assumed, but is required a sample size of over 2,500 in order to produce precise assesments (Hoyle, 1995; Ullman & Bentler, 2003). Consequently, in the current study the author used the ML approach in order to estimate the model parameters (see Chapter 4).

By the time the parameters of the model are acquired, the fourth step is to check data fit of the model. When the data fit is good then the established model is supported by the data sample, but when the data fit is poor then model needs to be established again in order to produce a better fit. The evaluation processes applied in order to test the model's data fit were two-fold: the individual parameters fit and the entire model's data fit. The first evaluation procedure was conducted in two parts. The first part was to define the feasibility of the individual parameters' estimates values. Specifically, the evaluation aimed at whether their estimates values were in the allowed range or not. The conditions that define this are the following: correlation exceeding one, non-positive definite correlation matrix, and negative variance (Byrne, 2013). In the current study none of the aforementioned issues were identified (see Chapter 4).

The second part in evaluating the individual parameters' fit was to assess their statistical significances. Specifically, parameters can be defined as statically significant when their t-values ≥ 1.96 at a level of $\alpha = 0.05$. As a result, non-significant parameters need be removed from the model (Holmes-Smith, 2001, 2002; Byrne, 2013).

The second evaluation process in testing the model's fit was to test the whole model's fit. The AMOS software programme offers a series of fit indices. In the current study the author used the subsequent major indices, which are suggested by Byrne (2013). These were the Chi-square (χ^2) test, the Normed chi-square (χ^2/df), the Adjusted Goodness-of-Fit Index (AGFI), the Goodness-of-Fit index (GFI), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). An analysis of each one of these indices is conducted in the next list.

- The Chi-square (χ^2) test is a traditional fit index and is the only statistical significance test in SEM. The non-significant Chi-square (χ^2) value signifies that the hypothesised model fits the data sample well (Hu & Bentler, 1999). The Normed chi-square (χ^2/df) is the ration of χ^2 divided by the degree of freedom and a value less than 3.0 indicates an acceptable fit (Hu & Bentler, 1999; Chen, 2007; MacKenzie, Podsakoff, & Podsakoff, 2011). However, the χ^2 is affected by the sample size and the data normality (Stevens, 1996; Fidell & Tabachnick, 2003; Lomax & Schumacker, 2012; Markus, 2012; Byrne, 2013; Kline, 2015). As a result, the χ^2 test is better to be used in combination with other indices.

- The AGFI and GFI signify the relative amount of sample variance and covariance interpreted by the model. The main difference between AFGI and GFI is that AGFI adjusts for the number of degree of freedom in the specified model. Both indices, though, range from 0 to 1 with values exceeding .90 indicating a good-fit model (Byrne, 2013).
- The CFI compares the hypothesised model's fit to a null or independent model. Its value ranges from 0 to 1, with values above .90 indicating a good-fit model (Hu & Bentler, 1999; Chen, 2007; MacKenzie, Podsakoff, & Podsakoff, 2011).
- The RMSEA expresses the discrepancy per degree of freedom between the data population and the hypothesised model (Byrne, 2013). Browne and Cudeck (1993), noted that RMSEA values of less than or equal to .05 can be considered as good fit, values between .05 and .08 as an adequate fit, and values between .08 and .10 as a mediocre fit, while values > .10 are not acceptable.

The fifth, and final, step is modification of the model. In this step, in case the hypothesised model's fit is less than satisfactory, then the model can be modified in order to improve its fit. There are two methods to improve the model's fit. The first one is to remove parameters that are not significant. Despite that, in case they are crucial, then they should remain in the model (Lomax & Schumacker, 2012; Byrne, 2013). The second method is to add extra parameters. The AMOS software programme provides three techniques that can help to modify the model. Specifically, the Modification Index (MI), the Expected Parameter Change statistic (EPC), and the standardised residuals (Byrne, 2013). Firstly, the MI describes the expected drop in overall χ^2 values. Larger MI for a particular fixed parameter would indicate that a better model fit would occur by permitting this parameter to be free (ibid). Secondly the EPC is identified, which signifies the estimated change in the magnitude and direction of every fixed parameter if it was to be free (Brown, 2014). Thirdly the standardised residuals are like Z scores. Larger values signify that a particular relationship in not well interpreted by the model. In particular, as Jöreskog and Sörbom (1988) suggested, values > 2.58 can be treated as large.

In the consequent section the author continues presenting the research design methodology that was applied in the current study. Specifically, an analysis of the qualitative approach, as well as its methods and techniques employed, is conducted.

3.7 Qualitative Approach of the Current Study

As it was noted in Section 3.4 the Mixed-Methods Concurrent Triangulation Strategy followed in the current study included a qualitative approach (see also Figure 3.1, Section 3.4). This section is focused on the qualitative methods employed in the current study. In addition, a pilot study using the same technique is presented in this section.

3.7.1 Qualitative Approach Research Design

A qualitative approach offers the opportunity for the "*study of issues in depth and detail*" (Patton, 2014, p. 14). As Patton mentions qualitative approach is usually conducted in the context of a programme evaluation. In particular, this was valuable in the research outcomes explanation because the qualitative data helped the author describe the participant students' experience of the world with their own words (Patton, 2014, p. 10). In addition, Upcraft and Schuh (1996) stated that qualitative approach allows researchers to fully comprehend how people make meaning out of their circumstances or experiences (Schuh, 2013; Aaron, 2014). According to these descriptions and definitions qualitative approach is particularly suited for gaining an understanding of the impact of learning communities on participants' experiences.

Creswell (2012), Patton (2014), and Marshall and Rossman (2014), suggest that qualitative approach can be conducted in three main forms: observation, documents analysis, and interviews (i.e. focus groups). In the current study the author employed the latter two ways applying a dialogical technique named the 'unfolding matrix', which is explained in a later section (see Section 3.7.1.2).

3.7.1.1 Focus Groups

To begin with, interviews allow researchers to discover things that cannot be directly observed (Creswell, 2012; Patton, 2014, p. 340). Interviews offer the ability to comprehend people's perspective on feelings and events that only they can fully relate (Patton, 2014; Marshall & Rossman, 2014). When group interviews are conducted, they are typically named focus groups. Nevertheless, as Patton (2014, p. 385) notes a focus group is first and foremost an interview, with the only difference more than one participant involved. Furthermore, it is possible to employ interviews long after an experience has occurred in order to comprehend programmatic impacts or outcomes (Creswell, 2012; Patton, 2014, p. 340; Marshall & Rossman, 2014).

Concurrently with the focus groups an 'unfolding matrix' was completed. The completed matrix resulted in a document consisted of raw data that was analysed in order to extract concepts, relationships, and categories (Padilla, 1994, p. 227). As such, the matrix provided a set of qualitative data that was analysed. An in depth description of the 'unfolding matrix' use is presented in the following sections.

3.7.1.2 The 'unfolding matrix'

Padilla (1991) was the first to describe the 'unfolding matrix'. According to him, the 'unfolding matrix' is a qualitative data collection technique that is used in order to assess heuristic knowledge. Padilla detailed this method as related to conduct "*dialogical research*" towards an effort to place the researcher and the participants "*in a partnership to achieve greater understanding about a situation*" (Padilla, 1993). The dialogical research is derived from Freire's work, who stated that the best method for learning involved a student assuming the role of a teacher and the teacher assuming the role of a student (Freire, 1970; Randall & Southgate, 1981; Shor & Freire, 1987; Padilla, 1993; Shor, 2012). Therefore, via conversation it is possible to discover how to accomplish a given task or the meaning behind something. Freire (1970, 2000) favours a system where people can teach each other as co-investigators. In addition, Padilla (1991, 1993) noted that it is via dialogue that participants can discuss the experiences they had while participating in something. In the current study, the author through observing and participating in the conversation, has the ability "*to identify the heuristic knowledge valid*" for a given context. Concurrently, the participants in the dialogue have the capability of learning new heuristic knowledge from the conversation that can be utilised in the future to carry on to accomplish success (Padilla, 1991, 1993).

Filling in the matrix during an interview is of great use, even if focus groups and interviews are of dialogical nature, and the final result of participants taking knowledge gained from reflecting on and sharing their experiences and applying them in the future could occur without the matrix. Miles and Huberman (1984, 1994) proposed that qualitative data collected via focus groups and interviews can easily and efficiently be examined via the use of matrix (Miles, Huberman and Saldaña, 2014). Nevertheless, Padilla modified this format, so that a researcher can start with an empty matrix in order to gather the desired data (Padilla, 1991, 1993). By the time the matrix is completed by participants, it evolves into a data set in and of itself, which can be subjected to "*conventional data coding and analysis to develop grounded concepts, typologies, or taxonomies*" (Padilla, 1994, p. 274). Consequently, the matrix is analysed through the use of the conversations' recordings in order to clarify the exemplars discussed (Padilla, 1993).

The initial step in developing a matrix is to establish a "*correct form*" in order to ensure that a complete and exhaustive data set can be accomplished (Padilla, 1994, p. 274). This is achieved with the development of what Spradley (1979) noted as a "*cover item*". A cover item is defined as a name "*for a category of cultural knowledge*" (Spradley, 1979, p. 100). Specifically, cover items have the potential to be expanded, or "*unfolded*", semantically via distinct examples, which collectively define the cover term (Padilla, 2009, p. 29). The aforementioned definitions are named exemplars, and "*are captured in one of the cells in the rows beneath the cover item*" (Padilla, 2009, p. 29). Padilla (1991, 1994) suggests that the cover term can be derived from the research questions, or else the collected data might not answer the questions related to the study. As the research questions of the current study have been derived from the literature, the cover term and subsequent exemplars should also be able to be linked back to the literature (Tinto's and Padilla's theories).

The cover term is the "*lead data vector"* or column within the matrix (Padilla et al., 1997, p. 7). this vector is the left-most column in the matrix. By the time the cover term is incorporated, more columns are then added to the matrix to the right side of the first column. The additional columns and the data contained are established in order to define the elements catalogued in the lead data vector. For instance, when a researcher is interested in teaching methods, then "*teaching methods*" would be the lead data vector. Extra columns could then be added to the matrix in order to represent the success rate, description of each different teaching method, or the activities included in each method. The interviewees would then be questioned first to catalogue the different types of teaching methods, apart from the remaining columns.

The interview participants will then reach a point in which they cannot add more new experiences to the catalogue they created. This is defined as saturation, and is described as the point where there is data redundancy or replication and nothing new is added (Bowen, 2008, p. 140). At this phase the remaining columns are revealed and each is filled-in for each type of teaching methods. Furthermore, extra columns can be added as the conversation guides in order to capture the full extent of each example. The concurrent development of the matrix vertically and horizontally is the "*unfolding*" of the matrix.

However, it is important to keep in mind that, because an interview rarely leads to a complete saturation with regard to answer a researcher's questions, the matrix needs to be completed over several interviews. This is noted by Spradley (1979) as "*tandem informants".* What this means is that each successive participant continues from where the previous stopped. In the first interview is created the initial set of examples and unfolds the matrix out as far as necessary for the example (Spradley, 1979, p. 10). Every sub-sequent interviewee then examines what the previous participants accumulated, contributes to the existing exemplars, and then provides new examples and defines aspects to the matrix. This is an iterative process that is repeated until saturation is achieved, with each session having a different colour to record comments into the matrix (Padilla, 1994, 2009). As Padilla (1994, p. 275) stated this is a very appropriate method of collecting data because it "*expands the base of experience captured by the interviewees and this is more likely to capture the multiple features that are usually presented*" within a given phenomenon.

According to Padilla (1994) the use of the 'unfolding matrix' offers the opportunity for a researcher to cover several objectives that are critical to qualitative research. As a first objective, he mentions that the 'unfolding matrix' sets boundaries "*for the data to be collected by clearly specifying a domain of relevant data for each data vector*" (Padilla, 1994, p. 276). This is critical, because without specific boundaries a researcher cannot know what data to gather in order to comprehend the phenomena. Succinctly, "*data collection without sensible limits is highly inefficient and may lead to data collection that is irrelevant"* (Padilla, 2009, p. 43). Through the early limitation of topics, the researcher is assured that the collected data can be used to answer the research questions and provide explanations that will aid improve knowledge about specific phenomena.

As a second objective Padilla (1994) notes that the data are gathered in a highly structured manner. The final objective is that the data are entered into the matrix are automatically processed (ibid). If one follows a column down across all the examples given for the cover term, one could find an exhaustive definition of that vector's cover term. Equivalently, taking every phenomenon defined across the rows is an exhaustive explanation of the phenomenon. In order to enter data into one of the cells, it firstly needs to fit into that cell, and when failing an appropriate cell, then a new data vector is created to accommodate it. As a result, a level of pre-coding is achieved. This does not mean that this is the final coding schema, but simply an indication of what the final schema could encompass. A further analysis of the matrix could reveal the final set of relationships and constructs, which would then be utilised in order to answer the research questions.

3.7.2 Pilot Study of Qualitative Approach

The ‘unfolding matrix’ technique was applied in the current study in order to investigate the experiences of first year undergraduate computing students who had participated in learning communities at the university studied. A form of the ‘unfolding matrix’ and interview protocol was developed and used in academic year 2013-2014. The qualitative data collection strategy was initially tested with a Pilot Study that was conducted in early 2013. Specifically, the pilot study process included 5 focus groups with 8 participants in each group (40 students in total). The protocol, presented in Appendix 11 (Focus Group Pilot Study Protocol) was used, and the matrix outlined in Appendix 6 (The ‘unfolding matrix’ template) was completed. The author tried to promote the focus group interviews as much as possible, and this resulted in a satisfying response from the potential participants. The focus group interviews provided data and an opportunity to analyse a completed matrix. The pilot study sections are focused on the participants in the focus groups, the analysis of the completed matrix, the discussion of the assertions that could be derived from the focus group, and lessons learned for application to the current study.

The participants (students) were invited to take part in the study through an invitation right after the questionnaire completion. The students interested in participating were provided with an interview consent form (see Appendix 7: Focus Group Interview consent form) and a time and location for the focus group was set accordingly. Once the interview consent forms were completed, the focus group initiated. During each focus group the author was recording the information into the matrix, for later analysis purposes, but also was taking quick notes in order to keep track of the most important subjects highlighted by the participants for additional detail as necessary. Each focus group lasted approximately 40 minutes from start to finish.

The students who took part in the pilot study were men and women who participated in learning communities at the university studied during the first semester of the academic year 2013-2014. The focus group pilot study was conducted at the same period with the questionnaire pilot study. Nevertheless, each student who participated in the focus group pilot study was in his/her first semester of study. Age groups varied, but the main age group was 18 to 22. Furthermore, students represented all computing courses of the Department of Informatics of the university studied.

3.7.2.1 Focus Group Pilot Study Analysis Process

The current study's analysis included data evaluation in the grid that was completed during the focus group. In contradiction to most qualitative analysis that usually includes transcripts analysis, the 'unfolding matrix' technique utilises the filled-in grid as the analysis unit, with codings and assertions being conducted from the data analysis in the matrix.

The completed matrix was then analysed by the author. Specifically, the threads in the data were identified. Threads are the stories being told by the participants as reflected by the phrases and words in the matrix (Padilla, 2009). The threads led to the development of codes that encompassed a great deal of the data in the matrix. Consequently, those codes were developed into five main assertions. An assertion is a finding revealed via the data analysis that emerged from the grouping together prominent themes and codes within the data (ibid). The primary explanations, as well as sub-sequent assertions, were reviewed by the author multiple times in order to achieve high quality analysis and provide better insight into what else might be hidden in the data.

It is also important to address how the participants completed the 'unfolding matrix'. Specifically, the grid was mainly completed in the presence of the focus group participants and they had the opportunity to inform the author, if there was any misinterpretation of what was mentioned by them, and/or if the author did not manage to fully capture the participants' intent of examples and thoughts. Nevertheless, it is worth to be mentioned that the participants did not have the opportunity to review the final focus group pilot study findings.

The author had to define the analysis parameters, due to the nature of the data collection using the matrix, and because each of the columns (vectors) can be treated as a primary vector for analysis. The author decided to focus on the 'Experiences' column as the analysis unit, but it still resulted in threads starting in later columns. Eventually, in the end, the five assertions discussed in Appendix 12 (Focus Group Pilot Study Results) could be related to experiences presented in the first column and their later definitions in the matrix.

3.7.2.2 Focus Group Pilot Study Conclusion

The focus group pilot study was proved to be a useful source of information. To begin with, it identified that the use of the 'unfolding matrix' for data collection and subsequent analysis was a very good technique that would serve well the current study. Second, the study analysis outlined five assertions that are connected with the literature related to student retention and success. This relationship is promising because there is need for research that confirms the theoretical underpinnings of student success research. Finally, the protocol included experiences that were broad and indicative that the focus group moderator would need participants to concentrate on specific experiences during the focus group activity.

3.7.3 The Main Qualitative Study

The following sections are focused on the current study. The pilot study offered an opportunity to prove if the 'unfolding matrix' would be an effective technique for data collection and analysis, and to determine if the protocol was satisfactory enough for determining experiences related to students' success. The pilot study outcome was that the 'unfolding matrix' was useful. The protocol only had to be altered slightly in order to elicit specific experiences and not simply reflect general experiences that were hard to describe. The outcome was the current study that is described in-depth below.

3.7.3.1 The Participants

The participants for the study were male and female students who participated in a learning community that was housed in computing course disciplines during their first academic year. The students who were invited to participate in the focus groups were in a learning community during the academic year 2014-2015 academic. The process included 10 focus groups with 8 participants in each group (80 students in total). During the interview subjects' recruitment, the author utilised purposeful and criterion sampling. Patton (2014, p. 46) noted that purposeful sampling place "*emphasis on in-depth understanding*". He continues by mentioning that via this technique, "*one can learn a great deal about issues of central importance to the purpose of the research, thus the term purposeful sampling*" (ibid). Furthermore, the fact that each student had participated in a learning community in the past also makes this criterion sampling, with the criterion being learning community participation.

The students were invited to take part in the focus group via e-mails (see Appendix 7: Focus Group Interview consent form). The basic idea was to have participants that would match the questionnaire respondents, in 6 to 8 participants per focus group each using the iterative process associated with the 'unfolding matrix'. Eventually, the final number of participant students was 80 and there were organised 10 focus groups with 8 participants in each group. Padilla (2009) indicated that, even if it is more efficient to apply focus groups to collect data and complete the matrix, it is also possible to use one-to-one interviews. In the current study, the author utilised only focus groups in order to collect data. In addition, the author wanted to ensure that the information filled in the matrix had more than one student's experiences described. The focus group lasted approximately 40 minutes.

Before every focus group the participants were provided with an Interview Consent Form (see Appendix 7: Focus Group Interview consent form), on which they had the opportunity to declare that it is permissible to use the information they provide with their real first name or with a pseudonym. In any case, all student data were anonymised as they were also informed in the Interview Consent Form. All interviewees' personal details, ethnicity and demographic information were removed so that nobody could ever trace-back their personal details.

3.7.4 Completing the 'unfolding matrix'

The 'unfolding matrix' was used in the interviews as a pre-set table to be filled in during the conversation. According to Padilla's (1991) study, the 'unfolding matrix' form followed is shown in Appendix 6 (the 'unfolding matrix' template). It is also critical to mention that the current study did not require the development of any additional vectors.

The author instead of using the negative term "*barriers*", it was decided to use a more generic word such as "*experience*", with the caveat being that the experiences could be negative and positive. Without any doubt, the barriers that have been overwhelmed were signs that a student tackled difficultly but preserved. Nevertheless, the positive experiences can lead to the growth in heuristic knowledge, and as a result should also be investigated. Both negative and positive situations could be examined through the use of the generic term "*experience*". All participants were motivated in the listing of exemplars under the cover term to remember that experiences could be either positive or negative provided that they contributed to their or their peers' overall success.

The participant students were asked about the intensity and length of their experiences in an effort to determine if an experience was present for more than a short period of time. Padilla (2009) noted that barriers that continue to be noticeable for students, which cannot be overcome, could ultimately lead to that student dropping out his/her academic studies. Furthermore, Tinto (2012) mentioned that it could prevent a student's ability to integrate academically or socially, depending on the nature of the experience. On the other hand, if a positive experience has been present for a long period, then it can lend itself to the student success. Thereby it is possible to eliminate barriers and aid student integration to the campus community. Nevertheless, in the current study, while length of time was provided by participants, intensity was difficult concept to grasp. Students were able to describe their experiences in-depth and offer to those provided by previous participants without problems. However, towards the effort to describe how intense a scenario was, did not lead to any useful or meaningful outcomes. Hence, while the column "*Intensity*" exists in the matrix, there is no data in it.

The Knowledge Used and Knowledge Gained vectors allowed the author to comprehend what heuristic knowledge was applied in overcoming a barrier. Discussion of environmental factors suitable to the experiences helps describe what effect any surroundings of students had on participating in a positive experience. In addition, these vectors help in comprehending the new things learned that could be utilised in similar situations in the future.

Characteristics Used and Characteristics Gained were the final two columns in the matrix. Participants were also asked not to discuss these aspects. This would require students' knowledge about Padilla et al. 's (1997) factors for successful students, as well as Sedlacek's non-cognitive variables and the characteristics associated with. These two columns were still available to students, but were not filled in during the focus group interview. This differs from Padilla's (1991) method, in which he mentioned that when utilising the matrix each column should be filled in as completely as possible during the focus group interviews. The complete of each column during the interviews had minor impact on the responses given by the participants.

After the completion of every focus group, the author listened to the recorded dialogues again. This offered the opportunity to better comprehend and expand on the notes to complete the matrix with the participants present, mark time stamps for illustrative comments on the matrix, and determine what characteristics were being used or gained by the students during the experience. With this practice the author assured that almost every suitable detail related to each focus group interview was recorded sufficiently and accurately for review, analysis and interpretation.

During the focus group interviews the empty 'unfolding matrix' was given to the participants on A3 printed versions. Only the first column was revealed initially for those participating in the focus group; the remaining columns were covered up with a blank piece of paper. Through this way it was ensured that the students participating would objectively provide an exhaustive list of experiences without affecting each other. By the time the participant students felt that all important experiences that contributed to their success at university were revealed, then the participants started discussing amongst them each experience in order to fill in the empty cells of the 'unfolding matrix'. The author served as the moderator of each group as well as the person to complete the matrix during the discussion. Furthermore, the participants had the opportunity to give feedback on what was recorded to ensure than an accurate definition of their experiences was given.

By the time the entire 'unfolding matrix' was completed and after commenting on existing experiences and exemplars, the participants were asked to list out experiences not already mentioned. Then, they provided exemplars to complete the remaining cells on the matrix. In addition, the participants had the ability to clarify, comment on, or rephrase the 'unfolding matrix' notes in order to ensure an accurate depiction of their experiences from their perspective. Finally, all notes were transferred into an electronic spreadsheet using different bolding, shadings, italicisation, or combination of the three in order to differentiate comments, titles and distinct notes. The outcome was a comprehensive definition of each cover term as defined by exemplars provided by the participants. The completed matrix that was used in the qualitative analysis, which is later presented in Chapter 5, can be found in Appendix 5 The 'unfolding matrix'.

3.7.5 Human Subjects Protection

Human subjects' approval was required for this study and subsequently granted by the university studied. Copies of the approval letters for the use of human subjects can be found in Appendix 8: PGR - Project ethical review form.

The author of the current study served as the principal investigator for the study. In addition, extra care was taken in order to ensure that the participants' rights were upheld and that the research was conducted in an ethical manner.

3.7.6 The Researcher's Role

The researcher's role in the current study was very important because he was very involved during the group interviews. That meant that the author may possess bias, negative or positive, about the participants or their experiences. In order to lower this potential bias, the author applied a qualitative method known as epoche. Patton (2014, p. 284) stated that "*epoche is a Greek word meaning to refrain from judgment, [and] to abstain from or stay away from the everyday, ordinary way of perceiving things* ". Basically, it requires the researcher to eradicate any possible biases about a phenomenon and focus on it as it was the first time (s)he sees it. In addition, Patton (2014, p. 485) mentioned that in order to complete this process, "*the research looks inside to become aware of bias,* *to eliminate personal involvement with the subject material, that is, eliminate, or at least gain clarity about, preconceptions*".

The author towards his effort to achieve this tried to remain as neutral as possible throughout the focus group interviews data collection and analysis process. Furthermore, because the author facilitated all interviews it was important to check his assumptions and biases about the university's learning communities and participants. Specifically, all student information was kept confidential and anonymised regardless if students' opinions were consistent with the university's goals or not.

Patton (2014) also noted that is critical to apply an analytical process called bracketing. In addition, defines bracketing as a scenario in which the researcher holds the phenomenon up for serious inspection (Patton, 2014). In other words, it is taken out of the world where it occurs, it is taken apart and dissected, and its essential structures and elements are un-covered, defined and analysed (Patton, 2014, p. 485). To achieve this, Patton (2014, p. 485) suggests various steps, which include finding the key phrases that connect to the phenomena within the participants' personal experiences, interpreting those phrases appropriately, and inspecting the interpretations closely in order to understand the essential recurring features of the phenomena. The 'unfolding matrix' analysis, the codes and themes development, and the assertions' subsequent creation from the data were completed based on these steps, securing that bracketing had occurred.

The preceding pages offered an in-depth explanation of the 'unfolding matrix', the data collection and analysis technique applied in the current study. Moreover, the technique's use in a pilot study was presented, as well as the study's results.

3.8 Conclusion

The current chapter presented the research architecture of this study, the research methods used, as well as data analyses techniques employed. In particular, the concurrent triangulation strategy that includes the combination of quantitative and qualitative approaches was applied in order to produce a set of data that can be characterised as rich and distinct. In the subsequent chapters the author presents the outcomes of this study as follows: Chapter 4 demonstrates the quantitative findings analysis, Chapter 5 the qualitative findings analysis and Chapter 6 demonstrates a thorough analysis of all findings by mixing the previously analysed results and answers the main research questions of the current study.

CHAPTER 4: QUANTITATIVE DATA ANALYSIS

4.1 Introduction

Through the application of the SEM, as it is described in Section 3.6.6, the current chapter presents the analysis of the quantitative data results and is structured as follows. In Section 4.2, a comparison between the participants and the university studied population takes place. Then, in Section 4.3 is conducted the data screening and cleaning, which includes missing values, outliers, normality, and sample size for the SEM. Consequently, in Section 4.4 the latent variables' Confirmatory Factor Analysis and the reliability and validity of each latent variable. In Section 4.5 the structural model analysis is conducted. Finally, in Section 4.6 the testing hypotheses results are presented.

4.2 Population and Participants

As presented in Chapter 3 the quantitative data was collected from two questionnaires, as well as by the university's administrative authorities. The 'First Engagement Questionnaire' was administered at the beginning of first semester (early October 2014) and was completed by 1,017, from which 171 were computing students. The second questionnaire was the 'Engagement Questionnaire' and was conducted to the same students in early December 2014. Nevertheless, student absences and early attrition reduced the number to 911 students. Through a review of each student's record it was revealed that 55 of the 911 students had voluntarily dropped out from university for academic reasons. From the 911 students 846 students re-enrolled for their second academic year. The remaining 10 students withdraw for non-academic reasons. The students who dropped-out for academic reasons were not included in the analysis as background research indicated that voluntary drop-outs are significantly different from dropping out for important reasons such as family or financial issues (Cope & Hannah, 1975; Tinto, 1993). As a result, the current study's number of participant students was 901, from a potential population of 5,557 full-time first degree entrants. Furthermore, the computing students were 171 of the 901 students.

Table 4.1 shows characteristics of both the participants and the total first year students' population as a whole, in terms of their pre-entry qualifications (A level scores), attrition rate and university enrolment. Information about the participant student parental background is demonstrated in Table 4.4 (see Section 4.3.3). On the other hand, information about individual attributes (race, age, gender, nationality etc.), was excluded because as it is explained in Section 4.5, it was not proved to be significant. T-test results were used to demonstrate that the 901 participant studied were indeed representative of the total population from which they were selected. More information about this is provided in the following Section 4.3.

Table 4. 1: Comparisons between the Participants and the Total Population

	Participants N= 901	Population N = 5,557	p-value
Pre-entry qualifications (A Levels score)	85.51	85.88	Ns * (0.114)
Attrition rate			.0001
Persist	846 (94.00%)	5022 (90%)	
Dropout	55 (06.00%)	535 (10%)	
University enrolment			.0001
Department of Accountancy & Finance	82 (9%)	231 (4%)	
Department of Architecture and 3D Design, and Art	83 (9%)	381 (7%)	
Department of Education, and Initial Teacher Education	53 (6%)	502 (9%)	
Department of Health Sciences	55 (6%)	544 (10%)	
Department of Informatics	171 (19%)	315 (6%)	
Department of Engineering and Technology	84 (9%)	438 (8%)	
Department of Behavioural & Social Sciences	85 (9%)	530 (10%)	
Department of Chemical & Biological Sciences, and Pharmacy	81 (9%)	607 (11%)	
Department of Music and Drama, History English Languages & Media, and Music Humanities and Media-General	72 (8%)	596 (10%)	
Department of Fashion and Textiles	70 (8%)	270 (5%)	
Department of Law, People Management and Organisations, Logistics Operations and Hospitality Management, and Strategy Marketing and Economics	65 (7%)	1143 (21%)	

* $\rho > 0.10$

4.3 Data Preparation and Data Screening

The Pascarella and Terenzini's (1980) Institutional Integration Scales, used by the author, embedded a combination of positively and negatively worded items. In preparation for SEM analysis the negatively worded items were reverse scored so that all item answers reflected non-negative student integration. Additionally, all data was inspected for any missing values, outliers and normality of distribution, based on guidelines specified by highly regarded researchers in the field such as Hair et al. (1998), Tabachnick & Fidell (2007) and Cohen et al. (2013). The SPSS version used for the qualitative data analysis process was IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., 2012).

4.3.1 Missing Values Management

In general, missing data is a common situation in most research settings that can lead to a problematic data analysis. Consequently, there are many statistical analyses in which the missing data impact is usually not fully explained or understood. Addressing, though, why data is missing, considering how to account for the missing data, and defining the missing data effect on the original research hypotheses are matters that must be reported when a statistical analysis on a data set with missing values is conducted (Allison, 2001, 2002; Brady & Collier, 2010). Specifically, SEM necessitates complete data with no missing values as missing values can have a critical influence on research outcomes (Allison & Oaks, 2002; Graham, 2009). In the current study some missing values were identified, and were assessed by considering both variables and cases.

First of all, the missing values were assessed by case. Their distribution is presented in Table 4.2, and 761 cases (84.46%) were valid, with no missing values, while 140 (15.54%) cases had missing value for at least 1 question.

Table 4. 2: Missing values distribution by case and by variable

Variable	Missing values		Variable	Missing values	
	Cases Count	Percent		Cases Count	Percent
IC1	1	.1	SI5_PGI	9	1.0
IC2	2	.2	AI6_AID	13	1.4
IC3	4	.4	LC2	9	1.0
IC4	2	.2	LC3	11	1.2
IC5	1	.1	LC4	14	1.6
LC1	1	.1	SI6_PGI	16	1.8
AI1_AID	5	.6	SI4_IwF	15	1.7
SI1_IwF	4	.4	SI5_IwF	11	1.2
SI1_PGI	7	.8	AI1_FC	22	2.4
SI2_PGI	4	.4	AI2_FC	21	2.3
SI4_PGI	3	.3	AI3_FC	23	2.6
AI2_AID	2	.2	SI7_PGI	26	2.9
AI3_AID	3	.3	AI4_FC	23	2.6
AI7_AID	8	.9	AI5_FC	25	2.8
AI4_AID	20	2.2	LC5	12	1.3
AI5_AID	10	1.1	SI3_PGI	39	4.3
SI2_IwF	0	0.0			

Secondly, the missing values were assessed by variable. In Table 4.3 are described the number of missing values by variables. The variables with the highest missing values were 2: SI3_PGI and SI7_PGI of the 'Engagement Questionnaire'. Specifically, those were: "My interpersonal relationships with other students have had a positive influence on my personal growth, attitudes and values" and "Most students at this university have values and attitudes different to my own" with 2.9% and 4.3% of missing values, respectively. In which case, as Tabachnick and Fidell (2001, 2007) note, '*variables containing missing values on 5% or fewer of the cases can be ignored'*. On the other hand, 4 variables were detected with zero missing values. The 3 of them were variables that were retrieved from the university's admission records. These variables were pre-entry qualifications (A Level scores) and student retention behaviour. The fourth was SI2_IwF: "My non-classroom interactions with faculty have had a positive influence on my intellectual growth and interest in ideas."

Table 4. 3: Missing values by variables

Count of Missing values	Count of variables	Percent
0	4	0
1	3	0.1
2	3	0.2
3	2	0.3
4	3	0.4
5	1	0.6
7	1	0.8
8	1	0.9
9	2	1.0
10	1	1.1
11	2	1.2
12	1	1.3
13	1	1.4
14	1	1.6
15	1	1.7
16	1	1.8
20	1	2.2
21	1	2.3
22	1	2.4
23	2	2.6
25	1	2.8
26	1	2.9
39	1	4.3

There are various methods with which missing values could be dealt with, and the pattern of missingness defines the potential biasing impact on the data (Allison & Oaks, 2002; Graham, 2009). Quantitative researchers have expanded three patterns of missingness: Missing Completely at Random (MCAR), Missing at Random (MAR), and not missing at random (NMAR). In particular, MCAR is applied when missing values are randomly distributed across all cases (Roth, 1994; Bennett, 2001; Acock, 2005). On the other hand, MAR *'is employed when missing values are not randomly distributed across all cases, but are randomly distributed within one or more sub-samples'* (Roth, 1994; Allison, 2001; Schafer & Graham, 2002; Graham, Cumsille, & Elek-Fisk, 2003). Finally, the NMAR type, which is also known as non-ignorable, takes place when missing values are not randomly distributed across cases and the missing values probability cannot be predicted by the data variables (Little & Rubin, 2002, 2014).

In the current study, the author applied two statistical methods in order to evaluate the missing values' pattern. These methods were the t-test and the MCAR test (Little, 1988; Little & Rubin, 2002, 2014). Initially, the t-test was employed in order to examine the cases without and with-missing values for every variable. Provided that this test is not-significant, then it signifies random missing values. In this study, the t-test was employed for 2 variables that expressed a high number of missing values: "My interpersonal relationships with other students have had a positive influence on my personal growth, attitudes and values" and "Most students at this university have values and attitudes different to my own". The test was not statistically significant, which signified that all data were completely missing at random.

The next statistical method that was applied in the current study was the MCAR test. This is a chi-square test that is used for those values that are randomly missing. Specifically, in case that this test's p-value is not significant, then the data is considered to be MCAR (Little, 1988; Schafer & Graham, 2002; Little & Rubin, 2002, 2014). The implication of completely random missingness is that the cases with missing data would be equivalent to a random subset of the entire sample In this study, the application of this test revealed that the missing values can be considered to be MCAR (Chi-Square (χ^2) = 1911.654, DF = 2006, Sig. = .934).

The 'Listwise detection' is a technique employed in order for a researcher to deal with missing values. Specifically, this technique incorporates deleting the missing values cases that are detected in the data. In other words, it considers the missing values as MCAR (Olinsky, Chen, & Harlow, 2003; Arbuckle, 1996; Marcoulides & Schumacker, 2013). This method sometimes is also called complete case analysis and is default procedure for many statistical programmes (Pigott, 2001). One main problem with this technique is that if the cases with missing values differ in some way from those with no missing values, for instance they are not MCAR, and then the remaining cases will be classed as a biased sub-sample of the total sample. Therefore, the analysis will yield biased results (Bennet, 2001). Despite that, as previously stated, when missing data are MCAR, then the observed data are essentially a random subset of the complete data. Thus, parameters derived from MCAR data under listwise detection are equivalent to those derived from complete data (Little, 1988; Bennet, 2001; Schafer & Graham, 2002; Marcoulides & Schumacker, 2013; Little & Rubin, 2002, 2014). In the current study, the reason for choosing this technique was due to the missing values in the data sample being MCAR. Furthermore, the number of cases with missing values was low. Finally, as long as these techniques were applied (missing value cases were erased), the remaining data was 761 cases.

4.3.2 Outliers

The technique employed in order to assess the SEM's parameters was the maximum likelihood. The parameters were inspected for normality and outliers, on account of the maximum likelihood being based on the normality assumption (White, 1982; Hair et al., 1998; Tabachnick & Fidell, 2001, 2007).

According to Tabachnick and Fidell (2001, 2007) outliers are described as cases with extreme or unusual values. These values can be considered either as univariate (single variable) or as multivariable (combined variables). Tabachnick and Fidell (2001, 2007) also noted that 'univariate' outliers are cases with an extreme value on one variable, while 'multivariate' outliers are cases with an unusual combination of scores on two or more variables (Tabachnick & Fidell, 2001, 2007).

A technique that can aid towards the identification of 'univariate' outliers is to convert the values of each variable to standard scores, for instance Z, with a mean of 0 and a standard deviation of 1. Tabachnick and Fidell (2001; 2007) recommended considering cases with Z scores that are higher than 3.29 ($p < .001$, two tailed test) to be outliers. Hair et al. (1998) suggest cases with Z scores that range from 3 to 4 to be outliers in occasions with large data sets, such as more than 80 cases. Nevertheless, critical Z score is depended on the sample size. In the current study, there were 11 variables. Specifically, these were: IC1, IC2, IC5, LC1, AI6_AID, LC2, LC3, SI6_PGI, AI1_FC, AI2_FC, which had 101 cases with Z scores more than 3.29. In particular, there were 90 cases that had Z scores of -3.30 and 11 cases with Z score of -3.44.

Cohen et al. (2013) note that '*when outliers are low in number and not very extreme, then they are better to be left alone'*. In this study, due to the fact that the 'univariate' outliers' number was low and the Z scores of these outliers were not so extreme the author decided not to erase them. Therefore, the data remained as 761 full responses.

4.3.3 Normality of Distribution

The author, in order to assess the normality distribution of the observed variables, employed various statistical and graphical techniques via the use of SPSS. Specifically, the graphical techniques included normality plots, expected normal probability plots, de-trended expected normal probability plots, and frequency histograms. A thorough inspection of the aforementioned graphs did not expose any normality assumptions violations. In Appendix Z are presented all normality plots and frequency histograms for each variable.

In this study, the normality distributions of the variables were assessed by applying two statistical methods, kurtosis and skewness. In particular, kurtosis is about measuring the flatness or peakedness of a distribution, while skewness is about measuring the symmetry of a distribution (Mardia, 1970; Tabachnick & Fidell, 2001, 2007). A distribution is considered to be normal when the kurtosis and skewness values are equal to zero (Mardia, 1970). Nonetheless, there are no formal cut-off points on the levels of kurtosis and skewness in order to define when variables are no longer classed as normal (Curran, West, & Finch, 1996; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Flora & Curran, 2004). Despite that, Tabachnick and Fidell, (2001, 2007) proposed that kurtosis and skewness values need to be within the range of -2 to +2 when the distribution of variables is normal. According to the Monte Carlo studies a kurtosis value that is smaller than 7.00 and a skewness value that is smaller than 2.00 can be classed normal. On the other hand, the kurtosis values that range from 7.00 to 21.00 and the skewness values that range from 2.00 to 3.00 are treated as moderately non-normal. Finally, when the kurtosis values are greater than 21.00 and the skewness values are greater than 3.00, the values are treated as extremely non-normal (Layard, 1974; Harwell et al., 1992; Curran, West, & Finch, 1996; DeCarlo, 1997). Another suggestion comes from Kline (2015) who stated that the variables with skewness values greater than 3.00 are treated as skewed and the variables that have kurtosis values greater than 8.00 are treated as having extreme kurtosis.

This study's variables' standard deviations, means, and kurtosis and skewness, are presented in Table 4.4. There were zero variables identified with skewness greater than 3.00, as well as zero variables identified with kurtosis greater than 5.00. As displayed in the outcomes of this table, all variables can be treated as normally distributed. Consequently, the maximum likelihood estimation can be utilised in order to test the current study's model (White, 1982; Hair et al., 1998; Hooper, Coughlan, & Mullen, 2008).

Table 4. 4: Descriptive statistics of the variables utilised in the study's model (n=761)

Descriptive Statistics									
Variable	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Parental Background (Admissions office)									
Father's education	761	1	5	2.28	1.21	0.73	.089	-0.73	.177
Mother's education	761	1	5	2.77	1.26	0.12	.089	-1.16	.177
Pre-entry qualifications (Admissions office)									
A Level scores	761	40	97.5	85.72	4.25	-0.12	.089	0.76	.177
First Engagement Questionnaire*									
Initial Commitments (5): IC - (First Engagement Questionnaire)									
IC1	761	1	5	3.12	.617	-.589	.089	1.625	.177
IC2	761	1	5	3.04	.556	-.259	.089	1.317	.177
IC3	761	1	5	2.97	.673	-.486	.089	.675	.177
IC4	761	1	5	3.23	.720	-.794	.089	.710	.177
IC5	761	1	5	3.41	.628	-.901	.089	1.257	.177
Engagement Questionnaire**									
Social Integration (SI) - Peer Group Interactions (7): SI_PGI									
SI1_PGI	761	1	5	2.98	.772	-.629	.089	.345	.177
SI2_PGI	761	1	5	3.17	.722	-.760	.089	.770	.177
SI3_PGI	761	1	5	2.89	.958	-.540	.089	-.632	.177
SI4_PGI	761	1	5	3.07	.732	-.790	.089	1.013	.177
SI5_PGI	761	1	5	5.17	1.274	-1.190	.089	-.045	.177
SI6_PGI	761	1	5	1.66	.612	.490	.089	.102	.177
SI7_PGI	761	1	5	2.18	.936	1.020	.089	1.259	.177
Social Integration (SI) - Interactions with Faculty (5): SI_IwF									
SI1_IwF	761	1	5	2.91	.750	-.539	.089	.304	.177
SI2_IwF	761	1	5	1.12	.320	2.409	.089	3.811	.177
SI3_IwF	761	1	5	2.28	.663	-.479	.089	.572	.177
SI4_IwF	761	1	5	1.93	.625	.406	.089	.847	.177
SI5_IwF	761	1	5	2.58	1.075	.155	.089	-1.329	.177
Academic Integration (AI) - Faculty Concern for Student Development & Teaching (5): AI_FC									
AI1_FC	761	1	5	1.80	.711	1.140	.089	3.178	.177

AI2_FC	761	1	5	1.91	.743	.998	.089	2.379	.177
AI3_FC	761	1	5	2.06	.969	1.484	.089	2.582	.177
AI4_FC	761	1	5	2.27	1.118	1.221	.089	.940	.177
AI5_FC	761	1	5	2.55	1.210	.835	.089	-.221	.177
Academic Integration (AI) - Academic Intellectual Development (AID) (7): AI_AID									
AI1_AID	761	1	5	3.00	.733	-.503	.089	.246	.177
AI2_AID	760	1	5	2.97	.690	-.565	.089	.760	.177
AI3_AID	761	1	5	2.89	.721	-.388	.089	.137	.177
AI4_AID	761	1	5	2.90	.685	-.489	.089	.582	.177
AI5_AID	761	1	5	3.00	.664	-.320	.089	.250	.177
AI6_AID	761	1	5	1.96	.762	.931	.089	2.882	.177
AI7_AID	761	1	5	2.97	.722	-.519	.089	.400	.177
Later Commitments (5): LC									
LC1	761	1	5	3.50	.601	-1.078	.089	1.778	.177
LC2	761	1	5	2.72	.976	.992	.089	2.050	.177
LC3	761	1	5	2.12	.729	.983	.089	3.846	.177
LC4	761	1	5	4.52	1.489	-.405	.089	-1.247	.177
LC5	761	1	5	1.43	.610	1.097	.089	.158	.177

*See Appendix 3: First Engagement Questionnaire

**See Table 3.2: Institutional Integration Scales' Items (Pascarella and Terenzini, 1980, pp 66-67) and Appendix 4: Engagement Questionnaire

4.3.4 Sample Size

According to White (1982), Hair et al. (1998), and Hooper, Coughlan, & Mullen (2008), SEM necessitates a large sample size in order to acquire reliable and significant parameter estimates. Nonetheless, there is no definition of how large a sample size is required in order to conduct SEM (Hair et al., 1998; Hooper, Coughlan, & Mullen, 2008). However, Anderson and Gerbing (1988) accept sample size between 100 and 150 as the minimum for conducting SEM. On the other hand, Kline (2015) proposes that all sample sizes below 100 cases could be treated as small, a sample size between 100 and 200 as medium size, and sample sizes that exceed 200 could be treated as large. Nevertheless, Hair et al. (1998) has also stated that a model that presents more parameters will demand a larger sample and the smallest sample size should be at least greater than the number of free parameters. In addition, Bentler (1985) and Bentler and Chou (1987) noted that a ratio of a minimum of five cases per estimated free parameter is acceptable in order to acquire significant estimates. Finally, Mueller (1997, 2008) recommends that the ratio of the number of cases to the number of observed variables is suggested to be at least 10:1.

Applying the previous theory, the sample size of the current study covered all of the aforementioned requirements. Specifically, the sample size is 761, which is greater than the 200 cases. Furthermore, in the hypothesis structural model there were 23 observed variables and 56 free parameters. The ratio of the sample number to the free parameters number of the model was 14:1. Finally, the ratio of the number of cases to the number of observed variables was 33:1. As a result, the SEM analysis could be administered without any additional complication. As Osborne and Costello (2004) noted '*larger samples are better than smaller samples because larger samples tend to minimize the probability of errors, maximize the accuracy of population estimates, and increase the generalisability of the results'*.

4.4 Confirmatory Factor Analysis

Anderson and Gerbing (1984; 1988), Bollen and Long (1993), Castaneda (1993) proposed a two-fold SEM procedure, which was also employed in the current study in order to estimate parameters. This was a measurement model that was accompanied by an SEM model. In particular, the measurement model is a Confirmatory Factor Analysis (CFA) which aims to define the relationships between latent and observed variables. The structural model then defined the connections amongst latent variables (Kaplan, 2008; Lomax & Schumacker, 2012; Brown, 2014). The structural model analysis is presented in Section 4.5

The CFA was applied using the AMOS software programme with the four latent variables (academic and social integration, initial and later goals and commitments) and 34 observed variables. Furthermore, the CFA supports the assessment of the validity and reliability of the observed variables for every latent variable (Sörbom, 1989, Jöreskog and Sörbom 1988, 1993; Hooper, Coughlan, & Mullen, 2008). The reliability of the observed variable is related to the variance degree elucidated by the construct rather than by error, which is measured by squared factor scores. Additionally, the observed variables considered to have a high reliability when the squared factor loading (or factor scores) for every variable is greater than 0.70, moderate if between 0.50 and 0.70, and poor if less than 0.50 (Jöreskog, 1976, 1993; Brown, 2014). As a result, in the current study any observed variables that had squared factors less than 0.50 were deleted from the model.

On the other hand, validity is considered as the degree of the observed variables that precisely evaluate what they are assumed to evaluate (Hair et al., 1998). Specifically, validity is acquired when the association between the observed and latent variables is statistically significant (Anderson & Gerbing, 1984; 1988).

In the current study, all measurement models were over-identified and the Maximum Likelihood estimation method was employed in order to estimate parameters. In particular, two procedures were applied to evaluate the goodness of fit of the measurement model. The first procedure aimed to test the goodness of fit of the individual parameters and the second aimed to test the goodness of fit of the entire model. Specifically, the first procedure was conducted in two steps. Step one was used to test the feasibility of the individual parameters' estimates values. This process helps a researcher to test if their estimates values are in the admissible range or not (Byrne, 2013). These estimates values incorporate: non-positive definite correlation matrix, negative variance, and correlation exceeding one (ibid). None of the aforementioned complications were detected while implementing the CFA for every latent variable.

The second part in evaluating the goodness of fit of the individual parameters was to test their statistical significances. According to Holmes-Smith (2001), parameters are treated as statistically significant when their t-values are greater than or equal to 1.96 at a level of $\alpha=0.05$. As a result, all non-significant parameters need to be removed from the model (Holmes-Smith, 2001).

As it was mentioned in Chapter 3, the second process in testing the goodness of fit of the measurement model was to evaluate the goodness of fit of the entire model. Even if the AMOS software programme offers a variety of fit indices, in the current study, the author employed major indices proposed by Byrne (2013). Specifically, these were: i) Chi-square (χ^2) test, ii) the Normed chi-square (χ^2/df), iii) Goodness-of-Fit index (GFI), iv) Adjusted Goodness of-Fit Index (AGFI), v) Comparative Fit Index (CFI), and vi) Root Mean Square Error of Approximation (RMSEA). In the following paragraphs is presented a brief explanation of these indices.

- The chi-square (χ^2) test is a traditional goodness of fit index and the only statistical significance test in SEM. A chi-square value that is non-significant signifies that the data sample fits well the hypothesized model (Tomarken & Waller, 2005). On the other hand, the Normed chi-square (χ^2/df) is the ratio of the χ^2 divided by the degree of freedom and a value less than 3.00 signifies acceptable fit (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004). Nonetheless, χ^2 is influenced by the sample size and the data normality (Hu & Bentler, 1999; Tomarken & Waller, 2005; Tabachnick & Fidell, 2001, 2007; Schumacker & Lomax, 2004, Lomax & Schumacker 2012; Stevens, 2012; Kline, 2015). As a result, the χ^2 test needs to be employed in combination with other indices.
- The GFI and AGFI indices are similar to squared multiple correlation and they define the relative amount of sample covariance and variance justified by the model. However, there is a difference between the AGFI and GFI. The AGFI adjusts the number of degree of freedom in the specified model, while GFI does not. Despite that, both indices range from 0 to 1, with values above 0.90 signifying a model of good fit (Byrne, 2013).
- Furthermore, the CFI index compares the hypothesized model's fit to an independent or null model. The values it includes range from 0 to 1, with values exceeding 0.90 signifying a model of good fit (Hu & Bentler, 1999).

- Finally, the RMSEA describes the difference per degree of freedom between the data sample and the hypothesized model. As reported by Browne & Cudeck (1993) and MacCallum et al. (1994) the RMSEA values that are less than or equal to 0.05 should be treated as values of good fit. Additionally, RMSEA values that are between 0.05 and 0.08 can be considered as values of adequate fit and values that are between 0.08 and 0.10 as a mediocre fit. Finally, values that are above 0.10 cannot be acceptable.

In this study, because most of the fit indices initially demonstrated a poor level of fit, the author had to modify the model until the fit indices indicated an acceptable level. As explained in Chapter 3, the AMOS software programme provides three techniques that can help the model's modification. These are: the MI, the EPC and the standardized residuals (Byrne, 2013). The MI describes the expected drop in overall χ^2 values when every fixed parameter was to be freely estimated in a subsequent run. Larger MI for a particular fixed parameter can indicate a better model fit by permitting this parameter to be free (ibid). The EPC signifies the estimated change in the magnitude and direction of every fixed parameter provided that it was to be free (Brown, 2014). Finally, the standardized residuals are like the Z scores. Larger values signify that a particular association is not well interpreted by the model. Specifically, as Jöreskog and Sörbom (1988) suggested, values greater than 2.58 can be treated as large. An in-depth analysis and discussion of the aforementioned techniques used in the current study is provided in the consequent sections.

4.4.1 Confirmatory Factor Analysis for Initial and Later Goal and Institutional Commitments

The 'Initial and Later Goal and Institutional Commitments' were measured by employing Pascarella and Terenzini's (1980) goal / institutional scale, which was embedded in both 'First Engagement Questionnaire' and 'Engagement Questionnaire'. Essentially, this scale is synthesised by six items (see Section 3.6.2, Table 3.2). Nevertheless, one of the items in the scale was removed because it could not be applied in the UK Higher Education context. This item was "I have no idea what I want to major in" as this didn't have the same meaning for students in UK higher education. As a result, the initial 'Initial and Later Goal and Institutional Commitments' measurement model consisted of 2 factors and 10 observed variables.

The initial 'Initial and Later Goal and Institutional Commitments' measurement model results did not fit the data well. As seen in Table 4.5, the results based on this model indicated a poor fit with 4 observed variables had very poor reliabilities. Specifically, IC3 in the 'First Engagement Questionnaire' and LC2, LC3, and LC5 in the 'Engagement Questionnaire' (low squared factor scores of 0.53, 0.43, 0.41, and 0.43), and the initial measurement model was therefore modified.

The first modified 'Initial and Later Goal and Institutional Commitments' measurement model was elaborated through the deletion of the preceding 4 observed variables from the initial measurement model. The outcome generated a moderate lack of fit between the model and the data (see Table 4.5). As a result, the model was modified again.

The MI indicated that a correlation of the error terms between IC1 and LC1, as well as between IC4 and LC4, could statistically improve the model fit. According to Bollen and Long (1993, p. 297) '*every correlation between error terms must be explained and interpreted substantively*'. Byrne (2013) has recommended that '*correlated error terms between item pairs are usually an indication of a high degree of overlap in item content'*. He also noted that '*allowing the error terms of each pair to be correlated appears to be both statistically acceptable and conceptually meaningful'*, because these observed variables are the same variables. In this case they are measuring students' commitments in the 'First Engagement Questionnaire' and the 'Engagement Questionnaire'.

The second and final modified 'Initial and Later Goal and Institutional Commitments' measurement model allowed error terms to be correlated between IC1 and LC1, as well as between IC4 and LC4. As can be seen in Table 4.5, the outcome generated a good fit between the model and the data.

Table 4. 5: Initial and Later Goal and Institutional Commitments measurement models

Initial measurement model	chi^2 (χ^2) = 178.74 with $p < 0.05$ (statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	40	4.47	.92	.86	.83	.12
First modified measurement model	chi^2 (χ^2) = 60.04 with $p < 0.05$ (statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	9	6.74	.94	.88	.93	.14
Second and final measurement model	chi^2 (χ^2) = 38.71 with $p < 0.05$ (not statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	16	2.41	.98	.96	.97	.08
Benchmark		<3.00	>.90	>.90	>.90	≥.05 (good fit), .05-0.8 (adequate fit), 0.8-0.10 (mediocre fit)
Note: df = degree of freedom; χ^2/df: ratio of likelihood (χ^2) to degrees of freedom= χ^2/df; GFI: Goodness-of-Fit index; AGFI: Adjusted Goodness of-Fit Index; CFI = Comparative fit index.; RMSEA = Root Mean Square Error of Approximation						

Analysing the standardised residual covariances for the second and final model, which are displayed in Table 4.6, revealed that none of the values exceed the limit-point of 2.58. Specifically, the top value was – 1.52, which validated that the second and final model was a good fit of the data. In Table 4.7 are presented the final results of the CFA for the ‘Initial and Later Goal and Institutional Commitments’.

The second and final ‘Initial Goal and Institutional Commitments’ measurement model included 4 observed variables and the ‘Later Goal and Institutional Commitments’ contained 2 observed variables. All of the observed variables, as presented in Table 4.7, exhibited factor scores ranged from 0.68 to 0.78 and were statistically significant. This demonstrates good genuineness. The reliability of the observed variables ranged from 0.49 to 0.61 signifying a good reliability level. Finally, the ‘Initial and Later Goal and Institutional Commitments’ measurement models are graphically demonstrated in Figure 4.1.

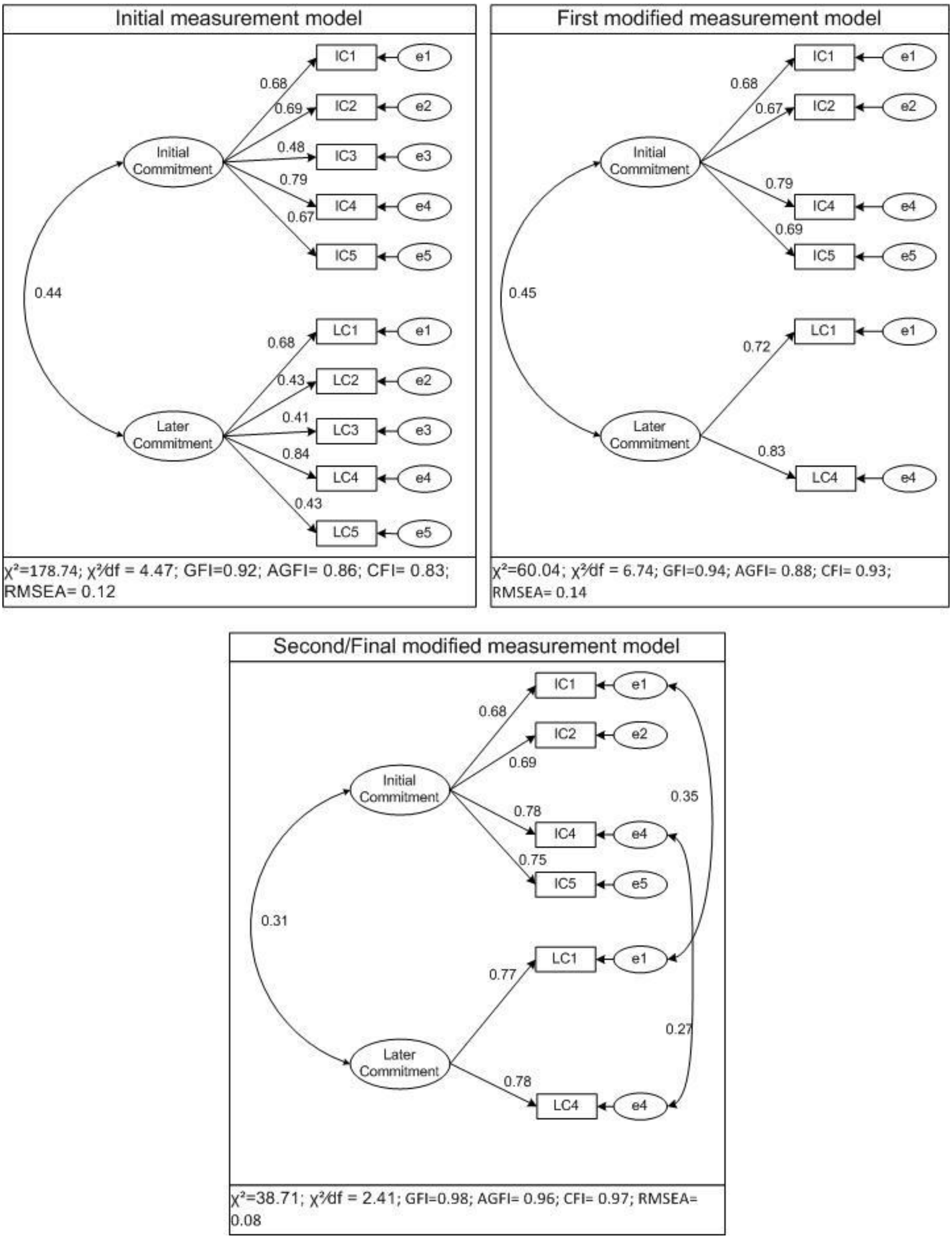
Table 4. 6: Standardised Residual Covariances (Final Model)

	LC4	LC1	IC5	IC4	IC2	IC1
LC4	.3572					
IC5	.4138	.0000				
LC5	-.6225	-1.5212	.0000			
IC4	.6134	1.5172	.1262	.0000		
IC3	-.4127	-.4388	.2268	-.3273	.0000	
IC1	.0585	.0000	-.5215	.1914	.3113	.0000

Table 4. 7: CFA for the Initial and Later Goal and Institutional Commitments (Final Model)

Variables	Factor scores	Observed variables reliability	Variance error
IC1	0.68	0.49	0.51
IC2	0.69	0.49	0.51
IC4	0.78	0.64	0.36
IC5	0.75	0.56	0.44
LC1	0.77	0.60	0.40
LC4	0.78	0.61	0.39

Figure 4. 1: The measurement models for Initial and Later Goal and Institutional Commitments



4.4.2 Confirmatory Factor Analysis for Social Integration

The measurement of the 'Social Integration' was conducted using two of Pacarella and Ternzini's (1980) scales. These were Interaction with Faculty and Peer-Group interactions. The 'Interactions with Faculty' scale had 5 items and the 'Peer-Group interactions' scale had 7 items. The initial 'Social Integration' measurement model therefore consisted of 2 factors and 12 observed variables.

The outcome of the initial 'Social Integration' measurement model signified that the model fitted the data well (see Table 4.8). Nevertheless, the outcome signified that 5 observed variables (SI4_IwF, SI5_IwF, SI5_PGI, SI6_PGI, and SI7_PGI) had very poor reliabilities with squared factor scores of 0.50, 0.44, 0.45, 0.41, and 0.35. As result, the model was modified.

The first modified 'Social Integration' model removed these 5 variables from the initial model and generated a moderate fit between the model and the data. As a result, the model had to be modified again. The MI revealed a correlation of error terms between item 1 and 6 could statistically improve the model fit. These items were SI1_PGI "Since coming to this university, I have developed close personal relationships with other students" and SI2_PGI "The student friendships that I have developed at this university have been personally satisfying". It was identified that the two observed variables were connected with the common construct 'Social Integration', as well as having similar words. As a result, their error terms were correlated as a statistically acceptable and conceptually meaningful (Bollen & Long, 1993, p. 297; Byrne, 2013).

The second and final modified 'Social Integration' measurement model allowed error terms to be correlated between SI1_PGI and SI2_PGI. As can be seen in Table 4.8, the second modified model generated a good fit between the model and the data.

Table 4. 8: Social Integration measurement models

Initial measurement model	chi² (χ^2) = 100.23 with p < 0.05 (statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	45	2.22	.95	.93	.91	.07
First modified measurement model	chi² (χ^2) = 75.19 with p < 0.05 (statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	14	5.15	.96	.92	.92	.11
Second and final measurement model	chi² (χ^2) = 40.60 with p < 0.05 (not statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	14	2.90	.98	.95	.96	.08
Benchmark		<3.00	>.90	>.90	>.90	≥.05 (good fit), .05-0.8 (adequate fit), 0.8-0.10 (mediocre fit)
Note: df = degree of freedom; χ^2/df: ratio of likelihood (χ^2) to degrees of freedom= χ^2/df; GFI: Goodness-of-Fit index; AGFI: Adjusted Goodness of-Fit Index; CFI = Comparative fit index.; RMSEA = Root Mean Square Error of Approximation						

The analysis of the standardised residual covariances for the second model, which are displayed in Table 4.9, identified that none of the values exceed the limit-point of 2.58. The top value was 2.23, which validated that the second model was a good fit of the data. In Table 4.10 the final results of the CFA for 'Social Integration' are presented.

The second and final 'Social Integration' measurement model included 7 observed variables. As presented in Table 4.10 all of the observed variables exhibited factor scores that ranged from 0.70 to 0.79 and were statistically significant showing good genuineness. The reliability of the observed variables ranged from 0.40 to 0.73, which signified a moderate reliability level. Finally, the 'Social Integration' measurement models are graphically demonstrated in Figure 4.2.

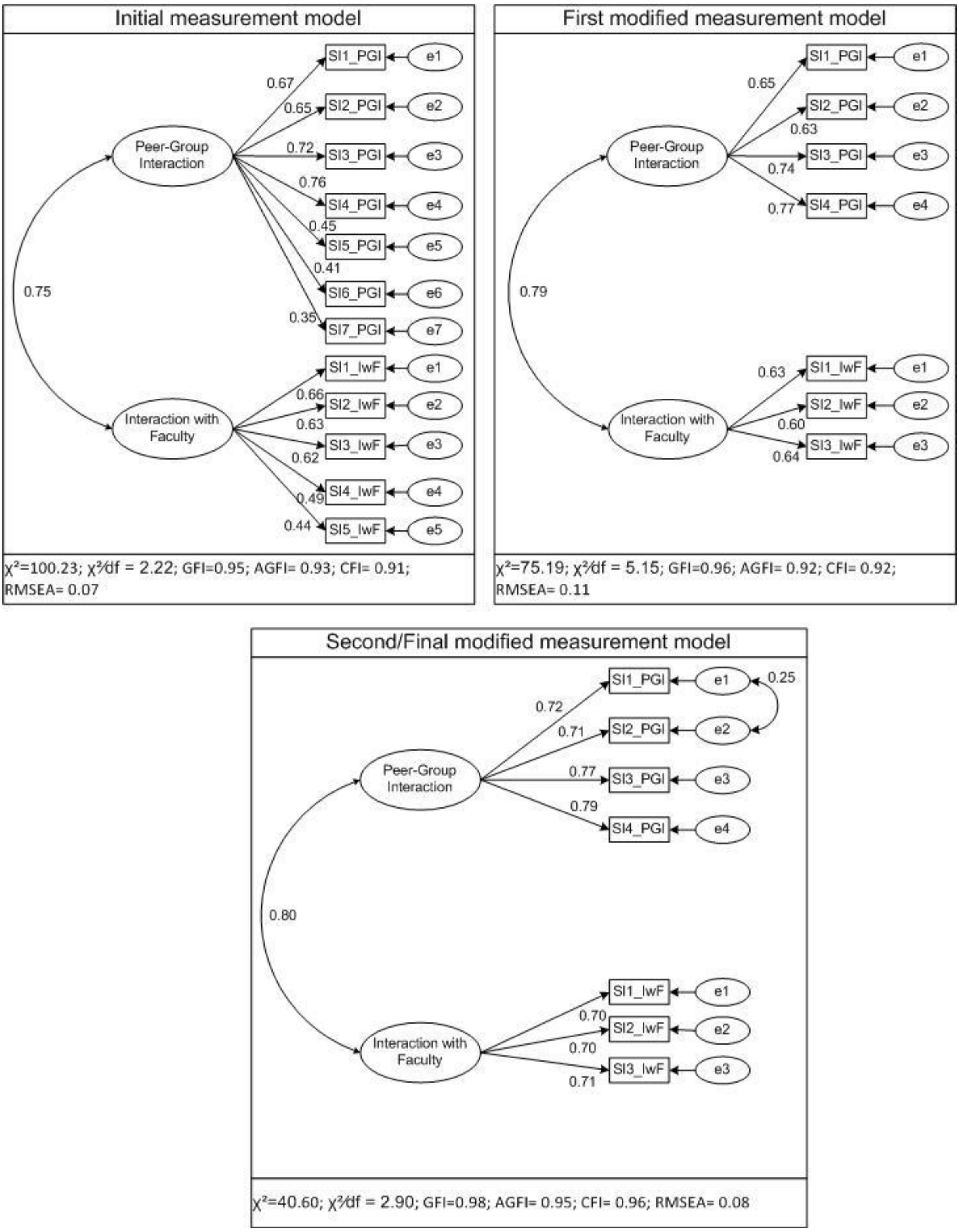
Table 4. 9: Standardised Residual Covariances (Final Model)

	SI4_PGI	SI3_PGI	SI2_PGI	SI1_PGI	SI3_IwF	SI2_IwF	SI1_IwF
SI4_PGI	.0000						
SI3_PGI	.0655	.0000					
SI2_PGI	-.5116	.0627	.0000				
SI1_PGI	-.1242	.5103	.0000	.0000			
SI3_IwF	.9309	.9564	1.5240	-1.1056	.0000		
SI2_IwF	.1689	-1.5631	-.1879	-.4587	-1.2342	.0000	
SI1_IwF	-.7441	-1.3922	.7421	.6153	-1.1343	2.2345	.0000

Table 4. 10: CFA for the Social Integration (Final Model)

Variables	Factor scores	Observed variables reliability	Variance error
SI1_PGI	0.72	0.44	0.56
SI2_PGI	0.71	0.42	0.58
SI3_PGI	0.77	0.66	0.34
SI4_PGI	0.79	0.73	0.27
SI1_IwF	0.70	0.40	0.60
SI2_IwF	0.70	0.41	0.59
SI3_IwF	0.71	0.51	0.49

Figure 4. 2: The measurement models for Social Integration



4.4.3 Confirmatory Factor Analysis for Academic Integration

The measurement of the ‘Academic Integration’ was conducted using two of Pacarella and Ternzini’s (1980) scales. These were Academic and Intellectual Development, and Faculty Concern for Student Development and Teaching. The ‘Academic and Intellectual Development’ scale had 7 items, with the ‘Faculty Concern for Student Development and Teaching’ scale having 5 items. The initial ‘Academic Integration’ measurement model therefore consisted of 2 factors and 12 observed variables.

The outcome of the initial ‘Academic Integration’ measurement model signified that the model fitted the data well (see Table 4.11). Nonetheless the outcome revealed that 7 observed variables (AI1_FC, AI2_FC, AI3_FC, AI2_AID, AI4_AID, AI6_AID, and AI7_AID) had very poor reliabilities with squared factor scores of 0.43, 0.32, 0.48, 0.46, 0.44, 0.31, and 0.38. The model was therefore modified.

The first and final modified ‘Academic Integration’ model removed aforementioned the 7 observed variables from the initial model, and as can be seen in Table 4.11, the outcome generated an excellent fit between the model and the data.

Table 4. 11: Academic Integration measurements models

Initial measurement model	chi² (χ^2) = 98.52 with p < 0.05 (statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	58	1.70	.95	.93	.91	.05
First and Final modified measurement model	chi² (χ^2) = 5.20 with p < 0.05 (not statistically significant)					
	df	χ^2/df	GFI	AGFI	CFI	RMSEA
Fit Statistics	4	1.18	.98	.97	.98	.02
Benchmark		<3.00	>.90	>.90	>.90	≥.05 (good fit), .05-0.8 (adequate fit), 0.8-0.10 (mediocre fit)
Note: df = degree of freedom; χ^2/df: ratio of likelihood (χ^2) to degrees of freedom= χ^2/df; GFI: Goodness-of-Fit index; AGFI: Adjusted Goodness of-Fit Index; CFI = Comparative fit index.; RMSEA = Root Mean Square Error of Approximation						

The analysis of the standardised residual covariances for the first (and final) modified model, which are displayed in Table 4.12, identified that none of the values exceeded the limit-point of 2.58. Specifically, the top value was – 0.95, which validated that the first modified model was a good fit of the data. The final results of the CFA for the 'Academic Integration' are presented in Table 4.13.

The final 'Academic Integration' measurement model included 5 observed variables. As presented in Table 4.13 all of the observed variables exhibited factor scores that were ranged from 0.70 to 0.75 and were statistically significant. This is evidence of good validity. The reliability of the observed variables ranged from 0.48 to 0.56, which signifies a moderate reliability level. Finally, the 'Academic Integration' measurement models are graphically demonstrated in Figure 4.3.

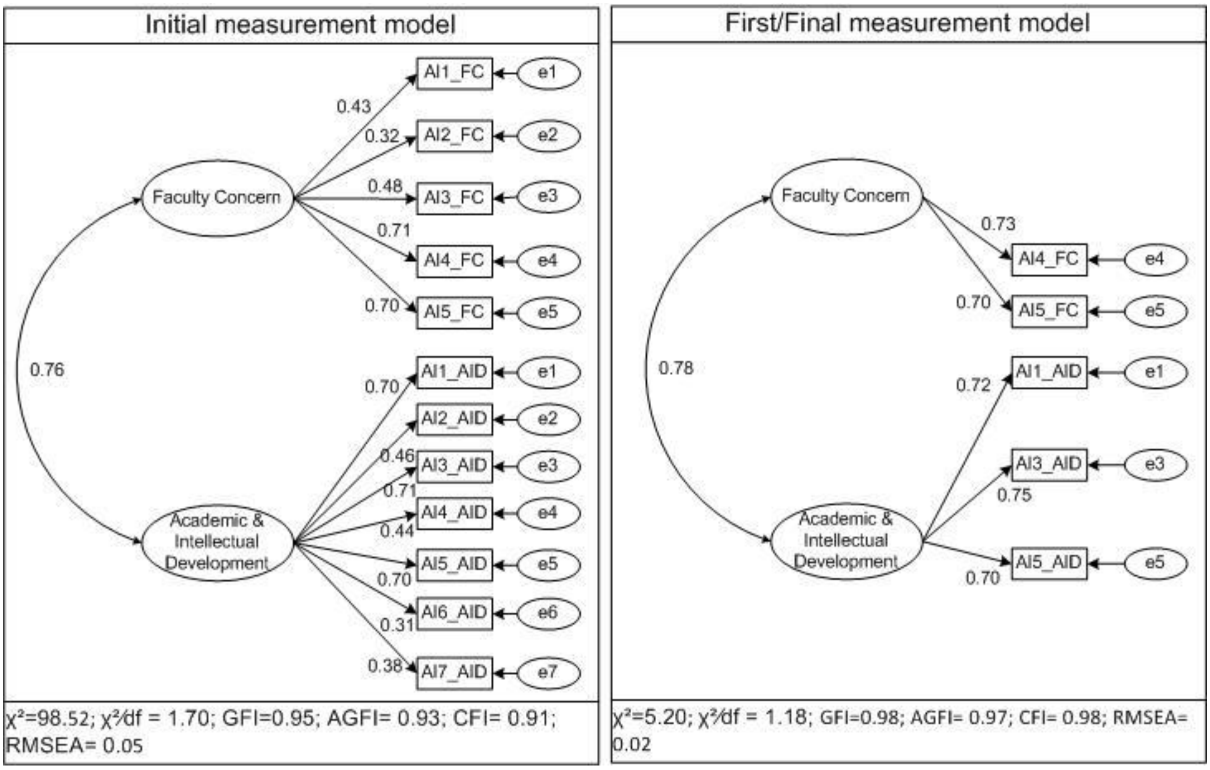
Table 4. 12: Standardised Residual Covariances (Final Model)

	AI5_AID	AI3_AID	AI1_AID	AI5_FC	AI4_FC
AI5_AID	.0000				
AI3_AID	.2051	.0000			
AI1_AID	-.0885	-.0974	.0000		
AI5_FC	-.9551	.5252	.0378	.0000	
AI4_FC	-.8819	.0241	.6155	.0000	.0000

Table 4. 13: CFA for the Academic Integration (Final Model)

Variables	Factor scores	Observed variables reliability	Variance error
AI4_FC	0.73	0.54	0.46
AI5_FC	0.70	0.48	0.52
AI1_AID	0.72	0.52	0.48
AI3_AID	0.75	0.56	0.44
AI5_AID	0.70	0.48	0.52

Figure 4. 3: The measurement models for Academic Integration



As previously described, the second phase, after the measurement model had been established and confirmed, was to test the structural model through the use of AMOS programme. The structural model characterises the relationships between the constructs or the latent variables, and defines those latent variables that indirectly or directly cause alterations in the values of other latent variables in the model (Byrne, 2013).

4.5 Structural Model

The next step, as long as the measurement model was established and confirmed, was to evaluate the structural model through the use of AMOS programme. In particular, the structural model characterises the relationships between the constructs or the latent variables (Byrne, 2013). It defines the latent variables that indirectly or directly cause alterations in the values of other latent variables in the model (ibid).

4.5.1 Structural Model Analysis

In Figure 4.4 is represented the initial path of the theoretical structure model. The outcome of the theoretical structural model revealed that the χ^2 of 514.36 with 198 df was statistically significant with $p < 0.05$, which suggested an inappropriate fit. Byrne (2013) noted that the χ^2 is highly sensitive to sample size and frequently recommends a poor fit with large sample size. The remaining fit statistics revealed a moderate fit between the theoretical model and the data with slightly lower than the commonly acceptable values of 0.90 ($\chi^2/df = 2.60$; GFI= 0.87; AGFI=0.84; CFI=0.81; RMSEA =0.08).

Figure 4. 4: The Initial Theoretical Model Path Diagram

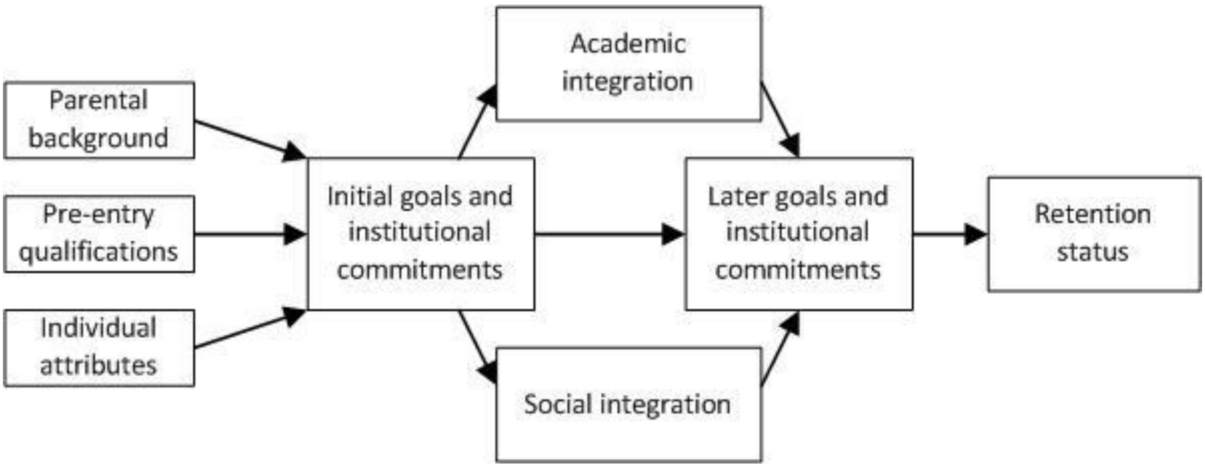
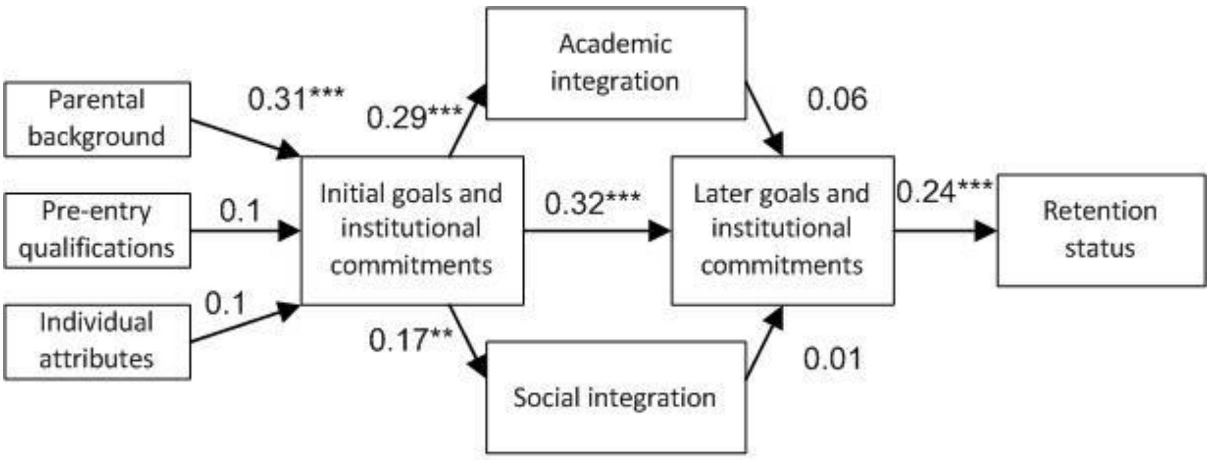


Figure 4.5 shows the standardised path coefficients for the initial theoretical structural model, with 5 of the 9 hypothesised paths significant with $p < 0.05$, were paths from ‘Parental Background’ to ‘Initial goals and institutional commitments’, ‘Initial goals and institutional commitments’ to ‘Academic Integration’, ‘Initial goals and institutional commitments’ to ‘Social Integration’, ‘Initial goals and institutional commitments’ to ‘Later goals and institutional commitments’ and ‘Later goals and institutional commitments’ to ‘Retention Status’.

The remaining 4 hypothesized paths which were not significant were the paths from ‘Individual attributes’ to ‘Initial goals and institutional commitments’, ‘Pre-entry qualifications’ to ‘Initial goals and institutional commitments’, ‘Social Integration’ to ‘Later goals and institutional commitments’ and ‘Academic Integration’ to ‘Later goals and institutional commitments’.

Figure 4. 5: The standardised path coefficients diagram for the initial theoretical structural model



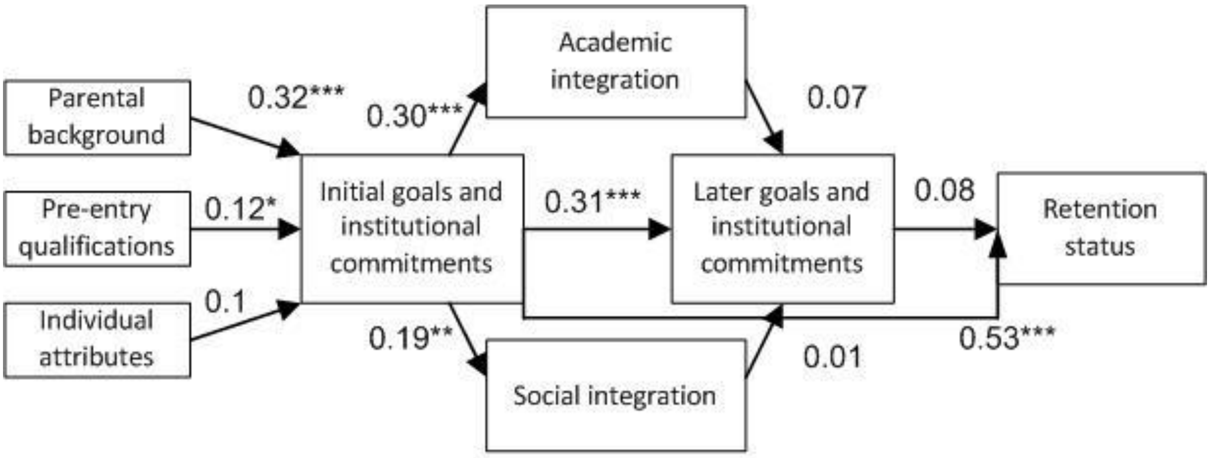
Note: 5% (less than 1 in 20 chance of being wrong), 1% and 0.1% (P < 0.05, 0.01 and 0.001) OR when using the asterisk system, significant at:
P < 0.05 *
P < 0.01 **
P < 0.001***

This initial theoretical structural model interpreted 15% of the 'Initial goals and institutional commitments' variance, 12% of the 'Academic Integration' variance, 6% of the 'Social Integration' variance, 15% of the 'Later goals and institutional commitments' variance and 8% of the 'Retention Status' variance.

According to the MI technique an improved model fit could be achieved through the addition of extra structural paths. Any large MI indicates that freeing the parameter could result in a better fit. The value of the MI is the equivalent of the change in χ^2 between a model in which the parameter is fixed (the original model) and one in which it is free (the model that would result were it freed). Specifically, any value larger than 3.84, the critical value of χ^2 on one degree of freedom, indicates a significant improvement in omnibus fit if the parameter is freed (Sörbom, 1989; Bentler, 1990). It is critical to mention that SEM needs to be driven by theory and so any modifications need to be justified with supporting theories (Bentler & Chou, 1987; Byrne, 2013). According to Jöreskog and Sörbom (1988; 1993) a path with a large MI should be estimated and modified in step. In the current study, the largest MI (71.15) was detected in a path from 'Initial goals and institutional commitments' to 'Retention status'. This indicates that the participant students' 'Initial goals and institutional commitments' had a direct effect on their retention. A similar finding had been identified by Munro (1981) in his American study. Specifically, he discovered a significant direct effect for commitment on retention for first year, full-time, undergraduate higher education students. As a result, in this study, the first modified structural model was elaborated through the addition of one path from 'Initial goals and institutional commitments' to 'Retention status'.

The outcome of the first modified structural model revealed that the χ^2 of 491.13 with 212 df was statistically significant with $p < 0.05$, which suggested a non-appropriate fit. Furthermore, the remaining fit statistics showed a slightly lower value than the commonly acceptable values of 0.90 (χ^2/df = 2.31; GFI= 0.88; AGFI=0.86; CFI=0.85; RMSEA =0.07). In general, the fit statistics revealed a moderate fit between the theoretical model and the data. In Figure 4.6 the standardised path coefficients are presented for the first modified theoretical structural model.

Figure 4. 6: The standardised path coefficients diagram for the first modified theoretical structural model



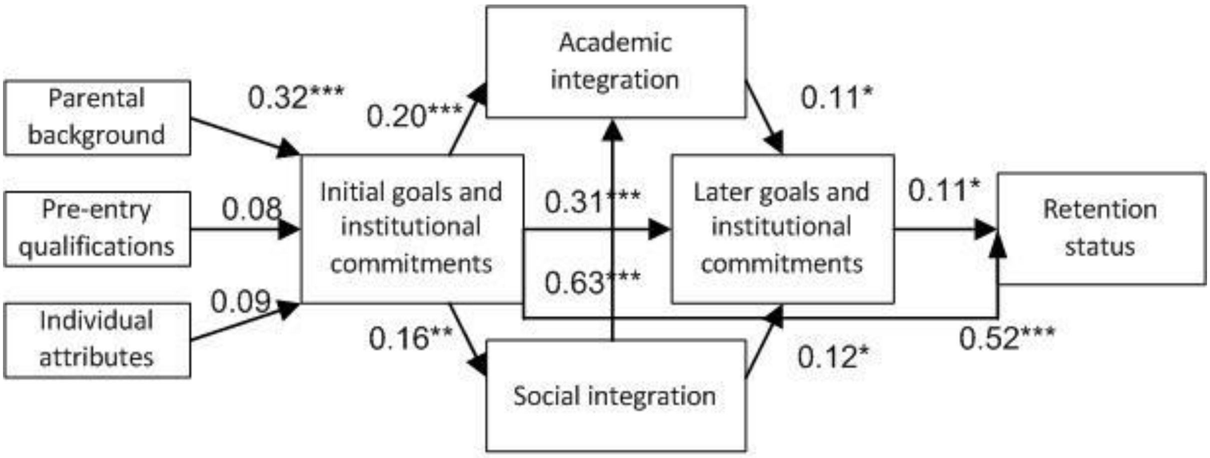
Note: 5% (less than 1 in 20 chance of being wrong), 1% and 0.1% (P < 0.05, 0.01 and 0.001) OR when using the asterisk system, significant at:
P < 0.05 *
P < 0.01 **
P < 0.001***

Through the review of the MI, it was discovered that the first modified structural model could have achieved a better fit if more paths were to be added. Specifically, the largest MI (81.16) was identified via a path from 'Social Integration' to 'Academic Integration'. This indicated that the participant students' social integration had a direct effect on their academic integration. In addition, this effect showed consistency with other researchers' results, such as Williamson & Creamer (1988), Stage (1988) and Nevill & Rhodes (2004). The second modified structural model was therefore elaborated via the addition of a path from 'Social Integration' to 'Academic Integration'.

The outcome of the second modified structural model revealed that despite a χ^2 of 390.08 with 213 df, it was statistically significant with $p < 0.05$, and all the remaining statistics were within acceptable values (χ^2/df = 1.83; GFI= 0.91; AGFI=0.90; CFI=0.91; RMSEA =0.04). As a result, a good fit between the second modified structural model and the data was identified. This model was the final modified structural model with no extra paths recommend for addition via a MI.

Figure 4.7 shows the standardised path coefficients for the second modified theoretical structural model. The model presents 9 hypothesised paths at least significant with p < 0.05 and only two paths, ‘Individual attributes’ to ‘Initial goals and institutional commitments’, and ‘Pre-entry qualifications’ to ‘Initial goals and institutional commitments’, which were not proved to be significant.

Figure 4. 7: The standardised path coefficients diagram for the second modified theoretical structural



Note: 5% (less than 1 in 20 chance of being wrong), 1% and 0.1% (P < 0.05, 0.01 and 0.001) OR when using the asterisk system, significant at:
P < 0.05 *
P < 0.01 **
P < 0.001***

The second modified structural model interpreted 16% of the ‘Initial goals and institutional commitments’ variance, 45% of the ‘Academic Integration’ variance, 35% of the ‘Social Integration’ variance, 13% of the ‘Later goals and institutional commitments’ variance and 34% of the ‘Retention Status’ variance.

SEM indicates indirect effects as well as direct effects. The indirect effects are those that are interfered by at least one variable. The total effects are the sum of the direct and indirect effects. In general, in SEM, latent variables are used in order to explain the paths (Markus, 2012). In Table 4.14 all direct, indirect and total effects of every latent variable are addressed.

Table 4. 14: Indirect, Direct, and Total Effects of Path Coefficients (Latent Variables – see also path coefficients in Figure 4.7)

	Initial goals and institutional commitments			Academic integration			Social integration			Later goals and institutional commitments			Retention status		
	IE	DE	TE	IE	DE	TE	IE	DE	TE	IE	DE	TE	IE	DE	TE
Parental background	-	.3214	.3214	.0640	-	.0640	.0512	-	.0512	.0992	-	.0992	.2016	-	.2016
Pre-entry qualifications	-	.0833	.0833	.0160	-	.0160	.0128	-	.0128	.0248	-	.0248	.0416	-	.1621
Individual attributes	-	.0914	.0914	.01828	-	.01828	.01462	-	.01462	.02833	-	.02833	.0575	-	.0575
Initial goals and institutional commitments	-	-	-	.1008	0.2060	.3068	-	.1643	.1643	.0160	.3112	.3272	.0311	.5210	.5521
Academic integration	-	-	-	-	-	-	-	-	-	-	.1100	.1100	.0101	-	.0101
Social integration	-	-	-	-	.6310	.6310	-	.	-	.0630	.1205	.1835	.0063	-	.0063
Later goals and institutional commitments	-	-	-	-	-	-	-	-	-	-	-	-	-	.1158	.1158

As shown in Table 4.14 the participant students' retention status acknowledged indirect effects from 'Parental Background', 'Pre-entry qualifications', and 'Individual attributes' via both 'Initial and Later, goals and institutional commitments', 'Academic Integration' and 'Social Integration'. The participant students' retention status also acknowledged an indirect effect from 'Initial goals and institutional commitments' via 'Academic Integration', 'Social Integration' and 'Later goals and institutional commitments'. Finally, there were no indirect effects on the participant students' retention status from 'Academic Integration' and 'Social Integration'. In the sections that follow the author presents the final step of the quantitative data analysis, where all the hypotheses are tested.

4.6 Testing Hypothesis

The outcomes of the analysis showed that 7 of the 9 hypotheses were statistically significant. Table 4.15 provides an analysis of the testing strategy previously described for each individual hypothesis. The statistical significance is defined by: t-values ≥ 1.96 and the average coefficient alpha reliability values above 0.7 latent variables (standardised path coefficient) (Terenzini et al., 1985, Markus, 2012; Byrne, 2013).

Table 4. 15: Hypotheses results

1st Hypothesis: students' pre-entry qualifications (A levels score, skills and abilities) associated with their initial goals and institutional commitments.
Standardised path coefficient: 0.08 and t-value: 1.54. Therefore, this hypothesis was not supported by the data.
2nd Hypothesis: students' parental background associated with their initial goals and institutional commitments.
Standardised path coefficient: 0.32 and t-value: 3.90. Therefore, this hypothesis was supported by the data.
3rd Hypothesis: students' individual attributes (race, age, gender, nationality etc.) associated with their initial goals and institutional commitments.
Standardised path coefficient: 0.09 and t-value: 1.67. Therefore, this hypothesis was not supported by the data.
4th Hypothesis: students' initial goals and institutional commitments associated with their academic integration.
Standardised path coefficient: 0.30 and t-value: 4.61. Therefore, this hypothesis was supported by the data.
5th Hypothesis: students' initial goals and institutional commitments associated with their social integration.
Standardised path coefficient: 0.16 and t-value: 2.41. Therefore, this hypothesis was supported by the data.
6th Hypothesis: students' initial goals and institutional commitments will be associated with their later goals and commitments.
Standardised path coefficient: 0.32 and t-value: 4.36. Therefore, this hypothesis was supported by the data.
7th Hypothesis: students' academic integration will be associated with their later goals and institutional commitments.
Standardised path coefficient: 0.11 and t-value: 1.98. Therefore, this hypothesis was supported by the data.
8th Hypothesis: students' social integration will be associated with their later goals and institutional commitments.
Standardised path coefficient: 0.18 and t-value: 2.71. As a result, this hypothesis was supported by the data.
9th Hypothesis: students' later goals and institutional commitments will be associated with their retention status.
Standardised path coefficient: 0.11 and t-value: 2.16. Therefore, this hypothesis was supported by the data.

The structural model analysis also discovered 2 extra paths that were statistically significant. First, the path from 'Initial goals and institutional commitments' to 'Retention status' revealed a significant positive association, which was evident from the standardised path coefficient of 0.52 and the t-value of 7.08. Second, the path between 'Social Integration' and 'Academic Integration' showed a significant positive association with a path coefficient of 0.63 and t-value of 8.53

A CFA analysis was employed in order to evaluate the measurement model's fit, and also the validity and reliability of each latent variable was inspected. The phases of the modified structural model development were then presented through an explanation of every step's procedure. The outcomes indicated that the final modified structural model interpreted 34% of the variation in retention. Finally, the SEM applied to test the hypotheses identified that from the 11 hypotheses, including the study's 9 initial hypotheses and the 2 additional paths emerging from the analysis, 9 were supported.

4.7 Conclusion

The current chapter addressed the outcomes of the quantitative data analysis. Initially the data sample was compared to the population. The data was screened and cleaned, as well as examined for outliers and normality. An analysis of the missing data was also conducted and the aetiology for the SEM sample size requirement was presented. Finally, the quantitative data analysis results addressed in the previous sections were also combined and mixed with the qualitative data, as it was initially indicated by the current study's mixed methods approach. The analysis and interpretation of both, quantitative and qualitative, findings are conducted in Chapter 6, but before this the qualitative data analysis is conducted in the following chapter.

CHAPTER 5: QUALITATIVE DATA ANALYSIS

5.1 Introduction

The aim of the qualitative data analysis was to gain an understanding of the experiences that created conditions for success for first year undergraduate computing students at a UK HEI. The focus group interviews included 10 focus groups with 8 participants in each group (80 students in total), and resulted in distinctive experiences and hundreds of data points defining those unique experiences (see also Section 3.7). In the following sections the author presents a detailed analysis of the completed 'unfolding matrix'. A complete version of the 'unfolding matrix' with raw data amalgamated from a series of interviews (focus groups) is provided in Appendix 5. The data are analysed, coded, theme-grouped and developed into assertions. At this point is important to clarify that the 'unfolding matrix' process of sharing previous comments amongst the participant students did not lead to any sort of bias. On the contrary it enhanced the results' significance as it gave the opportunity to every participant to critically reflect on other students' comments. This was achieved through the initiation of constructive dialogues and arguments that were originated by students themselves. As a result, this added extra value on comments identified by them through an iterative process and helped reveal new areas of interest that otherwise might be difficult to identify.

5.2 Analysing the 'unfolding matrix'

The main study analysis of the 'unfolding matrix' is conducted in the same manner as in the pilot study (see also Section 3.7.2). The aim was to develop a set of assertions or substantial findings via the data analysis. To achieve this, the author and the participants developed codes representing the various commonalities among the data in the 'unfolding matrix'. Then, the codes were grouped into themes in a form of data reduction. Those themes were then shaped into constructs (or assertions), which represent the most important findings of the study. The analysis unit, which are the cells that would be grouped into themes and used to define and support assertions, was the lead data vector 'Experiences'.

The students' experiences or the provided information about their experiences were often related to definitions of other experiences identified in the 'unfolding matrix'. Even though the experiences may or may not be related to each other, the themes outlined within the other vectors were important enough to authorise inclusion in the assertions, despite of the experience they were defining. Furthermore, it is critical to restate that the matrix was completed by applying pre-defined categories for the column headings, and none of the interviews results in an additional 'unfolding' of the matrix.

Consequently, all data collected during the focus group interviews fit into one of the nine extant vectors.

The completed 'unfolding matrix' was reviewed by the author many times. This process offered to the author the opportunity to reach a satisfactory level of valid coding, and themes developing with the data and experiences provided by the participants. Then, the author checked the themes and searched for the overlaps within his analyses. This analysis resulted in a set of assertions, each one supported by the various themes derived from the data set. The final results of these analyses are the five assertions presented in the following section. Finally, after the assertions, the implications of the current study are outlined, and a discussion regarding the challenges related to the 'unfolding matrix' use as a data collection method is conducted. A discussion regarding the limitations of the study concludes the current chapter.

5.3 Assertions

As it was also discussed in Chapter 3, the 'unfolding matrix' works well as a method of organising data as they are collected. Furthermore, this method allows a researcher to comprehend the definition of a given phenomenon on its own or combined with other described experiences. The 'unfolding matrix' analysis uncovered many codes and themes that in turn were developed in five assertions. These assertions are presented in detail in the following sections, and where possible are related to existing theories, as well as supported with quotations from the focus group interviews.

The 'unfolding matrix' examination revealed that learning communities have an impact on students, even if not all experiences presented resulted from direct participation in a learning community. In addition, the academic and social integration concepts, as appropriate conditions for academic persistence and success (Tinto, 1993, 2012), are clearly present. These lead to the **first assertion**: **Learning communities help first year undergraduate computing students to become academically and socially integrated to a university.**

As discussed in Chapters 2 and 3, academic and social integration happens on two different levels: formal and informal. Tinto's theoretical model of student attrition signifies that formal academic integration is academic performance. Nevertheless, academic performance is basically a by-product of a series of interactions, which include interacting with faculty in class, during help sessions or office hours. Formal social integration is evident when students participate in societies, organisations, or other organised activities. Informal integration occurs outside of the places and times where someone would expect interaction to take place. Examples of informal integration are when a student interacts with a member of academic staff at the gym and discusses about non-academic topics, or when simply interacts with peers. Pascarella and Terenzini (2005) note the significance of out of class interactions with faculty members because they can have a regulative effect on students' perceptions of faculty and the university in general.

An important factor within this notion of integration is the students' need to interact with a variety of people while in university. The first year undergraduate computing students interviewed for the current study had specific and repeated interactions, which had a direct impact on their success and on themselves. The focus group interviews participants presented examples of interactions with family members, peers, lectures, assistant tutors that resulted in their learning communities, acquiring new skills, or embedding relationships.

The interactions described are of four different types. To begin with, the **first** type is the **academic** and includes interactions that revolve around academic topics. Even though classmates are part of this set of interactions, participants mainly discussed interactions with lecturers, assistant tutors, and academic advisors.

The fact that the participants characterised interacting with faculty members as a contribution to their success is something expected. Astin (1993, p. 383) mentioned that "*every student-faculty interaction has significant positive correlations with every academic attainment outcome, such as degree attainment and graduating with honours*". Nevertheless, students need to learn how to manage these interactions, as well as familiarise themselves with them. In addition, students mentioned that their interaction with members of academic staff assisted, in a way, to make the instructors (lectures, tutors, and assistant tutors) friendlier towards them. In the following paragraphs are presented quotations from the focus group interviews.

A. During the first semester, one of my tutors used to come and have lunch with us on a weekly basis. This helped me to get used to the idea of being able to approach a tutor and ask for his/her assistance. Also, this experience made me realise that all tutors are, or can be, friendly and approachable. - first year computing student
B. Through the learning community I joined a sports society and whenever I go to the gym for exercise I meet some of my tutors. While we exercise, we talk (not necessarily about class) or we might have a quick coffee or lunch after we finish gym exercise. We can joke around and have conversations for various matters. - first year computing student
C. I developed relationships with my tutors and assistant tutors from my learning community by going in their offices and asking for guidance and help for my assignments. In the beginning it

was intimidating, but after a while I realised that seeking help from my tutors is kind of good. I also realised that they are kind and keen to assist me with my social and academic life as a first year student. - first year computing student

Some of the participants indicated that their tutors and academic advisors provided important help for their academic progress.

A. The academic advisor I contacted was very good. Any questions, any concerns I might have he is there to help me out. He is always keen to give me information and his opinion on important matters. - first year computing student
B. This specific tutor always tries to make sure that all students, international and non-international, understand what they need to do for the module he instructs. He always offers extra help, during office hours, in order to make sure that all students acquire the knowledge required to complete this module's assignments. - first year computing student.
C. In my opinion it is very important to meet with your tutors while you are doing your assignments, in order to make sure you are on the right track. This also helps you to develop good relationships with them. I believe that is how student-tutor relationship should be. – first year computing student

The **second** type of interaction is the **social**. These interactions are those that were more often described by the participants with their roommates (peers), non-learning community friends, friends made within the learning communities, or friends made within their study programmes. Some of these interactions were of academic kind, such as study groups or doing homework together. However, these experiences were discussed within getting to know one's peers' context. For this reason, they are included in the following quotations and not within the previously presented academic discussion.

A. I live in the same floor with students from my learning community and I find it great to be able to have friends who are in the same class with me. – first year computing student
B. I have met people who helped me expand my interactions within the university. I joined societies in which, through various activities, I learn new and different things. Also, I met new people who helped meet other people and improve in my classes. – first year computing student

The participants described many interactions that resulted in good friendships or involvement in sports teams or societies.

A. I joined societies for academic support and that has as a result to make two good friends. It is one of my best experiences in my life, because also helped to make new friends from other courses. This also helped me to create connections with students from other classes. – first year computing student
B. When I first met my tutor, he gave me information about joining societies that where related to my course. – first year computing student
C. I started playing in our university's volleyball team with other students from the same learning community. We play together once every week. Also, it's a good way to meet people outside of class and interact with them in an informal basis. – first year computing student

Even if most interactions took place with instructors in an academic context there were also experiences noted by some participants indicating that social interactions with course instructors contributed to academic success as well. These experiences are represented in the following quotation.

> One of my tutors was so willing to be open with us and find common ground that me, and my fellow classmates, would feel very comfortable coming to her. She put a lot of work into getting to know us. – first year computing student

Apart from developing social interactions, it was equally important to establish relationships with other students early in the semester. This best described in the following quotation.

> In my opinion being comfortable in your university environment is critical for your academic and social success. Especially in the first weeks of your first semester are the most important, because it is when you meet your classmates and you develop your initial friendships and relationships with other students and instructors. In the beginning, it was a stressful situation for me as I had to establish friends, to figure out how classes function, relate myself with class instructors, and go on with a routine... and, in general, get used to the university life. – first year computing student

The previously discussed comment that the first weeks of the first semester are very important for new students is reflected to some prominent higher education researchers' comments. Specifically, Levitz and Noel (1989, p. 66) mentioned that the "*most critical transition period occurs during the first two to six weeks*". In addition, Upcraft and Gardner (1989, p. 10) noted that it is an essential thing for students to establish close friends especially during the first month of enrolment in order to ensure university success.

Even if making close friends is very important, the personal tutor relationship was also identified as a critical part to the students' success. The participant students described a wide range of interactions with their personal tutors, but also a variety of setting related to the significance of having a personal tutor. Furthermore, some of the students mentioned that over the course time assisted their tutors during classes. Even though, these interactions could be interpreted as social or academic mentoring, they fell into a category up to themselves. Several of the participants mentioned that through this participation met new friends and developed relationships with their tutors as a result of their participation. This is important because the participating students did not discuss their experiences as simply being only social or all academic. Correspondingly, the **third** type of interaction that supports this assertion is related to **academic guidance and support programmes**.

The participant students described their relationships with other first year computing students. The following quotations are related to the experiences addressed by the first year computing students about taking advantage of personal tutors.

A. When I joined university as a first year student I met my allocated personal tutor. My personal tutor would give advice and guidance me about the classes. Also, he would give me information about university life and student societies. - first year computing student
B. In my opinion, it is very important to have personal tutors. Yes, sure, you have your friends, your classmates, but it's nice to have someone experienced who is there to guide you. It is nice to have someone to open up and share your concerns with, as well as learn from his/her experience. - first year computing student

These interactions appeared to have profound impacts on the students who discussed them. Wilcox, Winn and Gauld-Fyvie (2005) indicated that there may be a relationship that contributes to the success of student after interacting with peers and their personal tutors. Aldridge and Rowley (1998) also noted that the personal tutor system has a positive impact on the students' persistence through all academic years. Furthermore, Garrison, Anderson, and Archer (1999) mentioned that one of the prominent aspects in students' persistence is the continual presence of tutors, as well as personal tutor support. Sedlacek (1999, 2004) also indicated that having a strong support person available is one of the necessary conditions for success and one of the non-cognitive variables related to retention. Evidently, the personal tutor system is something that can help ensure success and retention for first year computing students, and not only.

The students have also related helpful instances where they have to interact with someone in a professional manner either directly or at a non-university site. As a result, the fourth kind of interaction is **professional**, because it involves interactions with members of university administration, employers, and co-workers in professional settings.

A. After I enrolled as a first year student I worked in a restaurant and the customer service system was not very effective. I talked to my manager and we agreed to develop a new programme that made my co-workers happier and as a result more productive. Inevitably, the customers were also more satisfied. Doing this I felt useful and more professional, even if that was not part of my job. - first year computing student
B. Industry experience is very helpful. One of my tutors told me that having industry experience, even if it is only for a few months, it will increase my chance to secure a placement job (after my successful completion of academic year one and two). It also helps you to have an early experience of real working life while you are still a student, and more importantly apply your university knowledge. - first year computing student
C. Working in a professional environment for the first time helped to learn how industry works and how what I learn in university is actually applied in real world. Also, I am able to communicate on a professional basis or a more mature basis, if you like. This communication with people older and more experienced than me helps me to learn a lot. As a result, I have a more professional approach on my university studies. - first year computing student

Personal tutors are described as those who can offer vital encouragement, tools for staying on course, but also those who remind to students that there is time for social life (Chickering & Gamson, 1987; Lea & Street, 1998). At this point it can be stated that the situations presented by the participant students clearly helped them to stay on course, as well as the sense that they could override university challenges.

The quotations supporting the first assertion have provided an in-depth look at the various types of interactions that the participants had, as well as how those interactions assisted their success at university. Nevertheless, integration has to go beyond interactions with environments and people, but also include **campus involvement**. In the following quotations the students interviewed indicated that they were involved in some aspect of campus life, such as members of societies, living in student accommodation halls, or working in an on-campus job. These experiences helped students to fully integrate at university life.

A. I play football with my housemates and other from different blocks. Before I join the sports society, I was mainly interacting with them in the classes associated with my learning community. Now I am more friends with them, as I got to know them better. It was a very good way to build friendships through a non-academic activity. - first year computing student
B. Sharing the same student accommodation with classmates (same learning community) made things easier for me. We have the same assignments, so we can work things out together. - first year computing student
C. Working at the Students' Union market helped to make many new friends from different courses. It put my social life in whole new level. Also, it made me more mature person because my daily interactions with UK and international students and staff helped me broaden my horizons. - first year computing student

Involvement is a critical aspect to student success and retention. Tinto (1993) includes it in his model as a necessary condition for student success. Furthermore, Smith and Naylor (2001) refer this, asserting that student involvement outside and in the classroom promote academic and social integration, which can then lead to persistence. Thomas (2002) concurs, stating that the role of institutional habitus is very important for student retention, for instance, involvement in societies helped students to build confidence, build friendships, learn new skills, feel comfortable, and develop leadership skills.

The experiences discussed by the participant students and their quotations addressed on the previous pages indicate that student involvement on campus and interactions with various groups of people are essential to their success at university. Even if it was not stated by any of the participants, it is very possible that these scenarios contributed to students' individual decisions to persist towards their bachelor's degree. Nevertheless, only integration and involvement on campus cannot provide a full explanation as to how students have been successful.

Apart from gaining a good sense of campus and developing necessary relationships there, a theme identified throughout data is the students' desire to better know themselves in relation, for instance, to other countries, work experiences, and other cultures. Accordingly, the **second assertion** that was derived from the data is that **first year computing students need to develop a sense of personal awareness in order to succeed.**

Researchers such as Chickering & Reisser (1993) and Stephenson (1998) addressed aspects of personal awareness. Specifically, they mention that students need to have a better understanding of themselves while they mature and move into adulthood. Chickering and Reisser's (1993, p. 117) student development vector is comprised of three components: (A) emotional interdependence, which means freedom from continual and pressing needs for affection, approval from others, or re-assurance, (B) instrumental independence, which is related to the ability to continue activities and solve problems through a self-directed manner, and (C) inter-dependence, which is related to the awareness of someone's place in and commitment to the welfare of the larger community. As discussed in the following quotations by the participant students, all of them were on the way to establish emotional independence and accomplish things, comprehending who they are, and solving problems as appropriate.

A. I went to this university because I wanted to be able to meet other people and make new friends, apart from those who are from the city I live. I have not regretted making this choice. I really like this university. - first year computing student
B. I had friends who were students at this university, but when I came they had complete their studies. So, I had to get involved in things, take advantage of opportunities and make new friends. - first year computing student
C. It was my parents' decision to come in this university, because they were my sponsors and also they wanted me to be close to home. After the first few months I feel that I made the right move. Also I am glad that I am able to go home every weekend. I can see my family and

non-university friends every weekend. At the same time, I am happy that I have made new friends at university and I don't have to go home all the time. - first year computing student

The hypothesis that these students know who they are within the broader context was revealed most strongly by students who came to university from far away UK areas and those who come from EU and international countries. These participants address that they learnt from their new surroundings and this played a role in learning more about themselves.

A. I came to study in this university from a different UK city, far away from here. Participating in societies and university activities helped me feel more comfortable, as I always was a very active person. Of course this also helped me to get to know better my classmates (same learning community) and also make new friends. - first year computing student
B. I come from another European country. I have visited many different places in Europe but it was only for holidays. Surely, it helps you to be open-minded, but it is different from moving to another country for a long term period. It feels like you are out of your comfort zone, but after a while real world feels less scary. The new experiences I had so far are a bit different from the country I come from. For instance, in the country I come from there is no university housing and each student has to find a house on his own. Also, they don't do a 'Fresher's Week' or 'Welcome to University' events. I prefer how things are organised in this university. - first year computing student

The participant students also described the importance of interacting with people different from themselves. Thomas (2002) noted that the student relationships in their collegiate environments helped promote their perceptions about human diversity and their own place in the larger community. This can be identified in the following quotations. Specifically, students described when interactions with a classmate, peer, or instructor may lead to better comprehension of the needs of those persons, and as a result, their ability to co-operate with other people.

A. In my 'A level scores' I had very good grades at Maths. But, in this university, it was so hard to understand my Maths instructor because of his accent. So, it was difficult for me. So, I decided to ask for assistance from other classmates, and that really helped. If I hadn't done that I would not have passed this module. It's all good... I know how to deal with people I don't completely understand...it was a hard situation but I figured it out. - first year computing student

B. I live in a student accommodation hall and I have made friends not only from my floor's flats, but also from other floors in the same block. Of course, all these people do not study the same course. This helps me to learn more about people with different backgrounds and their experiences. I interact with different people on different levels, and I always try to understand 'how they think', or 'what can I do to better explain my opinion'. These interactions and experiences with all those people helped me to better communicate and interact with people. - first year computing student

There were also case in the current study in which students learnt more about themselves while working on campus or non-campus job. The participant students described many things, the ability to learn on their own, defined how to become dependent on their abilities and when to request for assistance became widespread during the analysis of the 'unfolding matrix'.

A. Learning without consulting books, but through somebody else's experiences and then teaching yourself what you are supposed to do. - first year computing student
B. Having worked in the industry before I join this university helped realise how things work on the other side of the world and how different each side's people are. I feel that this helps me a lot with my university studies. - first year computing student
C. I believe that industry experience is very important for young people. Those who had/have the opportunity to have a full-time or part-time job are privileged to see the real world, not only classes. Now, even if you like your job or not, it is a good thing to have one, because it gives you the opportunity to check possible job opportunities for your future carrier. It helps you review options you had in mind so far, but also see examine new possibilities. - first year computing student

These descriptions can also be related with Padilla's (1991, 2009) discussion about the application of heuristic and theoretical knowledge. One of the students presented a scenario in which he was forced to rely on the theoretical knowledge he had learnt in class, but at the same time he had to learn things from others in his workplace in order to accomplish his assigned tasks and get his work done. Another student noted that coming to study in a UK HEI, even if originally being from a different culture, helped her be more open-minded and know how to work with different cultures. Finally, there was one student who discussed the ability to apply knowledge gained in a class, not only in the university context, but also in different contexts, for instance, in his part-time job. These also relate to Sedlacek's (1999, 2004) statement about gaining knowledge in particular fields that are necessary for success.

One more important part of personal awareness is the students' interaction with the university they attend. The participant students addressed that they were involved on campus, which is a theme already presented into the first assertion. Nevertheless, other aspects related to the university they attend were presented as guiding students' persistence. Specifically, students noted the university's friendliness.

A. I usually get help from my classmates, but I mainly seek for advice from my tutors. So far, all my tutors were very polite and always keen to help me. In general, this university is very helpful as a whole. I mean, the library services, finance services, student helps, they are all there to happily assist you. This friendly environment makes feel that I made the right choice to come at this university. - first year computing student
B. I believe there is a direct correlation between students' feeling happy and comfortable being at a university and students' academic success. For example, one I had a very bad, for personal reasons, and I was in our department, going to a class...and I met one of my tutors... and I had a random, but very friendly conversation...that made me feel very good, it cheered me up. The result was that my mood changed positively. - first year computing student
C. I come from a low populated place so, finding a very friendly place like this university made feel really good. This is a very important thing, especially when you move to a new place for the first time in your life. The university's friendly and warm welcoming environment though helped me to feel that this place can be my new home. - first year computing student

The students also addressed other opportunities that were made available to them.

A. I am the student representative of my class. That helped me to ease the transition of being a university student. It is a great experience, as a feel proud of representing my classmates. Of course, this also helps me improve the social aspect of my academic life, as I have to regularly discuss with my tutors and most of my classmates. - first year computing student
B. I and a group of friends created a society in which I was voted as the president. We try to be active, so we organise various activities. It keeps me in touch with my friends, and also I get meet new people all the time. - first year computing student

In addition, other students discussed about the benefits of sharing a house or flat.

A. I share a house with other students, not only first year undergrad. I am the youngest, but my other housemates are sometimes irresponsible. This year I learnt how to organise my time and my daily routines effectively and efficiently. I have to organise everyone in order to pay our bills on time, keep the house clean and cook. For these reason I think that my housemates feel lucky they have me. However, the main problem was that they were very noisy and I couldn't focus on my studies. But, we had a talk and now everything is fine. We all respect each other's study time. Living with other people made realise that I have some good leadership skills. - first year computing student
B. It is really nice to live in a student accommodation hall with a whole lot of other students. You daily recognise people and you get to say 'hi', which helps a lot the social part of your academic life. Again, having so many people living around you, feels great. - first year computing student
C. The student accommodation halls usually will put in the same blocks most of the first year students. That helped a lot to interact with other students, many times from the same class as mine (same learning community), and of course make new friendships. As a result, many times we work on assignments in teams. - first year computing student
D. Most of my classmates (same learning community) lived together in the same student accommodation. That was very helpful for me, academically and socially. Getting to know better the people that I am in class with is great, because it helped me to meet their friends as well. - first year computing student

The aspects of participating in leadership opportunities, getting benefited by sharing a flat/house, and being in a friendly and warm welcoming environment, are also important in UK and international student success literature. For that reason, it is not a surprise that the current study's data analysis emerged similar assertions emerged. Specifically, Boyer (1990) mentioned that a community should be both open and caring, two elements that are related to a university being welcome. Students acquiring leadership skills have been associated with student satisfaction and leadership in university has been tied to continued involvement, and as a result, student persistence (Mulford & Silins, 2003; Kuh et al., 2011). Sedlacek's (1999, 2004) seventh non-cognitive variable can also be reflected at this point, as it addresses the students' need for leadership experiences in order to be successful in university.

The benefits related to students' sharing a flat/house have also been addressed in Section 2.2.4. Nevertheless, extra benefits of students living with classmates and other students include participation in extracurricular activities, frequent engagement with peers and faculty, and being more satisfied with the university in general (Kuh et al., 2011; Biggs & Tang, 2011).

In addition, students addressed the need to seek for personal assistance and guidance when needed. A particular example comes from the following student description:

> In the beginning I was struggling with my course and I felt that I won't be able to complete my first academic year. This caused me stress, especially, when I was seeing that my classmates were not having any significant problems with their studies. I tried to find a solution on my own, but I could not decrease my stress levels. Then, I found out about the academic advisors and decided to arrange an appointment with them. The guy I talked to told me that I was stressing out myself because I was stressed. After a long talk with him I started feeling better. I needed to learn how to control my stress levels and discussing your problems with much more experienced people helps you a lot. - first year computing student

There were other students who had similar problems and solved them out by seeking advice from their instructors, or simply asking others for help. The behaviour of help-seeking is often associated with academic success aspects. As such, it could also be included in the first assertion. Nevertheless, it is categorised with this assertion because it is connected with the personal awareness concept. The participant students admitted that, in order to seek for help, they need to firstly accept that help is a good and necessary thing. Furthermore, the students had to comprehend the help-seeking behaviour benefits in order to be able to take advantage of it.

A. Living with other first year students in the same student accommodation, especially from the same class (same learning community) helps me a lot with my studies. We work on things together, and this helps me improve myself as we learn from each other. - first year computing student
B. My personality type is one of those who do not feel embarrassed or hesitate to seek for assistance and advice. For example, whenever I need help from my personal tutor or module instructor, I will simply contact them by email or knock their office door and ask for help. I did it because it was needed and would help my academic progress. - first year computing student
C. So far, I have attended some help sessions, but in most cases those sessions were very busy covering a large group of students. This was not good, as I didn't have enough time to discuss my queries with the tutor covering those sessions. As a result, there wasn't much you could

learn from those sessions. On the other hand, I have also attended help sessions in small size classes, in which there was only the tutor and a small group of students. These sessions were only for first year students (my learning community), and specifically, Maths-oriented. I learnt a lot from those sessions. - first year computing student

D. Reaching out to people for help is very important for academic advancement and knowledge expansion. From an academic point of view, it helps you clarify and learn from your tutors, as well as from your classmates (same learning community). Also, it helps you interact with other students and tutors, which is one more opportunity to make new friends, but also network with your tutors. An important factor that can help you to keep this network going, is to know when and where to meet those students and tutors. One of the things I have learnt as a first year student is that diplomacy is critical for academic progress. - first year computing student

In the aforementioned assertion examples of first year undergraduate computing students achieving a better consideration of who they are in association with other instructors or students in their environment were described. Throughout these conversations one more theme emerged. This was the concept that first year undergraduate students tend to gain a strong sense of self-awareness and their own self potential. It seemed that they acquired a better understanding of who they are and what they seek from their academic studies, approximately, during the first six months of their studies.

A. I don't really need to work and I consider myself lucky because I can strictly focus on my studies. I always wanted to have a part-time job, but in this period of my life I have put priorities and studying is the first one on the list. Working is not that important yet. - first year computing student
B. Some people say that studying is not fun at all. I don't totally agree with this statement. In my opinion, studying is something that must be done if you want to successful in life. My friends say that I am a very good student. I believe that I am a hard worker and that's the reason I manage to get good grades. - first year computing student
C. I always try to help my friends and classmates. I try to encourage them. I have this thing... always try to do my best, but also keep people around me optimistic about the university work that needs to be done. - first year computing student
D. Since I started my studies I had classmates, friends, who helped me with university work. Of course I also help them... it's nice to give back. I want to meet my aims and having other students from the same learning community to assist you is great. - first year computing student

Most participants identified the importance of getting to know themselves, as well as getting integrated to the institution's environment. Nevertheless, there is the concept of the learning curve in university (Yelle, 1979). According to this, students must not only be able to make acquaintances and have a better sense of what is their aim in university, but also learn to achieve their targets on their own. As a result, students should develop a sense of independence, which is based on an internal locus of control (Lefcourt, 1976). Lefcourt (1976) characterises '*an internal locus of control as being able to believe that success or failure at something is controlled by a person's own behaviour, rather than external circumstances*'. From this notion is derived the **third** assertion. **The transition through university is related with the need of first year undergraduate computing students to become more independent, to learn how to learn on their own, and develop intrinsic motivation.**

Generally speaking, universities have shifted in a locus of control from external to internal sources (Pascarella et al., 1996; Fazey & Fazey, 2001). In the current study, many of the participant student experiences revealed an early dependence on others motivating them to perform well.

A. I always try to do my best when I do my university work. My housemate is from the same course and that helps me a lot. She is a very good student. So, the fact that we live in the house inspires and motivates me to become better. This is what I need in order to do well in university. - first year computing student
B. Living in the same place with your classmates (students from the same learning community) makes things a lot easier. We share similar concerns and struggles, academic and social, which are common for all first year students, especially in the first six months. So, it is good living all together because we help and motivate each other to study, attend classes, and get good grades. - first year computing student
C. I live in a student accommodation on the same floor / flat with some of my classmates. So, we have this 'rule', first one to wake-up in the morning has to also knock doors. In that way we also make sure to go to class. - first year computing student

Nevertheless, students' external locus of control affected their internal motivation, which made them realise that such experiences contribute in their academic success (Pascarella et al., 1996; Fazey & Fazey, 2001).

A. I have my flatmates telling me all the time to do my coursework. I know it is important, but it also requires your motivation. My flatmates' (some of them classmates as well) encouragement help me get thing done. - first year computing student
B. After the first few weeks I got connected with people in my classes. With some of those classmates, we started working together on assignments and tutorial/practical exercises. After a while I realised that whenever I go home (student accommodation) I don't want to hang out with my flatmates. This makes me feel bad, but we don't have common interests, not even common modules. That is why I prefer to mainly interact with my classmates. Also, they help me stay focused on my studies. - first year computing student
C. One of my first year tutors is new. I mean he has been to teaching for the first time in his career. He is a bit nervous and as a result the teaching quality is low. The positive outcome of this situation is that I learnt to distinguish good tutors from bad. Also, in other cases I realised that some tutors are good in lectures than in tutorials/practicals, and the opposite. However, I also realised that sometimes people do jobs they don't like and do for their own reasons. So, I came to understand that the same thing goes for students. In some modules they are good because they think they are more useful, while in some other modules they are not. - first year computing student
D. I learnt to work with other classmates when we have a difficult module. We have a common cause to pass this module. This helped us to develop friendship bonds. I did try to understand my tutor, but the difficulty of this module led us to work together, as a team, in order to succeed. It was the first in my life that I released the importance of teamwork. - first year computing student

Although there was an appreciable shift from external to internal motivation, it was also clear that students acknowledge the need for development and maintenance of university-based support systems. The students mentioned that support systems helped in their ability to succeed due to the realisation that they were not going through tough situations on their own.

A. I learnt about this university service from an email I received on my student mail account. It was very helpful. I asked for help and they offered me guidance and a sort of training, and I managed to get a part-time job. Also, they are always there for you when you need to talk to someone or something. - first year computing student
B. Being part of the university's archery team I managed to interact and develop bonds with other team-members on an informal basis. I feel can meet them any time and if I have a

problem, academic or non-academic, they are there to listen and support me. - first year computing student

C. In big classes the support is not good at all. If you are in a class with 50 or more students, you can get easily distracted. In other cases, there is not enough time for the tutor to support us all. So, I prefer smaller classes, where you can better support, but also develop relationships with your classmates and tutors. - first year computing student

Many of the participant students connected various experiences, such as getting help from others, with the concept of support systems. However, most of them experienced a sense of personal – achievement because they were able to complete a task or accomplish a goal on their own. This inter-dependence with others is connected with students own personal awareness, but realistically is directed on meeting targets themselves.

A. Meeting people with experience and knowledge before I start my university studies helped me a lot to pick the right course. Especially before you enter university when you are not mature, you may get easily affected in the wrong direction. That's why I believe that universities' recruiting services need to keep improving their services in order to attract students who have deliberately decided to study this course. I really like to be surrounded by smart people. This is very good for my self-improvement because I get the opportunity to work with knowledgeable students. Students who are willing to learn, improve, and be successful. This is very inspiring, isn't it? - first year computing student

B. In some sessions, especially in the first weeks of the first semester, our tutors would bring final year students for a few minutes talk. These are successful students, with high grades, and are there to inspire, but also warn for potential academic and social issues that we might meet as first year computing students. This is a great experience as I learn what I need to do in order to become like them. - first year computing student

C. In some cases, instructors can be strict and intimidating, and this can make you feel really uncomfortable as a student. However, I believe that sometimes you must feel like this in order to get things done. One of my first year tutors is strict, but after a couple of months I came to realise that she does on purpose. She wants us to be professional students and this is what I want to be as well. It is hard, but it is worth it. – first year computing student

At this point Chickering and Reisser's (1993) vector was identified. In particular, the third part of the vector that describes the importance of inter-dependence and awareness of someone's place in the world in relation to others. Furthermore, Garrison, Anderson, and Archer (1999) and Sedlacek (1999, 2004) noted that, in general, peer tutoring relationships have a positive effect on student satisfaction and academic persistence, especially in science, technology, engineering or math courses.

All three aforementioned assertions that are related to this study are derived from the participant students' interactions with others in way that lead to academic and social integration. Specifically, they try to achieve this by gaining a sense of self-awareness in an effort to become successful after completing their academic studies. In addition, the participant students described experiences that helped them progress from an external to an internal locus of control in order to become more independent persons. The following assertions, which are two in number, are related to the three previous, but basically differ in terms of inter-connection, as addressed by the students.

In the current study, the first year undergraduate computing students identified the prominent need for strong academic skills, such as note taking and studying, in order to succeed. Furthermore, they addressed that in case inadequacy on any or all of these skills, it was critical to develop them in order to secure a potential success in their studies. As a result, the fourth assertion is the following: **students need to cultivate an effective academic attitude skill-set in order to succeed. Also, this skill-set needs to be customised to each student's individual abilities and strengths.**

The current study's participant students described repeatedly opinions about the notion of learning how to study. Almost every participant mentioned something about study methods and behaviours they knew, as well as the need to change or adapt them in the university level. Specifically, most of them shared the following opinion: the skill-set they once had cannot be effectively applied anymore and there is a prominent need for an update or the development of a new set of skills in order to secure their academic success.

A. The way you study for high school is a complete different thing from how you study for university. I believe that seeking guidance from your tutors on how to do your assignments is very important, especially in the first months. - first year computing student
B. When I was in high school we were following a system in which all work was done in class. So, I can’t really say that I had a specific study method to follow when I came in university. - first year computing student
C. I never studied hard when I was in high school. But, I learnt a lot when I came in university. Well, I had to. My classmates and tutors helped me a lot. The truth is, though, that if you don’t try hard and you don’t seek for help, you won’t be able to succeed. - first year computing student

Another important point that students identified was the trial and error process as an effective method of learning.

A. As I never learnt how to effectively study when I was in high school, I had to learn how to study while in university. For me it was mainly trial and error. I had to learn from my mistakes and not repeat them. At the end of every week I re-evaluate my activities and my progress in university in terms of how efficient I was. So far, this process had helped me a lot. - first year computing student
B. I ask from my tutors to provide me with constant feedback regarding my academic progress. Unfortunately, not all tutors are willing to do that, but those who do it help me a lot to learn from my mistakes and improve myself. - first year computing student
C. Applying a trial and error process helped me to learn new things about myself, such as learning abilities and skills. It’s a time consuming process, but it is worth it. Also, it is a better to do in your first academic year and find a learning process that suits you, rather than doing it as a second year student. - first year computing student

The trial and error methods applied by the participant students have also indicated that the studying environment significantly affects students. Additionally, it differs from student to student.

A. One thing that I know from high school is that I need a quiet room in order to study. Knowing that helps me to be more efficient when I do university work. - first year computing student
B. I have tried many different locations around university, such as the Students' Union area, Library, Study Areas, and Quiet Rooms. I found out that for me the most inspiring area is the library. - first year computing student
C. I prefer to study in my room because I need a quiet place in order to focus on studying. When I need a change on my studying environment, I will book a quiet room in the library. Only when I know that no one is going to bother me, I can get university work done. - first year computing student

A variety of other pieces of research show the importance of academic skills development while in university. Specifically, Murray & Steedman (1998), Andrews & Higson (2008) and Hugh et al. (2008) noted that students show the tendency to acquire academic skills throughout university, in particular, as they deal with new scenarios or situations. In addition, Astin (1996) has connected the academic skills development to constant persistence and, finally, graduation from university. Consequently, students' skills development is a natural occurrence, which greatly contributes to retention and academic success to university.

Furthermore, student addressed the need to learn more about effective study methods that could help them succeed in university. The following paragraphs present the comments of two students who felt that they did not have the necessary skill-set, and they had to seek for help and guidance to others.

A. Studying in university is a complete different thing than studying in high school. The skills required to succeed are different. Myself and a group of classmates, with a similar mind-set, have a created a very ambitious team. In this team we try learn extra skills that are not taught in-class, but are required in the industry. We work together and try to gain extra knowledge. Working with people from the same course and same classes (same learning community), with similar interests, seems to work very well for me. - first year computing student
B. What I did to improve my studying was to discuss with classmates how they managed to get a good grade in an assignment or in an in-class test. Of course, I also share with them my study methods. Sharing study methods has been proved good for my studying. - first year computing student

In addition, the participant students mentioned that group working is an effective study method, which also reduces completion.

A. University group projects can help you develop new friendships, as well as improve the existing ones. Especially, when the personalities match then studying becomes an ideal thing. This happens because we hang out and do stuff together, but when it comes to university work one of us will say: "*Okay guys time to do some work now...",* and we all follow. We shared ideas and study methods in a friendly environment, and I consider myself lucky for this. - first year computing student
B. During my first weeks in university I created a study group with some other classmates. This helped me a lot in studying. It also made me feel less afraid of asking questions to my tutors that might be considered silly by some other students. I realised that there were students with similar questions to mine. - first year computing student

Through these processes the participant students were able to share skills that were proved to very useful to them. For instance, many of them mentioned that they realised the importance of conducting the university work in advance and not leave everything to the last minute.

A. I knew, before I come to university, that completing university work on time is very important. I had the same attitude when I was in high school and that helped to get good grades. I was advised to do same thing in university, and, so far, I do it. - first year computing student
B. In the first semester, once every week, I attend the help sessions. After every class I write down a list of queries and when I go to the help sessions my questions are answered by the tutors or other students. All tutors are very helpful, always ready to guide and help. My interaction with other students helps me to learn new things about studying. Also, in these sessions I get the opportunity to know my classmates better. - first year computing student
C. From my experience, so far, I realised that when you programme things in advance, you get things done. This goes, especially, for the assignments. If you finish your assignments before the deadline, then you will have time to ask your tutor questions, make corrections, and improve your grade. I strongly believe that planning and working in advance is a very effective method. - first year computing student

D. If you want to succeed, getting things done early is very important. Also, it helps you feel less stressed. When I do my work early, I am less stressed. So, yes, I can say that you need to get your work done as early as you can. - first year computing student
E. I always go to the help sessions. I listen to other students' questions and I learn from them. Also, I go to my tutors' offices during office hours and ask them questions. To be honest, I prefer the one-to-one meetings. It's easier to ask questions and you get better answers. I learn to discuss with my tutors on a 'personal relationship' basis, and this helps me a lot. - first year computing student
F. Taking notes during lecture and tutorials is a very useful technique, which I also had in high school. Note taking in university, though, is different. In university, I must be alerted and not miss a thing. I believe, it's an important factor for academic success. Listening and taking notes helps you pay attention on specific study material and parts of the lecture and/or tutorial that are important. - first year computing student
G. I am student who prefers to study all the reading material of a module. I feel less stressed like that. Especially, during the exam or in-class period. I like to get things done early. If I don't do my study work in advance, I feel stressed, which is not good. - first year computing student

The concept of working and interacting with other students and instructors is indeed a key factor in the broad aspect of academic success. Many of the participant students addressed that university is hard, and especially for first year students a new experience, which requires a great deal of effort in order to succeed. This experience does not have to be a single-person journey. As students noted, it is crucial to interact with other and develop the appropriate relationships, both academically and socially, in order to persist and succeed. It is this protean (many-sided) approach to success that functions as a foundation for the final assertion of the current study.

Specifically, the last assertion is a meta-assertion, because it stands alone but also encompasses various elements from the previous four assertions. During the data review process, the researcher created a code named "*student interaction*", which was used in the coding process. This approach included a broad set of things, but was placed in the grid each time one of the students mentioned an interaction with others, having someone else as an example to follow, participating in group activities, receiving guidance from another student, or other group experiences. It seemed, though, that this was not a simple research artefact.

The analysis showed that there was something of particular research interest in the interaction between first year students with other successful students towards their academic success. Specifically, it included participant students who met and/or developed relationships with other successful second and/or final year students. Additionally, the students addressed that whenever they were given the opportunity to discuss with successful undergraduate students and/or postgraduate students (i.e. master's and doctorate students) about their successful backgrounds and stories, helped them a lot to be successful themselves. As a result, the **fifth** assertion is that **first year undergraduate computing students need to actively interact with other successful students.**

This assertion is more than the role of modelling or academic guidance and support presented in the first assertion. Regardless, how valuable they were proved to be, according to the participant students, they appeared to be ephemeral and based on the occasional situations in which the participant students found themselves. In the fifth assertion are identified the intentional actions of the participant students to actively seek out and engage with role models, tutors (academic and personal), and peers, in order to take advantage of optional opportunities to meet and interact with student who have been successful in computing fields. In some cases, these interactions presented were with second and final year students. Most of these, though, were interactions related to students who had graduated from university successfully.

The participant students addressed many cases of successful students considered as their role models, as well as their intention and need to interact with them in an effort to be successful in university. In the following paragraphs are presented two indicative quotations, which were mentioned by two participant students.

A. The fact that we get the chance to meet students who completed successfully the course in which I am enrolled, and are also successful in their careers, is very beneficial. Usually they give a presentation of who they are and they we can have open group discussions with them, but also on a one-to-one basis. At least, I did it, because some others didn't, and I got so much from that experience. After that conversation I was sure that I made the right choice to come and study this course. - first year computing student
B. In some cases, the helps sessions are led by PhD students and we get the chance to discuss their experiences. This is very helpful because I get the chance to talk to someone who has been a student for many years. In many occasions, we carry on our conversations after the class ends and I ask them for guidance and advice for successful learning methods and study

> techniques. I believe, it is a great privilege to get help from knowledgeable and experienced people. - first year computing student

The participant students also described experiences they had with other undergraduate students. In most cases, they met those second and/or final year students in common societies, such as sport societies, other organisations, or learning communities. The following student comments reflect on this notion.

> ...the help and guidance I got from second and final year students made feel more confident about my studies, and my ability to succeed in university. They were students who made it through, and I am sure that if I keep in touch with them, I will be able to have their support for a long time. - first year computing student

At this point it would be also useful to address a distinct difference between these interactions. The student relationships with peers seemed to be more supportive in nature, while the interactions with professional graduates were more encouraging and nurturing (see also previous quotations).

The current assertion could also be related to two of Sedlacek's (1999, 2004) non-cognitive variables. To begin with, Sedlacek's fifth variable described students who have set long-term goals. In the same spirit, first year undergraduate computing students' interactions with successful students aimed to help them see themselves completing their long-term goals. Secondly, Sedlacek's sixth variable involves students' need to have strong relationships with their tutors (personal and non-personal). The current study's data analysis showed that students tend to be more successful when they have strong tutors. These tutors impact on students can be comprehended through single interactions in a class or as part of a student-tutor ongoing relationship. Despite of the context in which the peer tutoring took place, the participant students felt that the chances of success are increased as a result of those interactions and experiences.

An in-depth analysis of the qualitative findings' implications is presented in Chapter 6 (see Section 6.4). At this point, though, it would be useful to discuss the challenges that the author met while using the 'unfolding matrix'.

5.4 The ‘unfolding matrix’ Challenges

The ‘unfolding matrix’ proved to be advantageous and efficient research tool that helped the author to collect and analyse data. In the following section, the author describes two challenges encountered while using the ‘unfolding matrix’ as a data collection technique. At this point, though, it should be noted that these challenges do not limit in any way the study’s applicability. Despite these challenges, it was possible to explore meaningful results from the data analysed. The main reason for addressing these challenges is to inform the future researchers in order to be aware of them while employing this technique.

5.4.1 The Empty Vector

Initially, the ‘unfolding matrix’ was never entirely completed. The manner it was filled in was affected by the nature of the interviews, which developed a scenario where one particular vector had no data entered onto it. According to Padilla’s (1991, 1994, 1999-2000, 2009) work when students access the university environment they confront a “*geography of barriers*” (see also Section 2.2.1.2). Alternatively, as he mentioned it is “*the salience and prevalence of the encountered barriers that help determine if a student will persist or leave a given university*” (Padilla, 2009). ‘Length’ and ‘Intensity’ were two columns of the ‘unfolding matrix’ that were included in order to comprehend the salience and prevalence of the participant students’ experiences. These columns were employed in order to reflect Padilla’s original study (Padilla, 1994). Specifically, ‘length’ was an easy concept for the focus group interviews’ participants to understand. They managed to effortlessly provide information about how long an experience lasted; in terms of if it was over or not, and how long an experience had been occurring (meaning those experiences that are present until today).

Nevertheless, ‘intensity’, proved a rather difficult concept to grasp. Specifically, the participant students were requested to estimate their experiences’ ‘intensity’ on a scale of one to ten, with one representing every-day life and ten being the most intense feeling they ever experienced. The focus group interviews participants could not manage to relate this type of subjective classification with their experiences. As a result, they were not able to determine where an appropriate rating would go. Additionally, the author struggled to explain it to the participants due to the ‘intensity’ concept was included from a research study that examined negative experiences (barriers), which had to be overwhelmed for success to occur. In the current study, the author, investigated experiences that even if they were determined as positive and negative incidents that occurred around or to a student, the plurality of the experiences presented by the participant students were of positive essence.

As a result, this generated a cognitive disparity for the participant students. In other words, the students could not manage to put an 'intensity' level on something that simply occurred in their lives. Padilla (2009) defined the world 'intense' as "*exhibiting a strong feeling or earnestness*". In the focus group interviews conducted none of the participant students described feelings strong enough to authorise ranking. Consequently, the author, instead of collecting data that was not fully comprehended by the students, decided not to collect it at all. Nevertheless, the vector remained in the 'unfolding matrix' grid during the focus group interviews, as it was part of the matrix's initial form (see also Appendix 5: The 'unfolding matrix').

5.4.2 Raw Data Analysis

The second challenge that the author met was the analysis of the 'unfolding matrix' analysis itself. As it was previously discussed (see also Chapter 3) Padilla (1994) mentioned that the 'raw data' in the grid is information provided by the participants. Specifically, the challenge was that data presented in the 'unfolding matrix' grid is the data to be analysed. Similar to a researcher conducting a quantitative study, the survey responses were respectively the grid data that was to be analysed.

The 'unfolding matrix' technique necessitates short phrases that need to be inserted into the various cells in order to epitomise the participant students' opinions. During the focus group interviews process the participants are present, and therefore have the chance to signify if what was reported was a precise depiction of what was literally described. Padilla (2009) noted that is critical, when feasible, to report the participants' authentic words while completing the matrix's grid. The author made sure to do this during the focus group interviews. The 'unfolding matrix' grid is treated as an objective data set, as this is what is analysed. Sometimes, it was difficult to read the data recorded in the matrix, so the author would simply read the data as it was presented in the grid. As a result, some of the recorded phrases could not be further investigated for possible deeper meanings, or what the participant might have been trying to imply. The data entered into the 'unfolding matrix' was what the participant students stated, and this was needed to be examined as such. This process cannot be classed as problematic, but it necessitated a conscious effort by the author in order to ensure that the participants' descriptions were studied and interpreted at a concise and actionable value (face value).

5.5 Conclusion

The current chapter discussed the findings of the qualitative analysis, which were developed in five assertions. These assertions were related to existing theories, and with quotations from the participant students, were proved to be fairly significant. In addition, the implications about how the qualitative analysis results might be utilised were addressed. In Chapter 6: 'Discussion of findings', the author focuses on bringing the study full circle by combining and mixing the qualitative and quantitative results. Finally, in Chapter 7: 'Conclusion', the limitations of the entire study are discussed, and recommendations for further research are also suggested.

CHAPTER 6: ANALYSIS OF FINDINGS

6.1 Introduction

The main aim of the current study was to investigate factors that affect student retention at UK Higher Education. In the two preceding chapters the author outlined the findings acquired through the use of both qualitative and quantitative data. The purpose of the subsequent sections is to integrate and discuss the aforementioned findings, as well as correlate them to preceding research.

6.2 Summarised Qualitative and Quantitative Results

As it was previously identified, in Chapter 3, the current study applied a mixed methods approach. Specifically, using Creswell's (2013) terminology, a very accurate definition regarding the current study's general architecture is a mixed methods approach with concurrent triangulation strategy. In other words, this is interpreted as the qualitative and quantitative data that were gathered and analysed in parallel. In addition, the priority is frequently equal and offered to both data forms. The analysis of data is frequently done separately and the integration frequently develops during the data interpretation phase (Hanson et al., 2005, p. 229). The reason for selecting this method was because it permits the confirmation, cross-validation, and corroboration of findings within a single study (Creswell, 2013).

The current research was conducted in two phases. The first phase employed a quantitative approach. In particular, the quantitative data was collected from 901 first year computing and non-computing undergraduate students utilising two questionnaires, which were administered in two different periods, as well as the university's admission office. Finally, the quantitative data were analysed via the application of the SEM technique.

The SEM outcomes analysis pointed out that the variables of the final model interpreted 16% of the variance in initial commitments, 45% of the variance in academic integration, 35% of the variance in social integration, 13% of the variance in later commitments, and 34% of the variance in student retention.

Furthermore, the SEM outcomes revealed that 7 out of the 9 hypotheses were supported by statistically significant outcomes. The 7 hypotheses that were supported are:

1) Students' parental background will be associated with their initial goals and institutional commitments.
2) Students' initial goals and institutional commitments will be associated with their academic integration.
3) Students' initial goals and institutional commitments will be associated with their social integration.
4) Students' initial goals and institutional commitments will be associated with their later goals and commitments.
5) Students' academic integration will be associated with their later goals and institutional commitments.
6) Students' social integration will be associated with their later goals and institutional commitments.
7) Students' later goals and institutional commitments will be associated with their retention status.

The remaining 2 hypotheses were unsupported:

1) Students' individual attributes (race, age, gender, nationality etc.) will be associated with their initial goals and institutional commitments.
2) Students' pre-entry qualifications will be associated with their initial goals and institutional commitments.

In addition, the SEM outcomes revealed 2 additional important results that were not part of the initial hypotheses. These 2 extra significant paths are addressed in the subsequent list:

1) Students' initial goals and institutional commitments had a significant positive direct impact on student retention.
2) Students' social integration was positively related to their academic integration.

It is critical to make clear at this point that main focus of the current study was to investigate factors for success and persistence in first year computing undergraduate students only. As it was previously discussed the quantitative data analysis included computing and non-computing first year students (901 computing and non-computing students). Moreover, as addressed in the introductory sections of Chapter 1, the quantitative data analysis examined the possibility of identifying any similarities and/or differences amongst students from non-common departments regarding student retention issues. This was not the case, as all students showed consistency on their answers. This fact indicated homogeneity on students' answers about factors for low retention and led to the second phase of the study. In this phase the author employed a qualitative approach. In particular, the qualitative data were acquired from first year computing undergraduate students only through a process that included 10 focus group interviews with 8 participants in each group (80 students in total). Therefore, in the subsequent sections, the results are presented holistically (by taking into consideration both quantitative and qualitative results) but through the first year computing undergraduate students' lens because they were the main research focus of the current study.

Through the application of Tinto's (1993) theory, Padilla's (1991) 'unfolding matrix' and Sedlacek's (1999) non-cognitive variables examined student factors for success and persistence at the university. In relation to students' levels of goals and institutional commitments, the author identified that persistent students seemed to be more motivated, as well as to demonstrate better levels of goal commitments rather than non-persistent students. Correspondingly, persistent students seemed to demonstrate better levels of institutional commitment than non-persistent students.

Concerning the students' levels of academic integration, there was no significant variation between persistent and non-persistent students. Both student types demonstrated modest degrees of academic integration into the university studied. Furthermore, it was not identified any significant variation between the two student types regarding social integration. Again, both groups presented modest degrees of social integration into the university studied.

Therefore, the author by employing the qualitative approach as an alternative method of prediction interviewed the participant students regarding to what they perceive to be critical factors that affect student retention in the university they attend. The most important factors that were identified by the participant students (persistent and non-persistent) are addressed in the following list. Specifically, the participant students who were recognised as 'non-persistent' pointed-out the subsequent results:

- Lack of cultivation of an effective skill-set and development of personal awareness (41%)
- Difficulties during the transition and adjustment period to university environment (40%)
- Non-sufficient academic support and guidance (19%)
- Difficulties cooperating in learning communities with other classmates (19%)
- Non-efficient active interaction with other successful students (18%)
- Distance from university (18%)
- Low motivation (18%)
- Difficulties on living away from home (6%)
- Financial problems (6%)
- Family problems (5%)

On the other hand, the participant students who were classed as 'persistent' identified the following results:

- Lack of cultivation of an effective skill-set and development of personal awareness (43%)
- Difficulties during the transition and adjustment period to university environment (40%)
- Non-sufficient academic support and guidance (27%)
- Difficulties cooperating in learning communities with other classmates (27%)
- Non-efficient development of relationships with academic staff (27%)
- Distance from university (20%)
- Non-sufficient academic support and guidance (20%)
- Low motivation (14%)
- Financial problems (14%)
- Family problems (5%)

6.3 Analysis of Quantitative Findings

The main theory that guided the current study was Tinto's (1993) theory of student retention, as well as Padilla's (1991) and Sedlacek's (1999) theories. The quantitative data analysis outcomes indicated that Tinto's theory provided a modest explanation of the student retention process in the UK HEI which was examined. However, considerable constructs of the theory applied, like academic and social integration, did not distinguish significantly between students who showed persistence and students who did not persist. Furthermore, the SEM outcomes indicated that Tinto's theory interpreted only a modest amount of the variance in student retention (34%).

There are a low number of quantitative studies that applied the SEM method to test Tinto's model. So far, the most cited studies that have tested Tinto's model at US HEIs are Braxton, Vesper, & Hossler (1995), Braxton, Sullivan, & Johnson (1997) and Braxton & Lee (2005). In the UK HEIs context, though, only one study can be found to test Tinto's model predictive validity. This research study was administered by Brunsden, Davies, Shevlin, and Bracken (2000) on two different courses: a) a Bachelor course in Computer Studies at an English HEI and b) a Bachelor course in Psychology at a Scottish HEI. A common denominator of all these studies was that Tinto's theory justified only a relatively modest portion of the variance in student retention. Comparing the aforementioned studies with the methodology used in the current study the following points can be addressed. A significant number of these research studies evaluated Tinto's model during the first academic year and gathered data at different periods of that year. Next, a large number of these studies applied Pascarella and Terenzini (1980) scales in order to evaluate Tinto's constructs. As a final point, the most effective statistical methods to evaluate the model are considered to be path analysis and SEM (CFA) as such techniques can assess and examine the associations among Tinto's model constructs, as well as permit the application of multiple measures to represent them (Markus, 2012; Kleinbaum et al., 2013). Nevertheless, SEM (CFA) is more beneficial than path analysis as it measures and specifies errors, while path analysis does not consider measurement or specification error (Ullman, 2006; Suhr, 2006, 2008). By not taking into account the measurement error might guide the researcher to systemic bias in parameter estimates (Cote & Greenberg, 1990; Goldstein, Kounali, & Robinson, 2008). Finally, this method provides the researcher with the opportunity to examine and model complex phenomena (Markus, 2012).

It is important to note that the model does not improve on observed probability of intent to persist. Simply presuming that all cases would report intent to persist would classify most cases correctly. By the same token, however, the model contributes to the prediction of those who did not express intent to enrol at the same institution the following year. The percentage correctly predicted in this category was modest, which shows the model as an improvement on alternative methods of prediction.

All of the relationships in this model are insightful. This confirms that, for instance, the positive effect of developing relationships with academic faculty and classmates, the negative impact of missing classes, and the positive effect of interacting with instructors, are all justified as predictors of persistence. The amount of explained variance in the model, although modest, is at a level comparable with similar research projects, as described in the previous paragraph, as well as with other researchers' studies who conducted similar research on persistence (Pascarella, Terenzini, & Wolfle, 1986; Milem & Berger, 1997; Berger & Milem, 1999; Thomas, 2000; Ziskin, Gross, & Hossler, 2006). An in-depth discussion regarding Tinto's model limitations is also provided in Sections 7.5 and 7.6.

Pascarella and Chapman (1983) recommended two potential interpretations for the modest interpretive power of Tinto's (1993) model. The initial explanation was the inadequate operational function of the model's variables. Another explanation could be that at least some critical student retention predictors might not be defined by the model. An additional probable interpretation might be that Tinto's model was designed in order to interpret the student retention process in the context of US higher education context, which exhibits a number of variations between the UK and the US higher education systems. For instance, in UK Higher Education the undergraduate degrees last for 3 years (4 when including a placement year) and students do not select a major module because it is pre-defined in their first academic year.

Tinto's (1993) theory identified four sets of variables:

1) Background characteristics,
2) Initial goals and institutional commitments,
3) Academic and social integration, and
4) Later goals and institutional commitments.

In the following paragraphs, the author presents a thorough discussion of the effects of the preceding constructs on student retention, based on the current study's results.

6.3.1 The Effects of Students' Background Characteristics

In the initial hypotheses, it was theorized that indicating students' Background Characteristics could have a direct and positive effect on their initial goals and institutional commitments. The goal commitments describe the extent to which a student is motivated, or committed, to acquire a university degree. On the other hand, the institutional commitment describes the extent to which a student is motivated, or committed, to graduate from a certain higher education institution. In the current study, parental background was identified through parents' formal education, as provided by the students to the university's admissions office during the enrolment period. The SEM outcomes defined that the parental background was significantly related with the participant students' initial goals and institutional commitments. This revealed that students whose parents had high levels of formal education were more likely to have high levels of initial goals and institutional commitments. This is consistent with Tinto's theoretical expectations as well as other researchers' work, such as Pascarella, Duby, & Iverson (1983), Braxton, Vesper, & Hossler (1995) and Braxton, Milem, & Sullivan (2000). The participant students' parental background predicted positive and indirect effect on student retention. The second characteristic, students' pre-entry qualifications, was identified via the participant students' A Level scores, collected from the university's admissions office. The final characteristic, individual attributes, was again measured by matching the participants' ID with the information provided to the admissions office. The SEM outcomes indicated that pre-entry qualifications and individual attributes were not significant predictors of initial goals and institutional commitments. These findings were also found to be consistent with several studies conducted at other UK and non-UK institutions, which addressed similar conclusions (Pascarella & Terenzini, 1983; Terenzini et. al., 1985; Braxton & Brier, 1989; Bray, Braxton, & Sullivan, 1999).

6.3.2 The Effects of Students' Initial Goals and Institutional Commitments

One of the initial hypotheses was that students' Initial Goals and Institutional Commitments were connected with their academic and social integration. According to the SEM outcomes the initial goals and institutional commitments proved to be a significant academic integration predictor, followed by a modest significance regarding social integration. This revealed that students with high levels of initial commitments were more likely to have high levels of academic and social integration. Similar findings were also reported in previous studies that were conducted by Pascarella and Terenzini (1983) and Mallette and Cabrera (1991). It was also hypothesised that the initial goals and institutional commitments were connected to later goals and institutional commitments. The SEM outcomes revealed that the initial commitments had a significant effect on later commitments. This indicated that the participant students who had high levels of initial commitments were predicted to have high levels of later commitments. Again, this proved to be consistent with Tinto's (1993) theory, as well as other studies conducted by other researchers in UK and non-UK institutions (Pascarella & Terenzini, 1983; Braxton, Milem & Sullivan, 2000; Braxton, Bray, & Berger, 2000).

6.3.3 The Effects of Students' Levels of Academic and Social Integrations

Another initial hypothesis was that students' Academic and Social Integration had a positive effect on their later goals and institutional commitments. The academic integration is described as the perceived academic performance and intellectual development by students. The social integration is defined as a student relationship quality with both the faculty and the peer group (Pascarella & Terenzini, 1980). The SEM outcomes pointed-out that both types of integration did perform a modest role in expressing either later commitments or student retention. An important identification of the prior research findings was that they were consistent with Tinto's (1993) theory or other researchers' investigations (Munro, 1981; Pascarella & Terenzini, 1983; Braxton, Vesper, & Hossler, 1995; Berger & Milem, 1999). The data outcomes can help explain why student academic and social integration can have an important role in predicting student retention. Focus group interviews with the participant students who had expressed their intention to drop out, from which most of them persisted, revealed that none of those students revealed positive experiences while in the university. Furthermore, those students did not manage to establish good relationships with staff members, in and out of class hours. They also complained about staff members' non-supportive behaviour. Additional data from the qualitative data analysis suggested that some students had low student attendance, as well as few of them participating in any kind of social activities organised on the campus. This finding revealed that academic and social integration constructs can have a significant influence on the student retention process, and as the focus group interviews showed, this offers a possible explanation as to why improved levels of academic and social integration may be needed within the university system which was studied.

6.3.4 The Effects of Students' Later Goals and Institutional Commitments

Finally, Students' Later Goals and Institutional Commitments revealed positive effects on student retention. The SEM outcomes pointed-out that later goals and institutional commitments was a significant predictor of student retention. This suggested that students who present high levels of later commitments were more likely to persist than those with low levels. This finding was consistent with Tinto's (1993) theory, as well as other studies conducted in other institutions (Pascarella, Terenzini, & Wolfle, 1986; Berger & Braxton, 1998; Braxton, Bray, & Berger, 2000; Braxton, Milem & Sullivan, 2000). Furthermore, the SEM analysis outcomes identified an additional finding that was not initially hypothesised and is not consistent with Tinto's (1993) theory. Specifically, it was revealed that the initial goals and commitments had a stronger direct effect on student retention rather than the later goals and institutional commitments. This finding was not found to be consistent with other researchers' studies that suggested that the strongest predictor of student retention was that of later commitments (Braxton, Bray, & Berger, 2000; Braxton, Milem & Sullivan, 2000). In the current study, the initial commitments were measured during the starting period of the first semester, while later commitments were measured during the ending period of the first semester. A possible explanation for this finding could be the negative experiences of the first year students in the social and academic integration systems of the university examined. In other words, despite those students entering the university with high levels of initial commitments, their negative university experiences led to their later commitments declining.

The data analysis results suggest that Tinto's (1993) theory was useful in analysing student retention at the university that was involved in this study. Not at its maximum potential, though, because the model variables accounted for only a modest amount of variance in retention. In addition, only two variables had a direct effect on retention. The largest direct effect on retention was accounted for by initial goals and institutional commitments, followed by later goals and institutional commitments.

Due to the aforementioned reasons the findings of the qualitative data analysis focused only on the first year undergraduate computing students and aided towards an in-depth and breadth cross-validation of the quantitative findings. Furthermore, as it was previously explained the main aim of the current study was to identify reasons for low student retention in first year undergraduate computing students. In Chapter 5 were presented a series of five assertions that were derived from the 'unfolding matrix' analysis, which was applied for the current study's data collection. Even if it is not possible to broadly generalise the findings of this study due to its criterion based, purposeful sample, there are several implications that can be made, as well as recommendations for improving and enhancing the learning community programme of a UK HEI. Such implications and recommendations are presented in the following section.

6.4 Analysis of the Qualitative Findings

The previously described five assertions embody various implications connected with them, in particular with regard to the continued contribution and growth of computing students' learning community populations in UK HEIs. Specifically, learning communities create environments that promote an on-campus interaction with a myriad of people, which may also support a continuous academic success and, ultimately, increase student persistence in university. Furthermore, it can be noted that 'learning communities' is a tool that enhances student retention, aids the development of academic and social integration, and promotes on campus interaction and involvement. In addition, 'learning communities' help students to succeed, which is an opinion widely addressed and supported by the participant students' experiences in the current study.

Moreover, students were offered many times the opportunity to interact with other peers, instructors (lectures, tutors, and assistant tutors), and academic advisors. Many of the participant students indicated that their academic success is related to their choice to interact with these groups. From those who addressed that developing strong relationships with their instructors is significant were also those who expressed positively about their general experience at the university attending. Additionally, some of them even asked, "*how come students do not ask their instructors for help*", as well as "*why they don't take advantage of the academic services offered by the university as extra help?"* Students with this kind of behaviour should be presented to fresher and high school visiting students, during open days, as something highly effective that aids first year students to accomplish academic success. UK HEIs should keep offering these opportunities to students, and certainly, improve and enhance them according to students' needs.

Apart from creating relationships with his/her instructors, a student can also be helped to achieve social integration and academic success at university, through his/her participation in academic guidance and support programmes, such as 'Help Sessions'. Most of the participant students in the current study indicated that their participation in such programmes aided them to feel more confident about persistence and success in their first academic year. Nevertheless, many students related to these academic guidance and support programmes (Help Sessions) other opportunities for peer tutoring through their participation in societies, friendships with postgraduate students, or through extra-curricular organisations that provided opportunities for tutoring (guidance and support). The fact that most of the participant students noted that they get benefited by these forms of peer tutoring interactions is a good indication that peer tutoring works well for first year computing students. Another interesting finding is that many of these students addressed their desire to assist the future first year students themselves They also said that they want to impact the lives of first year students just as they were impacted by upper-class, advanced, or graduate students.

Effectively, computing students' participation in learning communities (i.e. help sessions, classes, student accommodation etc.) should continue to provide novel and innovative offerings for first year computing students, and also include into those offerings enhanced academic success skills programmes (academic guidance and support) and promote peer tutoring by providing opportunities to interact with other successful computing students (upper-class, advanced, or graduate students).

On the other hand, there were cases in which the participant students described experiences that occurred outside of their learning community. Furthermore, they mentioned that the experiences indicated occurred while they were involved in a learning community. Even if the students did not see peer tutoring as part of the learning community experience, it actually was an important function of the learning community. As a result, such experiences that could have taken place only through participation in a learning community are embedded within this implication.

From a practical point of view, peer tutoring is a method to develop communities for computing, as well as any other course' s students. Additionally, peer tutoring could aid students explore success patterns that they could apply according to other students' positive interactions and experiences. This opinion is also supported by previously mentioned researchers, who indicated that peer tutoring, as well as academic guidance and support of students by successful students in the field were effective interventions, and the current study could support that conclusion.

Furthermore, this study has evidently shown that students come to university without having, or thinking they have, the appropriate and effective academic skill sets. The 'unfolding matrix' data analysis revealed 'effective learning methods' as one of the most discussed and addressed topics during the focus group interviews. In addition, there were some participant students who indicated that they did not know what learning techniques to follow when they entered university. Despite that, these students tried to learn from other students. They discussed learning methods with them, which they employed as long as they confirmed which methods worked well for them. Consequently, the development of programmes that offer new student with basic skills for success in university would only help to address this issue. Nevertheless, it should be mentioned that several of the participant students addressed that they applied trial and error methods in order to discover what worked best for them. As a result, academic success programmes could provide a toolkit of study techniques and methods that would aid students to efficiently acquire effective study skills.

As it was previously discussed, in the fifth assertion, it is critical to create an environment in which computing students interact with each other, but also with exemplar students who are successfully employed in computing studies (second and final year undergraduate students). This recommendation is coherent with the peer tutoring relationship addressed above. It varies, though, in terms of focus. Specifically, it emphasizes on those specific interactions that offer a mechanism that helps students to comprehend what is needed in order to be successful in their academic studies. In addition, first year undergraduate computing students have to see that final year students have succeeded, as well as have to hear from these people the necessary steps needed in order to ensure their success.

From a methodological point of view, the implications of employing the 'unfolding matrix' in the current study are classed as 'important'. Padilla (2009) mentioned that in order to complete the 'unfolding matrix' either focus groups or interviews may be applied. The researcher of the current study decided to use the 'focus group' methods due to the high number of participants, and as for time managing purposes, the participants were interviewed in groups. As described in Chapter 3, this permitted the participants to interact with each other while creating the initial matrix from scratch.

The focus group interviews conducted gave the opportunity for comparison and clarification of definitions that might not have been clear enough in the one-to-one interviews context. Additionally, the knowledge depth regarding student success was ensured through the mix of a wide variety of student opinions. It is also the author's opinion that while the students who participated in the focus groups were willing to do so, many of them likely would not have been active and confident enough participants in one-to-one interviews. However, there can be cases where the participants' experiences cannot be elaborated in a focus group. In such event, a researcher may employ a mix of interviews and focus groups. This ensures that the researcher possesses the ability to grasp a group's sense of set of phenomena, but also in depth aspects from several individuals. In the current study, the author conducted some individual interviews, sideways, in time periods before and after the starting and finishing time in some of the focus group interviews. These data they were included in the 'unfolding matrix' as part of the focus group interviews process anonymised, always with the participants' consent.

The general implication, at this point, is that the ‘unfolding matrix’ use is an eminently effective data collection method. The qualitative research techniques that include interviews usually necessitate not only interacting with each participant as if no other participants had been interviewed, but also the transcription of all those interviews. Then, the transcripts developed are analysed, which typically results to a high number of pages. The ‘unfolding matrix’, however, significantly reduces this workload. The data is filled in the ‘unfolding matrix’ with the participants present, and then is analysed, coded, and examined through the development of themes and assertions. Furthermore, the development of a starting structure permits the efficient collection and data analysis encircling a given phenomenon, without reducing the data set richness. Concerning the current study, the completed ‘unfolding matrix’ (see Appendix 5: The unfolding matrix) and the previous chapter, the method can produce results similar to those acquired when applying a more usual method.

The way in which this methodology was applied also drove the technique forward. Similar studies might employ both techniques, but in the current study the author employed only focus group interviews for reason previously addressed. The iterative focus groups technique, in which the participant students had the chance to provide criticism on the previous participants’ comments and experiences, happened to be very effective in terms of offering a more informative approach than the typical focus groups. For instance, in a regular focus group, what a participant mentions may initiate a broader conversation on that topic. However, in this study, what was commented by one of the participant students in an earlier focus group interview generated a pathway for further conversations on that experience in a later focus group interview. In addition, it frequently initiated the participants’ memories about a similar, yet distinct, experience they desired to relate. Finally, the qualitative analysis results are focused on the first year undergraduate computing students, but as discussed in Chapter 6 could also be related to all UK HEIs' first year undergraduate students. This is only possible due to the rich data collected through the ‘unfolding matrix’ technique combined with Pascarella and Terenzini’s engagement questionnaire that was used for the quantitative data collection.

There were some extra insights that were offered by the qualitative data analysis. In the following paragraphs the author manifests a thorough discussion of the additional qualitative data findings.

6.4.1 Further Qualitative Data Findings

Tinto's theory was proved to be modest towards the effort to explain student retention process for the UK HEI studied. The quantitative data analysis findings offered some significant results for reasons that first year undergraduate computing and non-computing students drop out from the university they attend, but not at the expected extent. The main aim of the current study was always to focus on computing students. Thus, using the quantitative data analysis results as solid foundation, the qualitative data analysis outcomes were utilised in order to provide further information regarding student retention issues in first year undergraduate computing students. Consequently, persistent students and student who dropped out were interviewed in order to indicate reasons and factors that affect student retention at the university in which they studied.

Overall, the participant students identified 11 factors, which were categorised in two different groups: institutional and non-institutional factors. Specifically, the participant students noted 6 institutional factors and 5 non-institutional factors, which were the main factors influencing student retention in the current study's examined UK HEI. In Table 6.1 are presented these 11 factors.

Table 6. 1: Student retention factors identified

Institutional factors	Non-institutional factors
1. Lack of cultivation of an effective skill-set and development of personal awareness. 2. Difficulties during the transition and adjustment period to university environment. 3. Non-sufficient academic support and guidance. 4. Difficulties cooperating in learning communities with other classmates. 5. Non-efficient active interaction with other successful students. 6. Non-efficient development of relationships with academic staff.	1. Distance from university. 2. Difficulties on living away from home. 3. Financial problems. 4. Low motivation. 5. Family problems.

The first most important institutional factor that was addressed by the participant students was: ‘Lack of cultivation of an effective skill-set and development of personal awareness’. This factor was mentioned by 70% of the participant students. They repeatedly described the need to cultivate an effective academic skill-set, which needs to be customised based on each student’s individual abilities and strengths. Researchers who conducted similar studies, such as Chickering & Reisser (1993) and Stephenson (1998) addressed aspects of personal awareness. Specifically, they mention that students need to have a better understanding of themselves while they mature and move into adulthood.

The second most important institutional factor identified by the participant students was the ‘non-sufficient academic support and guidance’. This factor was cited by 60% of the participant students. This finding is also supported by other researches who have also indicated the importance of this factor (Metzner, 1989; Thomas, 1990; Seidman, 1991; King, 1992; Peterson, Wagner, & Lamb, 2001). For instance, Seidman (1991) discovered in his research that students who receive pre-enrolment advising were retained and transited into the second academic year at a higher rate (20%) than students who did not receive consulting. Furthermore, Braxton, Duster, and Pascarella (1988) investigated the academic consulting effects within Tinto’s model through the use of path analysis. These researchers discovered that academic consulting expressed a positive indirect effect on student retention via academic integration and later institutional commitments.

Another critical institutional factor that was derived from the participant students’ focus group interviews was the assertion related to the ‘Difficulties during the transition and adjustment period to university environment’. This factor was cited by 60% of the participant students. Furthermore, the three final institutional factors noted by the participant students were: ‘Non-effective development of relationships with academic staff’, ‘Non-effective active interaction with other successful students’ and ‘Difficulties cooperating in learning communities with other classmates’. These factors were noted by 35% of the participant students. These factors are also supported by academic and social integration concepts for academic persistence and success that are clearly presented by Titno (1993, 2012). Moreover, Pascarella and Terenzini (2005) also agree with this finding, as they mentioned the significance of out of class interactions with academic staff and faculty members, as well as the importance of student integration with a variety of people while in university, including classmates and academic staff.

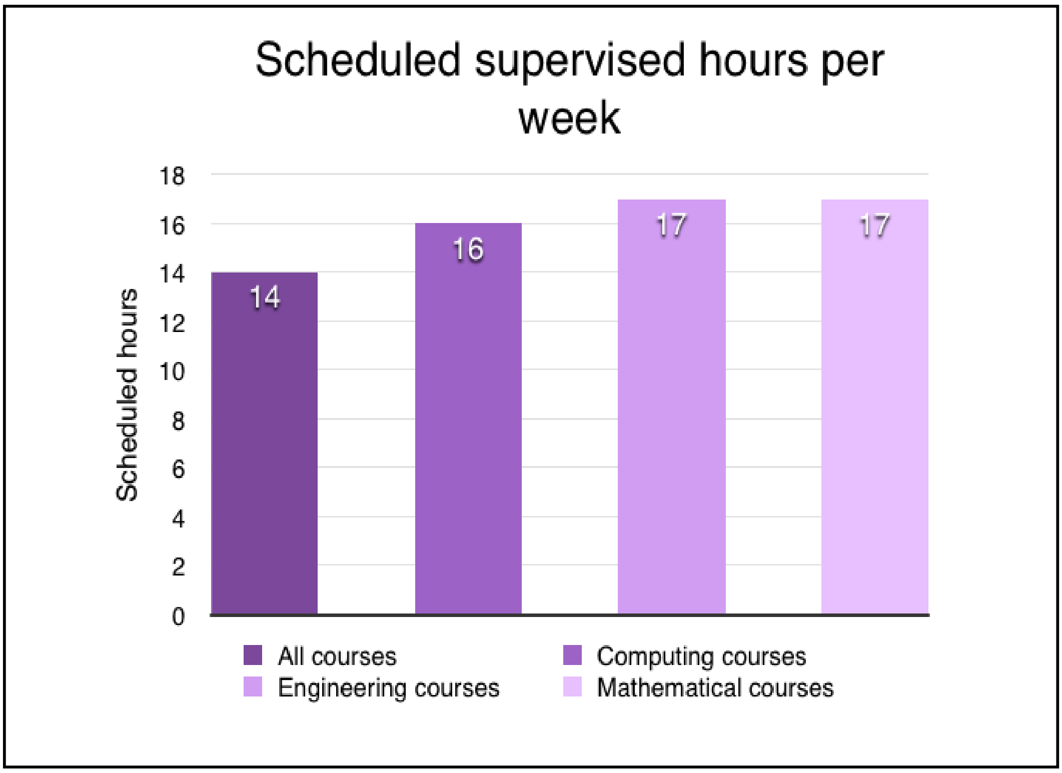
However, the participant students referred 5 non-institutional factors that affect student retention. A commonly referred factor was 'distance from university' and was mentioned by 30% of the participants. The second non-institutional factor was 'difficulties on living away from home'. This was referred by 20% of the participant students. The third non-institutional factor was 'financial problems'. This was referred by a 10% of the participant students. The fourth factor was 'low motivation', which was also cited by a 10% of the participant students. Finally, the fifth factor which was related to 'family problems' was cited by a low number of the participant students (< 5%). Nevertheless, dropping out willingly is very dissimilar to dropping out for important reasons such as family or financial issues (Cope & Hannah, 1975; Tinto, 1993). As a result, the two previous factors might lead students to non-willing withdrawals from an institution, but do not offer a complete justification about students who willingly withdraw.

Even if there are factors that cannot be completely controlled by a university, such as the last two factors, there are still areas in which a university can improve its control in student retention, such as the remaining factors. The aforementioned findings indicate that the computing department of the UK institution studied could improve its student retention levels by targeting its focus on factors that are manageable. These factors were identified through an in-depth analysis undertaken on the unfolded matrix data. There were two sets of factors identified. The first set of factors is about how students perceive their academic experience and the second set is about what students think about their academic experience.

How students perceive their academic experience

Supervised contact hours: Figure 6.1 (see next page) presents the average supervised hours (comprised of lectures, tutorials and supervised laboratories) per week for first year students for UK computing courses and compares this to the average for all courses, engineering and mathematics courses. The average for all courses is 14 hours per week, whilst for engineering, mathematics, and computing it is higher at 16, 17 and 17 hours per week respectively (HEPI, 2013). This is to be expected as courses with large practical elements have more contact hours than courses with more theoretical content and those involving greater levels of independent research and reading.

Figure 6. 1: Scheduled supervised hours per week across the UK Higher Education sector (HEPI, 2013)



Whilst on average computing courses have more supervised hours to support more practical content, the range of mean scheduled contact hours for computing courses at the institution studied had a median value of 13 hours, but varied from 12 to 14 hours. Differences in the amount of supervised hours between institutions' computing courses are hard to explain, with some institutions providing a much higher amount of supervised hours compared to others. A more in-depth analysis regarding the supervised and unsupervised study hours of the computing department of the UK institution studied is presented in the second set of factors (**Total supervised and unsupervised study hours**).

Different contact types: Gibbs (2010) states that the amount of supervised hours is less important than the quality of the contact. Gibbs (2012) also highlights that there are negative educational outcomes associated with large teaching groups. Other factors, which also influence educational outcomes, include the feedback given to students and their social and learning experiences (Gibbs, 2012). These factors are discussed in the subsequent sections.

Small size classes: In the UK computing department studied classes typically included single academics sometimes with teaching assistants as well. On average computing students attended 4 to 5 hours per week in medium-sized groups (classes of 6 to 20 students) for tutorial/laboratory exercise classes, and 3 to 4 hours per week in large-sized groups (classes of 21 to 50 students) mainly for lectures and sometimes for tutorial/laboratory exercise classes. There are considerable variations in practice amongst the various computing departments studied. This is discussed further in the second set of factors (**Total supervised and unsupervised study hours** and **Student workload)**.

The findings from the focus groups show that small group teaching (tutorial/laboratory exercise classes of 1 to 5 students led by academic and/or teaching assistants) is preferred by students. 60% of students who had experience of drop-in sessions and/or small classes (tutorial/laboratory exercise classes of 1 to 5 students) stated that they would prefer learning in small groups as this aids them in gaining more knowledge and being more effective with their studies. By comparison 20% of students stated that they prefer large group teaching (classes of more than 50 students) and 20% preferred medium group teaching (classes of 6 to 20 students).

Students were asked if classes were led by an academic member of staff or a non-academic member of staff, for instance a postgraduate research student. All students stated that academic members of staff were more likely to lead large group practical sessions and lectures. Over 95% of the classes with more than 50 students were led by an academic member of staff compared to 80% of the classes with 1 to 5 students which were led by a non-academic member of staff. Generally, non-academic members of staff were used to lead small teaching groups, such as mathematics and programming drop-in sessions. Furthermore, students during focus group interviews stated that they perceived research students as teaching assistants to be more approachable and felt more comfortable when the small teaching groups were led by them. In addition, they mentioned that in those cases their academic engagement was higher and they tended to learn more. This agrees with Gibbs (2012) whose work indicates that small size classes increase students' sense of belonging. This issue is discussed further in the second set of factors (What students think about their academic experience).

Feedback: Gibbs (2012) states that "the amounts of feedback students receive and the nature of this feedback has a marked effect on student outcomes". In terms of feedback for tutorial/laboratory exercises the majority of students were satisfied with receiving verbal feedback. For coursework which was handed in, the most common way for students to receive feedback was through written comments related to the assessment criteria and a grade (by e-mail and/or printed). This was reported by 70% of the first year computing students, 20% of students stated they received verbal (in person) feedback for their coursework and 10% reported receiving no feedback. Students preferred to receive written feedback on their coursework.

This study identifies that feedback remains an issue for computing courses. Overall, 60% of the students are satisfied with the feedback given to them, but 40% disagreed that teaching staff had given them prompt feedback. Half of those that disagreed said that they get feedback but with poor comments, whilst the other half would like to have received further comments or discussion from their instructors, not just feedback repeating the assessment criteria. This mirrors national dissatisfaction with assessment and feedback within computing courses as expressed through the NSS. In particular computing students score the 15th lowest out of the 20 subject areas of study in the UK HEIs for their views of assessment and feedback in their courses (HEFCE, 2013).

Finally, 75% of the computing students mentioned that they mainly receive feedback on physical copies of their work. It is interesting to note that whilst the extensive use of e-mail is perhaps to be expected within computing departments where students are traditionally engaged with technology use, feedback to students is generally provided via physical copies of their work.

The second set of factors is about what students think about their academic experience. In particular, the subsequent sections discuss class attendance and students' commitment to unsupervised study.

<u>What students think about their academic experience</u>

Attendance: A third of students stated that they had missed, on average, an hour per week of their taught sessions. This reduces the actual average of supervised hours for computing students from 13 to 12 hours per week. When the students were asked to explain why they stopped or rarely attend certain classes (comprised of lectures, tutorials and supervised laboratories) their most common answer was related to how useful they found the previous sessions they had attended. Specifically, 45% of the students reported that they did not find the lectures useful and 30% said that they felt no need to attend the lectures as they can access all notes online. Other reasons included work commitments (10%), cancelled lectures/tutorials (6%) and a variety of other reasons (9%) including personal reasons, health reasons and language comprehension difficulties.

Unsupervised hours: According to the Higher Education Policy Institute (HEPI, 2013) the average of unsupervised hours in all courses is 16 hours per week. In the current study the average for computing courses was 13 hours per week.

Whilst the average figure is 13 hours per week, there is some variation in unsupervised study behaviour amongst different students. Women are under-represented in computing departments, and across the wider Science, Technology, Engineering and Mathematics (STEM) subjects within the HE sector (HESA, 2012). Interest in computing courses, stereotypes, personality, values, interpersonal orientation and computer self-efficacy are all areas where differences between men and women have been identified (Botcherby & Buncker, 2012). These areas, as they relate to computing course studies, are a potentially interesting area of further research, in particular in relation to attitudes and approaches to study. Within the current study, a comparison was made between male and female students in terms of unsupervised study time, and within the sample, female students on average spent two hours per week more studying than male students. Another potential variation in unsupervised study relates to student age where, in this study, younger students tended to engage more in study groups with classmates than mature students who spent more hours studying individually (Woodfield, 2011; HESA, 2014b). Finally, students in this study who had part-time employment commitments were no less committed to either unsupervised study hours or class attendance, reflecting the results of other UK research in this area (Thomas, 2002; Robotham, 2012).

Total supervised and unsupervised study hours: By considering the number of supervised study hours alongside the unsupervised study hours, a view of the relationship between the two can be gained. Students who attend 0–10 supervised teaching hours per week on average spend 15 hours on unsupervised study. Students attending 11-14 supervised teaching hours tend to spend slightly fewer hours on unsupervised study (13 hours) whilst students attending the maximum provided number of supervised teaching hours per week (14 hours), study more outside of taught sessions (16-18 hours respectively). Of the students studying the maximum hours, the majority (70% of this group) were female, and mature students (40% of this group) were also disproportionately represented.

Approximately 10% of the computing students who participated in the focus groups expressed their desire to drop out of university. Those dropping out are harder to reach and the current study was focused therefore on those that have expressed a desire to drop out. These students' views need to be understood in order to improve their experience and reduce the risk of further drop out.

As the sample did not include students who were already disengaging, the level of desire to drop out is likely to be higher than 10%. Of those within the sample who expressed a desire to drop out, all felt confident about their academic skills, and the majority stated that they felt their course was challenging enough for them (70% of the 10%) and they reported attending the majority of their supervised study hours (80% of the 10%). When this was explored further within the focus groups, students who expressed a desire to drop out said that they had decided to continue with their studies because they felt this increased the likelihood of developing a future career and that having invested a time and financial commitment they wished to persist with their studies.

Academic experience: In general, computing students were satisfied by the overall quality of their course, both in terms of what they receive and contribute to it. Specifically, 85% mentioned that it is good. A minority expressed dissatisfaction with their academic experience. When the students were asked if their academic experiences met their expectations 30% said they had exceeded them, 60% said they had been neither worse nor better and 10% said they were worse than expected. Furthermore, 20% stated that they might have changed course if they knew what they did now about their academic experience.

The main reasons for dissatisfaction amongst all students in the sample were:

- 34% of the dissatisfied students thought that their course was not well organised
- 32% stated that teaching quality was low
- 30% that they expected better support from tutors
- 26% of the dissatisfied students felt that feedback was poor
- 25% that large classes were not effective
- 15% stated that the course was not challenging enough

Scheduled supervised hours: Students who participated in the focus groups stated that one of the main reasons they felt their course was not as challenging as they expected was because they had less supervised hours than they had expected. In other words, they expressed their desire for more tutorial/ laboratory sessions that could offer more practical hours with more work to do while on campus. Between 20% and 30% of the focus groups' participant students were either dissatisfied or strongly dissatisfied with the amount of supervised hours they received, and that for students who received 0 to 10 supervised hours per week only 57% were either satisfied or strongly satisfied with the supervised hours they received, whilst 73% of students receiving 11 to 14 hours per week were either satisfied or strongly satisfied with the supervised hours they received. Within the focus group discussions students also linked supervised hours with 'value for money', with more satisfied students those who receive a high number of scheduled supervised hours per week.

The focus group data analysis was also used to test the possibility of an independent association of factors with the likelihood of being satisfied with 0 to 10 supervised hours per week. The analysis identified the following factors as being the most important regarding student satisfaction with the scheduled hours they received.

- If students are satisfied with the teaching quality
- If students have developed their relationships with the academic staff (lecturers, tutors)
- If students are satisfied with the use of university facilities
- If students have a clear understanding of the course aims/objectives.

Teaching quality: Overall, students were satisfied with the teaching quality they received. Most of the students characterised the teaching staff as supportive (70%). Furthermore, 70% agreed that course requirements were clearly explained.

However, 35% of the students indicated that they were not motivated by their instructors and 40% of respondents stated that instructors explained things poorly. In addition, 25% stated that the teaching methods were not structured well. A very similar percentage viewed their bad course experience as linked to a poorly organised course (see section also **Academic experience**). Nonetheless, during the focus group discussions, students may not explicitly consider their contributions to their studies when evaluating their experiences, and therefore the responses should be seen both as indicative and potentially influenced by, for instance, a broad range of personal, social and demographic factors.

Additionally, students commented that some lectures were not useful partly because they could access the material online outside of the lecture or because there was no additional information provided by the lecturer in the lecture to support the lecture slides. Students said that they wanted more interactive sessions, shorter lectures and to spend more hours undertaking activities where they could have a more personal contact with the instructor. Students perceived that their subject required more practical exercises and tutor supported activities than some other disciplines. This agrees with

Gibbs (2010, 2014) whose work addresses a connection between teaching quality (as well as instructors' roles and functions) and retention.

Facilities usage: In general, there was high student satisfaction (90%) with access to university facilities. Access to facilities was seen as important by students in terms of supporting their unsupervised study, though the level of satisfaction with facilities did not affect the number of supervised or unsupervised study hours undertaken.

Course structure: One of the main reasons that students gave for their dissatisfaction was poorly organised courses (34%). Exploring this issue further with focus group participants highlighted an interesting finding that students responding to this question associated poor course organisation with poorly explained information regarding their studies.

It is worth to mention at this point that the quantitative approach was used to collect data from all first year students in order to offer the opportunity for a comparison amongst first year students from different course divisions, and investigate any major similarities and/or differences on retention issues. The quantitative results, even if they were modest, have shown similarities and common student retention issues. Consequently, the qualitative approach was applied for an in-depth and thorough exploration of the first year undergraduate computing students' reasons for dropping out of university, as this was the primary aim of the current study.

Having completed the analysis and interpretation of the quantitative and qualitative data the author proceeds with an overall discussion of findings by mixing the two preceding interpretations and answering the current study's research questions in an extensive discussion demonstrated in the subsequent section.

Finally, whilst the results of this study cannot be generalised as they are focused only on the first year undergraduate computing students at the selected UK HEI, the issues raised could be linked to possible application of knowledge. An in-depth discussion is later presented in a section related to implications and recommendations for practice (see Section 7.4). Nevertheless, it is suggested that further research with a larger sample across UK HEIs computing departments would have significant merit. Further recommendations for the future researcher, as well as limitations, of the current study are presented in later sections (see Section 7.5 and Section 7.6). The final section of the findings chapter focuses on the first year undergraduate computing students of the UK institution studied and gives final answers to the current study's main research questions.

6.5 Answering the Study's Main Research Questions

The aim of the current study was to examine the appropriate conditions for success for first year undergraduate computing students who enter a UK HEI and participate in learning communities. In particular, the subsequent research questions were addressed:

1. How do first year undergraduate computing students perceive their university experience?
2. To what depth and breadth does learning community participation affect social and/or academic integration?
3. What are the identified barriers/limitations to improve retention?
4. What learning characteristics or knowledge do students maintain and how are they accomplished?

In the following sections the author defines how the aforementioned questions were answered by the current study. Additionally, a discussion of what other questions remain to be answered is offered.

6.5.1 How do first year undergraduate computing students perceive their university experience?

The first question of the current study was developed in order to demonstrate the approach in which first year undergraduate computing students perceive their university experience. Furthermore, this question was concentrated on how their participation in learning communities can affect that perception. Specifically, as it was identified by the participant students their participation in a learning community was a highly beneficial experience (for evidence see Chapter 4, 5 and 6).

Nevertheless, a deeper look into the data can show how the participant students experienced their academic experience via the learning community lens. The majority of the participant students described and defined their participation in a learning community and were all positive experiences.

At this point, it is critical to indicate that the experiences of those who did not participate in a learning community are not described in this study. As a result, it cannot be possible to know whether those students could have had similar experiences as their participating peers, or not. Nevertheless, most of the participants' represented experiences could only be developed while engaging within a learning community designed environment. As Astin (1993) described in his study the participant students produced the 'Input – Environment – Output' university impact model, which hypothesised that students enter a university with set of experiences and characteristics and then interact with the collegiate environment in various different ways (i.e. participating in societies, attending classes, working on coursework etc.). These interactions, in association with the students' input characteristics helped students to develop new abilities, skills, and characteristics (see Section 2.2.3.1). In the current study, the participant students had a minimum of two common inputs. Specifically, all participant students were first year undergraduate students and all were computing students. Furthermore, they shared a common experience as participants in a learning community environment while in the first semester of their first academic year.

The elements and characteristics that were shared by the participant students, in conjunction with the positive views of their academic experiences, signify that student participation in learning communities is one of the factors that strongly assisted in their success in academic activities. In addition, one of the experiences that were mostly noted by the students as supporting directly their success was being involved in a learning community, but was also correlated to living near other students who were also participating in the same or another learning community.

Moreover, the participated students identified other experiences that occurred as part of their learning community experience, such as attending help sessions, learning how to study, developing relationships with their instructors, and participating in academic guidance and support programmes, as well as seeking support from their personal tutors. Although all these experiences were critical factors for students' success, their participation in academic guidance and support programmes, as well as seeking support from their personal tutors, appeared to be the most impactful.

Summarising, all these points are indicative that the learning community experience has a significant impact on the students' ability to learn more about themselves and others, to comprehend the academic success requirements of the university they attend, and to establish skills that can support them in their academic, social and professional activities. Finally, these experiences could directly be correlated to the students' academic and social integration to the university they attend, which is the focus of the current study's second research question.

6.5.2 To what depth and breadth does learning community participation affect social and/or academic integration?

As it was described in Chapter 4, 5 and 6, the participant students learning community participation had a positive effect on their integration, both academically and socially. An in-depth investigation of this assertion indicated that the participant students were able to evolve relationships across a spectrum of people at the university, involving staff members, their instructors, other students in their classes or in their department, and their learning community peers. Moreover, the participant students pointed-out that their involvement in student societies and help sessions aided their academic and social development since their initial participation in these learning communities. Many of the participant students also addressed that they encouraged other students to participate in these learning communities (for evidence see Chapter 4).

The students consistently specified examples of how their participation in learning communities helped them to develop new friendships, learn academic success skills (i.e. study methods), and get involved in campus activities and societies. For all these students, their participation in a learning community can be interpreted as a catalyst for establishing the necessary conditions that promote academic and social integration, as described by Tinto (1993) in his student persistence theory.

Tinto (1993) noted in his theory that in order for '*students to be retained to a university, they must become formally and informally integrated into the university in both academic and social realms'*. The examined university offered these experiences in an apparent manner. The students were associated in course, as well as located in common residence halls or houses together. In addition, the instructors administered out-of-class support sessions to students who were both academic and social in nature. The students, through their participation in learning communities, were able to get to know their instructors in and out of class, but also developed strong relationships with their classmates and other students with whom they were living with (see Section 2.2.1.1 and 2.2.3.2). As it was also indicated in previous chapters (see Chapter 4, 5 and 6), the students indicated that they were benefited from such relationships and noted that these experiences were connected to their continuous academic progress, and finally success at the university.

This notion for academic success was desired by most of the participant students. Nevertheless, it cannot occur without overcoming obstacles. Consequently, this leads to the third research question that is dedicated to this aspect of success.

6.5.3 What are the identified barriers/limitations to improve retention?

In 1999-2000 Padilla provided a new context inroad to comprehend the university experience. In his study he elucidated that university could be explained as "*geography of barriers*" (1999-2000, p. 136). The importance of each barrier, in relation with students' abilities to overcome each barrier, defined whether or not the students would persist (remain enrolled) in university. Although, most of the overcoming experiences expressed by the first year undergraduate computing students were positive, there were few barriers described that were helpful to comprehend what these students had to overcome in order to be successful.

The most extensive challenge for all students included a definite lack of skills that would lead to academic success. Specifically, the participant students frequently identified that they did not know how to study or that the skills used while in school did not benefit them in university. In addition, students described that they went through periods of trial and error, specifically with regard to study locations (i.e. library, room or apartment, student accommodation lobby). Even though it was not detected as an important barrier to success by the participant students, having strong academic skills is a critical component in order to do well in university level coursework (Astin, 1993; Pascarella & Terenzini, 2005). In case these students had failed to obtain such academic skills, there is a high possibility they would fail to persist in university.

Another set of experiences presented by the students as a possible barrier to success included dealing with instructors. Particularly, the participant students mentioned experiences about instructors who were intimidating, having accents that were difficult to understand, not being good as lecturers especially in large classes, and being challenging to cooperate with them in the classrooms.

Even though the aforementioned barriers were in students' lives, they were not proved to be impassable. For each of the presented barriers the participant students addressed methods in which they overcome them. For instance, one of the students mentioned that sometimes a student needs to approach the instructor and ask questions even if the instructor is not approachable. Another student noted that working with classmates helped to better understand what was taught by the instructor, in order to be able to study more efficiently. One more example comes from a student who indicated that had to understand that different instructors have different teaching methods, and this helped to work through similar situations in the future. The experience of encountering a barrier and successfully overcoming it is exactly what Padilla (1999-2000) defined as necessary means for student success.

The first year undergraduate computing students also seem to have employed various non-cognitive variables in overcoming these barriers and becoming successful students, which were addressed by Sedlacek (1999, 2004) (see also Section 2.2.1.3). Particularly, one of his non-cognitive variables (his second) includes having a realistic self-appraisal and knowing when to look for assistance or other methods of completing a task. Furthermore, another variable (his sixth) suggests that a support system should be in place for students in order for tutors to be able to support and guide the students to success. Finally, Sedlacek in his eighth variable mentions that students acquire knowledge in a given field in order to be successful. In the case of the current study the knowledge field was to learn how to work with instructors, and also the module being taught. The participant students were able to overcome challenges, through learning about both these aspects, as well as applying the other two variables. The process of overcoming barriers and engaging characteristics in order to accomplish success correlate to the fourth and final research question of the current study.

6.5.4 What learning characteristics or knowledge do students maintain and how are they accomplished?

In the final question of this study the author presented the characteristics or knowledge that a successful first year undergraduate computing student embedded in order to be successful. In addition, in this question is asked how those characteristics and/or knowledge were developed and learned. This idea is derived from Padilla et al.'s (1997) study for student success local models and Sedlacek's (1999, 2004) non-cognitive variables (see also Section 2.2.1.3).

Padilla et al. (1997) mentioned that are there three main factors that affect students' academic success. Specifically, these are: pre-university knowledge and experiences, university support systems, and internal and external awareness (ibid). The first factor is about what students thought to be important about university before entering and the second about the need to develop effective university support systems for the attending students. The third factor is more amorphous, but is related to locus of control (Lefcourt, 1976). Basically, the student needs to acquire an understanding of the things that are within his/her ability to control (internal) and those things that are outside of his/her control (external). When established, the student needs to concentrate on the internal pieces in an effort to overcome the external barriers.

The participant students in this study did not specifically address what they knew about success methods in academic level before accessing university. Their focus was mainly revolved around academic skill-sets. As it was identified in Section 6.5.2, as well as in Chapter 5, the participant students mentioned that they had some skill-sets that were developed while in school and that these skills could or could not be productive after they entered university.

In addition, there were students who felt they would need support and guidance while in university. In general, though, it was identified that the knowledge the participant students had in order to succeed before entering university did not offer a great deal to the data collection.

Nevertheless, when it came to knowledge acquired at the university studied, there was a great amount of data collected. While reviewing both qualitative and quantitative data, one can realise that student managed to learn a sufficient amount of knowledge after they started participating in various academic and social experiences at university. Even if the knowledge is, in general, definite to the situations and experiences presented, there were some common themes identified.

Specifically, the participant students determined that learning how to develop relationships, as well as the importance of those relationships, could be key elements for their academic success. Those relationships extended from normal friendships with classmates and other students to developing an instructor relationship in their universities. Furthermore, the students signified that they learned it was critical to convene and collaborate with other students who were successful in computing careers. This point was also identified in the findings presented in Section 6.5.2, as well as in Chapter 5.

The participant students did not indicate many thoughts connected to characteristics they had before entering university when discussing the experiences that lead to their success and persistence. Nonetheless, they seemed to acquire many new characteristics connected to academic success while in university.

Concerning characteristics usage frequency, the students mostly applied characteristics related to Sedlacek's (1999, 2004) second non-cognitive variable, which describes a realistic self-appraisal. This characteristic, which was related to the participants' success, was very common while students were discussing about what worked for them as study methods and methods for completing their coursework.

Furthermore, several students mentioned the importance of creating relationships and networks with other students and their instructors. This relates to Sedlacek's (1999, 2004) sixth non-cognitive variable of having strong support systems and Padilla et al.'s (1997) need for students to create strong support systems.

Most of the characteristics acquired by the participant students appeared to be related to development and maintenance support systems. One more area that appeared to be important included students possessing realistic self-appraisals. Specifically, about how they work best and what was required in order to complete specific tasks. Additionally, the idea of being in control of one's experiences was highlighted. The students understood that in order to be successful they need to meet and interact with other individuals (students and instructors), develop their motivation and learn methods that will help them to learn on their own. By taking control of the situations, the participant students managed to acquire characteristics that were broadly associated to Padilla et al.'s (1997) factor referring to internal awareness (see also third assertion in Section 5.2).

6.6 Conclusion

In the current chapter the author discussed and integrated the findings acquired from the quantitative and qualitative data in order to detect factors that affect and influence first year computing and non-computing undergraduate students' retention at a UK HEI through the use of Tinto's (1993) theory, but also as well as Padilla's (1991) and Sedlacek's (1999) theories.

The quantitative data analysis outcomes pointed-out that Tinto's model was modest in justifying student retention issues of first year undergraduate computing students due to model variables interpreting a modest amount of variance in student retention. Additionally, significant constructs of this model, such as academic and social integration, did not succeed on presenting major variances between students who were retained and students who withdrawn.

The quantitative data analysis outcomes revealed that solely two variables from Tinto's model expressed a direct effect on student retention. In particular, the most important direct effect was identified by 'initial goals and institutional commitments', which was then followed by 'later goals and institutional commitments'.

On the other hand, the qualitative data analysis focused only on first year computing undergraduate students and revealed that Padilla's (1991) and Sedlacek's (1999) theories produced useful results. In particular, the qualitative outcomes followed up and completed Tinto's theory results. This helped the author to clarify and confirm the quantitative outcomes, but also identify factors for low student retention in the UK HEI studied and answer the current study's four research questions.

Finally, from these four research questions only the second part of the fourth question that is about characteristics acquired and employed would require some further examination in future studies. Even if the question could be answered using the data collected, the other questions were answered in a far more definitive manner. In-depth justifications of this, as well as several limitations of this study are discussed in the subsequent chapter. Additionally, in the final chapter of the current study is presented a summary of the most important findings, as well as recommendations for further study by future researchers.

CHAPTER 7: CONCLUSIONS

7.1 Aim of the Study

The main aim of the current study was to address factors (reasons) that affect student retention at UK HEI. The main underpinning theory that guided the current research was Tinto's (1993) theory for student integration, as well as Padilla's (1991) and Sedlacek's (1999) techniques and theories for student success. These theories are progressive, long-term, and examine student retention holistically as the interaction outcomes between students and a university's academic and social integration system. All previous theories are explained in-depth in Chapters 2 and 3.

As described in Chapters 2 and 3, the fundamental underpinning concept of Padilla's (1991) and Sedlacek's (1999) theories, is no other than Tinto's (1975) theory. In his theory, Tinto (1975) describes that a student accesses a specific institution with a series of background characteristics. In particular, these characteristics involve parental background, pre-entry qualifications, and individual attributes. Specifically, the parental background characteristics contain the family level of education and family social status and the individual attributes include information such as race, age, gender, nationality etc. The pre-entry qualifications incorporate information about the students' pre-academic education, as well as other academic-related skills and abilities. According to Tinto (1975), with whom Padilla (1991) and Sedlacek (1999, 2004) agree with, all these entry characteristics directly affect a student's initial goals and institutional commitments. Particularly, goal commitments describe the what extent a student is committed to acquire a higher education level certificate, whereas institutional commitments represent to what extent a student is stimulated to complete his/her university studies from a certain institution (Tinto, 1975, 1993).

In addition, initial goals and institutional commitments influence a student's extent of integration in a university's academic and social systems. The academic integration includes two areas of integration, the normative and the structural. The normative integration is connected to the extent to which a student recognises the normative structure of the academic system, while the structural integration includes meeting the explicit standards of the university (Tinto, 1975, p.104). On the other hand, social integration relates to the extent of partnership between a university's social systems and an individual student. As Tinto (1975, p. 107) noted '*informal peer group relationships, extra-curricular activities, and interactions with administrators and faculty are mechanisms in which social integration occurs*'.

Finally, both academic and social integration influence a student's later goals and institutional commitments. Furthermore, these are also influenced by a student's levels of initial goals and institutional commitments. This is also supported by Tinto (1975, p, 96), who noted that '*in the conclusive analysis, the interaction between the student's commitment towards the aim of being successful and completing university studies, and his/her commitment to the university, is what defines whether or not the student chooses to withdraw from university*'.

7.2 Research Methodology Synopsis

The research approach employed in the current study was a mixed methods approach. Specifically, as it is appropriately described by Creswell (2013), it was a 'mixed methods concurrent triangulation strategy'. This is explained as a synchronic process of quantitative and qualitative data collection and analysis, with priority equally given to both data forms. Furthermore, data analysis is conducted separately, with data mixing taking place in the 'data interpretation phase' (Hanson, et al., 2005, p. 229; Teddlie & Yu, 2007). The main reason for selecting this strategy was due to its allowance of findings confirmation, cross-validation, and corroboration, all within the process of one study (Creswell, 2013). Both quantitative and qualitative methods supported each other as confirmatory techniques. In particular, the SEM (quantitative) was adopted because it employs a confirmatory approach to the data analysis (CFA), rather than an exploratory one (see also Section 3.6.6) and the 'unfolding matrix' (qualitative) because it allows data confirmation by sharing previous comments and exposing them to an iterative and constructive dialogical process (see also Section 3.7.1.2). The mixed methods concurrent triangulation strategy operated as a confirmatory framework that hosted the aforementioned confirmatory techniques.

The strategy applied was conducted in two stages. In the first stage the quantitative approach was used and data was collected from 901 first year undergraduate students. Particularly, two questionnaires were utilised at two phases in conjunction with data collected from the university studied admissions office. Finally, the quantitative data were analysed by utilising the SEM method.

In the second stage the qualitative approach was applied. The data was acquired from first year undergraduate computing student only in order to aid the author's effort to answer the main research questions of the current study. The data collection included 80 students who were interviewed in focus groups using the 'unfolding matrix' technique.

7.3 Important Findings Synopsis

The outcome from the quantitative data analysis using SEM indicated that the variation explained by Tinto's model was modest. The model's variables justified 34% of the variance in student retention. The SEM outcomes defined that 7 out of the 9 hypotheses recommended by Tinto's theory were supported by statistically significant outcomes. Specifically, the hypotheses supported are:

1) Students' parental background will be associated with their initial goals and institutional commitments.
2) Students' initial goals and institutional commitments will be associated with their academic integration.
3) Students' initial goals and institutional commitments will be associated with their social integration.
4) Students' initial goals and institutional commitments will be associated with their later goals and commitments.
5) Students' academic integration will be associated with their later goals and institutional commitments.
6) Students' social integration will be associated with their later goals and institutional commitments.
7) Students' later goals and institutional commitments will be associated with their retention status.

On the other hand, the 2 not-supported hypotheses of the model were:

1) Students' individual attributes (race, age, gender, nationality etc.) will be associated with their initial goals and institutional commitments.
2) Students' pre-entry qualifications will be associated with their initial goals and institutional commitments.

In addition, the SEM signified 2 outcomes that were not part of the initial hypothesis model. These were:

1) Students' initial goals and institutional commitments had a significant positive direct impact on student retention.
2) Students' social integration was positively related to their academic integration.

In summary, the quantitative data analysis results indentified that Tinto's theory was modest towards the examination of factors for low student retention at the UK HEI studied. Three possible explanations were given by the author for Tinto's (2006) theory not so effective explanatory power. Specifically: (1) One explanation might be a function of inadequate operational definition of the model variables (Pascarella & Chapman, 1983), (2) Another explanation could be that at least some critical student retention predictors might not be specified by the model (ibid), and finally (3) a possible explanation could be that Tinto's model was employed in order to interpret the student retention procedure in the context of the US higher education, and the variances between the UK and the US higher education systems were many (see also Sections 2.2.5 and 6.3).

The qualitative data analysis was conducted via the utilisation of Tinto's (1993) theory, Padilla's (1991) 'unfolding matrix', and Sedlacek's (1999) non-cognitive variables. With consistency to the current study's research, and having as background the quantitative analysis results, the qualitative data collection and analysis was focused on inspecting factors that lead to low student retention and prevent academic success and persistence in first year computing undergraduate students. According to Tinto's (1993) theory, the main underpinning theory of the current study, it was identified that persistent students seemed to have higher levels of initial and later goals and commitments then students who were non-persistent. Furthermore, both academic and social integration did not address a significant difference between persistent and non-persistent students. As a result, as an alternative method of prediction, the author enquired the participant students regarding to what they perceive to be critical factors that affect student retention at the university studied. The participant students who were classed as 'non-persistent' signified the following:

- Lack of cultivation of an effective skill-set and development of personal awareness (41%)
- Difficulties during the transition and adjustment period to university environment (40%)
- Non-sufficient academic support and guidance (19%)
- Difficulties cooperating in learning communities with other classmates (19%)
- Non-efficient active interaction with other successful students (18%)
- Distance from university (18%)
- Low motivation (18%)
- Difficulties on living away from home (6%)
- Financial problems (6%)
- Family problems (5%)

While, the 'persistent' participant students addressed as important factors the subsequent results:

- Lack of cultivation of an effective skill-set and development of personal awareness (43%)
- Difficulties during the transition and adjustment period to university environment (40%)
- Non-sufficient academic support and guidance (27%)
- Difficulties cooperating in learning communities with other classmates (27%)
- Non-efficient development of relationships with academic staff (27%)
- Distance from university (20%)
- Non-sufficient academic support and guidance (20%)
- Low motivation (14%)
- Financial problems (14%)
- Family problems (5%)

A further analysis of the previously mentioned qualitative data results offered a final list of factors that affect student retention. This list identified 11 factors that were categorised in two different groups. The first group was about institutional factors and the second group was about non-institutional factors. Specifically, the institutional factors were: (1) Lack of cultivation of an effective skill-set and development of personal awareness, (2) Difficulties during the transition and adjustment period to university environment, (3) Non-sufficient academic support and guidance, (4) Difficulties cooperating in learning communities with other classmates, (5) Non-efficient active interaction with other successful students, and (6) Non-efficient development of relationships with academic staff. On the other hand, the non-institutional factors were: (1) Distance from university, (2) Difficulties on living away from home, (3) Financial problems, (4) Low motivation, and (5) Family problems.

Finally, all the aforementioned rich data analysis results were then used as theoretical and practical domain and range in order to answer the four main research questions of the current study (see also Section 6.5). Whilst the results of this study cannot be generalised as they are focused only on the first year undergraduate computing students at the studied institution, the consistency of issues between a university's departments increases confidence in the commonality of issues raised, and suggests further research with a larger sample across UK HEIs would have significant merit. A thorough discussion of the current study's limitations is conducted in the following section.

7.4 Implications and Recommendations for Practice

The current section provides an analysis of the student engagement and retention implications, as well as recommendations for practice, arising from the findings outlined in this study.

Study time variability and standardisation: According to the data analysis, students identified issues such as; their courses not being challenging enough, significant workload variation between term 1 and term 2, or that they had less work to do than they expected. However, only a minority of students wanted a more challenging course with extra work. Nevertheless, this is an area where further research could be undertaken by individual institutions. The current study's mixed-methods approach could provide a method for institutions to identify their students' overall workload and to engage in a dialogue with them with a view to identifying potential changes to their course delivery. HEFCE's recent consultation on the National Student Survey (HEFCE, 2011) specifically involves discussion of the benefits of engagement-based surveys.

Students reporting low unsupervised study hours were more likely to have considered dropping out. An implementation of effective monitoring of study patterns could be considered by institutions in order to support interventions designed to improve student retention, for instance through student consent for learning analytics data collection.

Improving student guidance and information provision: A third of students in the sample stated that if they had known more about their academic experience before enrolment, they would have made a different course choice. Students feel it is very important that they can have the opportunity to compare courses based on realistic information before making their final course choice (BIS, 2011). In 2012, Higher Education Funding Council for England (HEFCE) decided to make available standardised information about undergraduate courses (HEFCE, 2013b). The official website to search for such information is Unistats (HEFCE, 2013b; Unistats, 2014). Specifically, the Key Information Set (KIS) is a comparable set of standardised information about UK undergraduate courses (HEFCE, 2013b). KIS has been introduced in response to the reforms outlined in the government white paper 'Students at the Heart of the System' (BIS, 2011). The aim of KIS is to provide the information prospective students need in order to make informed choices about higher education (Unistats, 2014). KIS draws data from the National Student Survey (NSS) and the Destination of Leavers from Higher Education (DLHE) which surveys students who gained a qualification from a university or college, six months after they left (HEFCE, 2014b; HESA, 2014c, Unistats, 2014). The introduction of KIS was intended to help students compare courses based on key pieces of information, supporting students to make informed choices. However, the information in KIS about student experience is limited (Unistats, 2014). KIS only relates academic experience to students' supervised study hours and placements, and does not include information on total workload and particular course delivery methods for example. Students, though, can access student satisfaction scores from National Student Survey (NSS) but still they do not have the opportunity to compare differences in academic experience. Again this indicates an area where further research could be undertaken. Apart from information provision, guidance and advice is also required to help students to make better decisions. The UK higher education bodies are currently undertaking a review of the provision of information within higher education (HEFCE, 2014). Part of this review, which is going to conclude in 2015, involves KIS.

Whilst the students' perspective provides a valuable insight into levels of engagement as they affect the students themselves, they may for example view issues in terms of the actions others may take to resolve a situation rather than how they may do things differently. Therefore, the reported areas represent only the students' expressions of the factors influencing their view of their studies. The messages emerging from the participant first year undergraduate students at the UK institution studied were:

1. Computing students expressed more satisfaction with organised courses where requirements are clearly explained by their instructors. Furthermore, they prefer expectations to be explicitly identified and instructors to support them in meeting these expectations.
2. Computing students believe that when they participate in small to medium study groups their academic experience is improved.
3. Computing students value good teaching support during their tutorial/ laboratory exercise sessions and non-academic staff were found to be providing good support.
4. Computing students expect their course to be less lecture-oriented and more tutorial/laboratory exercise oriented classes, when comparing themselves to students in other disciplines.

Students' expressed a desire for more supervised teaching hours and felt that the amount of supervised study hours linked to their sense of engagement. As such, increasing supervised study hours may lead to students feeling more satisfied. The computing department studied may not be providing teaching experiences that best meet the needs of all their students. Therefore, the following recommendations for practice are proposed to the computing department's academics and faculty leaders. In particular, the participant students:

1. Expressed more satisfaction with well organised courses with requirements clearly explained by their instructors. Furthermore, they preferred expectations to be explicitly identified and instructors to be supportive,
2. Believed that when they participated in small to medium study groups their academic experience improved,
3. Valued good teaching support during their tutorial/laboratory exercise sessions, and
4. Expected their course to be less lecture-oriented and more tutorial/ laboratory exercise oriented classes, when comparing themselves to students in other disciplines (see Section 6.4.1).

7.5 Limitations

There are several limitations that must be taken into consideration in the current study. To begin with, a limitation of this study is the fact that it was conducted at a single UK HEI. Therefore, the findings of this study may not be generalised to other universities of the same or other type. As Tinto (1993, p. 112) noted his model '*attempts to explain student retention within a given university and is not a systems model of departure'*.

Second, the technique employed for the qualitative data collection could be seen by some as a limitation. As discussed in Chapter 3, the 'unfolding matrix' technique is developed in order to collect one's data before it is even collected by establishing a grid derived from the research questions and literature supporting the topic being studied (Padilla, 1991, 1994). Generally, qualitative data analysis nature is characterised emergent, which means that data collection is based on real-world settings and phenomena, and topics are investigated as they are identified (Padilla, 1994). This concept has also been discussed by Patton (2014, p. 40) who stated that the researcher in an emergent design has an '*openness to adapting inquiry as comprehension deepens and/or situations alter*', and also, '*the researcher avoids getting locked into rigid designs that eliminate responsiveness and pursues new paths of discovery as they emerge'*. Nevertheless, the 'unfolding matrix' technique response to this through its ability to 'unfold' vertically as definitions of the lead data vector are investigated and horizontally as concepts that fall outside of the pre-defined categories are justified. Therefore, even if there is a precise structure that is followed for the data collection, it does allow pertinent areas of research to be investigated. Although, it still could be considered as a limitation for a study, this technique permits new information to be inquired and inspected in the light of the study. It is the researcher's decision, though, to determine where in the existing grid the data should go, if anywhere, or if new columns will have to be added. Whereas the application of the 'unfolding matrix' is possible to lead the expansion of grounded theory, some may choose a more traditional emergent or realistic inquiry designs in order to achieve their research objectives.

Third, due to the fact that the qualitative research focus was on the experiences of first year undergraduate computing students, the voices of non-computing students were not heard in sufficient depth and breadth in the current study. It is possible that the types of experiences they would address could differ from this study's participants, and as a result they should be involved in future research. Specifically, studies including learning communities from more, if not all, departments, with greater student representation, and how they perceive their ability to achieve academic success should be conducted. As Padilla (1991) described, '*it is likely that the learning* *communities experience is contributing to the development of heuristic knowledge. Nevertheless, it is equally possible that students can develop just as much heuristic knowledge in spite of or even without the learning community experience'*. Therefore, non-learning community participants should also be studied in the future in order to identify the benefits of learning communities' participation in the development of heuristic knowledge.

The fourth limitation is related again to the qualitative data collection process. Specifically, it is about the potential inaccuracy of the experiences addressed by the focus group interviewees. The participant students, though, had the opportunity to comment on the previous participants' experience, which secured a certain level of accuracy within the sample examined. Despite that, if the same study was to be conducted with different students would possibly result different results. Therefore, it is extremely difficult to define the extent to which these experiences are shared for all computing student at the university studied. Nevertheless, the focus group interviewees presented experiences that were mainly positive and linked these experiences to their academic success. Ergo, it would be useful to consider developing some of these conditions in order to enhance learning communities and other initiatives for first year computing and non-computing students.

Fifth, the data acquired from the quantitative and qualitative data collection were rich, but the results deduced from that data are limited in the broader population sample that is represented by the participants in the study. This study was focused only on student retention in first year undergraduate students, with a particular emphasis in computing students. Therefore, student retention in subsequent years was not examined. Even if the outcomes of this study cannot be generalised beyond first year undergraduate computing students who were in a learning community of the university represented in this study, these findings could be applied broadly to this university's departments through the notion that if several students indicated that something was helpful, many more students could benefit from the same intervention.

Finally, another limitation of this study was that it was not possible to validate if the non-persisted students of the institution studied were transferred to another institution, and whether or not were willing to re-enrol to the same university, or another, to continue their studies.

Considering what was said before, it is likely that the techniques and methods used, as well as the heuristic knowledge acquired by the participant students, could be shared to all students of the university studied. Ergo, even if the results cannot be generalised broadly, the current study's outcomes could impact the approach in which learning programmes are offered and opportunities are made available towards the effort to aid students' development in order to achieve academic success and careers.

7.6 Recommendations for Further Research

Even if the current study's findings provide some useful conclusions regarding the benefits offered by the learning communities and first year undergraduate computing student's involvement, it is considered a starting point for further research on the total population of the UK HEI examined. The outcomes of this study should be used in order to guide a second quantitative study involving a larger sample of computing and other courses first year students, but also increase the data sample size by including second and third year students from all courses. Similarly, a second qualitative study should involve more computing students, as well as students from other courses. Furthermore, as in the quantitative study, the new qualitative study should include in the data sample second and third year students. While this study involved a large data sample not all voices were present in this study, and it is likely that including polyphony of experiences will lead to more accurate results. It is prominent to understand the experiences of these students and create opportunities and programmes where success can be more readily obtained. As such, further research is necessary in order to establish the efficiency and the efficacy of factors already recognised as predictors of successful student retention. Such an effort would necessitate a long-term process that would include a larger sample collected from not only a single university, but from a number of different UK HEIs in order to provide a more detailed analysis for student retention issues and methods for academic success.

A second direction for future research would be an in-depth exploration of men and women experiences at the examined UK HEI, since there might be gender differences. Specifically, addressing their differences and similarities in their knowledge approaches and experiences is a necessary piece of the retention puzzle that needs to better understood. It is also recommended that variations between different genders might be related to staff-student interactions, students' motivation, as well as future career opportunities. Towards this research direction it would also be crucial to include students from black and ethnic minority (BEM) backgrounds. If completed, the study should develop a design that would lead to the creation of a new innovative learning model that would take under consideration issues related to protecting and respecting students' individuality, as well as meeting the unique needs of every student.

A third direction would be to test the possible option of allowing students to select a major module and not be pre-defined in their first academic year as it happens in other higher education systems, such as the US higher education system. Nevertheless, before any alterations to the current higher education system, a pilot study should be conducted in order to evaluate its effects on attrition and retention.

Previous research has pointed-out the significance of the academic staff-student association in relation to student retention (Tinto, 1993; Pascarella & Terenzini, 2005). In the current study the quantitative data analysis results addressed that student-faculty interaction, as a social integration indicator, showed a modest impact on student retention. Despite that, the qualitative data analysis as an alternative interpretation method revealed why this factor did not affect student retention in this context. Specifically, the reason was because some of the participant students (persisted and withdrawn) expressed some dissatisfaction regarding their relationships with faculty members. Therefore, as a fourth direction, it is recommended to examine methods in order to improve development of relationships between students and faculty, in a formal and non-formal context, which could aid to overcome hierarchy. This would then help students to improve their social, as well as academic, integration. A point clearly indicated by many first year computing students during the focus group interviews.

The quantitative data analysis results of the current study indicated that many students, from those persisted and withdrawn, did not show significant participation in social activities while at university. Studies conducted by other researchers have indicated the significance of student participation in university social activities in student retention (ibid). In this study, it was repeatedly described by the participant students the importance of peer relationships in the overall student experience. Social integration and student interactions are critical for their academic improvement, retention, and finally, progression. Therefore, the fifth direction is that the UK HEI examined, through promotional materials, should further investigate the benefits, in terms of performance and progression that could result from first year computing students' participation in student learning communities, extracurricular activities and societies.

The importance of academic advising and support on student retention has also been addressed in previous research (Thomas, 1990; Pascarella & Terenzini, 2005). In the current study the qualitative data analysis results revealed that computing students indicated the need for better support and guidance. Therefore, as a sixth recommendation, it is suggested that the university examined should re-evaluate its student support and guidance systems in terms of effectiveness and efficiency.

It was noted in Section 6.3 that, so far, Tinto's model has been tested by using the SEM method in only a few quantitative studies. A commonly identified factor in all those studies, as well as in this study, was that Tinto's model interpreted a relatively modest portion of the student retention variance. Reflecting on a series of points that was addressed in Section 6.3 and according to the author's experience by conducting this study, it is suggested that this method can aid a researcher who wants to examine and model complex phenomena. Therefore, it is recommended that future researchers should employ this statistical method in similar studies.

One more point can be made regarding Tinto's model modest interpretation of the student retention process. It could be theorised that the most significant predictors identified may not be accurately addressed by this theory. Therefore, a more comprehensive research study would be strongly recommended in order to specify these predictors. As it was previously noted, such an effort would need an even larger sample and preferable more than one institution (see also Section 2.2.5).

Finally, the current study was based on factors derived from Tinto's theory. Further research could therefore examine additional factors such as alternative learning and teaching methodologies, as well as new technologies that could aid the employment of such methods (i.e. cloud computing, big data). This could also improve the variance proportion explained in any future explanatory model of student retention at the UK HEI examined (see also Section 2.2.5).

7.7 Final Thoughts

The current study was conducted in order to better understand the experiences of first year students with a particular focus on first year undergraduate computing students at a UK HEI, who were involved in a learning community related to their courses. The participant students provided a wide range of data and information that resulted in the answers of the four main research questions. It is evident that first year students, regardless if they are computing students or not, become integrated to the university both socially and academically. Student support systems play a prominent role in the students' success, which is also consistent with the existing literature. In addition, most computing students seemed to develop a strong sense of self-awareness and who they want to become.

At the same time computing students showed a tendency to become more independent. For instance, there were computing students who wanted to figure things out on their own and worked in order to develop an internal locus of control with regard to personal success. According to Lefcourt (1976) '*individuals who develop an internal locus of control are likely to accomplish more over time and have a better understanding of they can get to where they need to be'*. In general, the more a university offers to help students better comprehend their personal aims and develop programmes that help to accomplish such aims, the more this university can support the improvement of internal locus of control in them as well.

This study also highlighted the students' need to develop robust academic skills sets that would benefit them towards their academic studies. These skills should be further cultivated and integrated into study programmes, and be offered to all students at the university examined, not only to computing students. Finally, it was also indicated the need for developing opportunities and programmes that permit computing students to interact with each other, with their instructors, as well as with other students who succeeded in their academic studies and computing careers. This includes successful study methods and networking opportunities. As many of the participant students mentioned that they were inspired by other successful students, and this helped them to be more determined and motivated for academic success.

In conclusion, the results of the current study lead to the point that through a continuous improvement of learning communities and other programmes that enhance student success, it could be possible to inspire more students who wish to study computing courses and at the same time contribute to their professional development. The accumulation of current and future students' experiences might result in the creation of a student success model that could be replicated broadly toward an effort to establish computing students' academic success and, therefore, a successful career. New technologies and tools, such as cloud computing and big data, could aid towards this direction by allowing greater diversity and enhanced interactivity between individual students and individual academics.

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APPENDIX

Appendix 1: Engagement Questionnaire Introduction

Engagement Questionnaire Introduction

Your views on your experience at your university so far

About the research

This engagement questionnaire is part of the university's work in identifying the 1st year student experience and how the university creates a sense of engagement and belonging during your studies. The aim of the research is to enhance and improve your experience now and in the future. The collected anonymised data will also be used as part of my PhD thesis which investigates the reasons of low student retention and connects them with behavioural patterns.

The questionnaire should take no more than 10 minutes to complete. All the questions require a tick in a box. Please try to be honest and reflective with your answers. In that way, the results will help us get a realistic picture of what students think about university. If at any point you do not feel comfortable about providing answers to the questionnaire then please do not feel obliged to complete the study.

What data is needed?

The engagement questionnaire is designed to assess your opinions about different aspects of your experience at university so far. Specifically, how you find the social and learning experiences and if you have any concerns about staying.

What will be done with the data?

Your answers will be treated with complete confidentiality and all data will be anonymised before analysis. Your student ID is being asked for so that your responses can be linked to the information you provided the university when you enrolled (such as age, gender, and ethnicity). Once your student ID has been used for this purpose, it is removed from the data set before analysis. If you wish to be completely removed from the questionnaire we will be able to do this up to two weeks after your questionnaire completion. Any responses which mention specific individuals, modules or courses will also be anonymised.

Once the data has been anonymised and analysed, it may be shared with colleagues across the university to help identify where we can improve the student experience. It will also be shared with other universities to support, enhance and improve Higher Education sector best practice. The final research findings will be published in journals and/or at research conferences.

If you have any questions or would like further information, please do not hesitate to contact me at the following email address: xxxxx.yyyyyyy@hud.ac.uk. Thanks for your help, Alex

Appendix 2: Engagement Questionnaire Explanation

Engagement Questionnaire Introduction

Your views on your experience at your university so far

About the research

This engagement questionnaire is part of the university's work in identifying the 1st year student experience and how the university creates a sense of engagement and belonging during your studies. The aim of the research is to enhance and improve your experience now and in the future. The collected anonymised data will also be used as part of my PhD thesis which investigates the reasons of low student retention and connects them with behavioural patterns.

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If you have any questions or would like further information, please do not hesitate to contact me at the following email address: xxxxx.yyyyyyy@hud.ac.uk Thanks for your help, Alex

Respondent Consent

Before completing the following consent checklist, if you have any questions or would like further information, please do not hesitate to contact me at the following email address: xxxxx.yyyyyyy@hud.ac.uk.

The researcher has attempted to provide a clear summary of the research study on the previous page but more detail can be found here, and within the sample Engagement Questionnaire. Your institution is also required to consent to the study through an Institutional Approval Form. This respondent consent webpage is provided to check that you understand the purpose of the study, your role within it, and that you are happy to participate in the study. Please select yes or no as applicable to each question below, and if you have answered YES to all the checklist statements, please confirm your consent by clicking proceed at the bottom. Please can you then complete the questionnaire.

If you feel you require further information or clarification prior to consenting to the study please can you contact the researcher as soon as possible. Similarly if, completing the questionnaire, you have any concerns regarding either the questions asked, your responses to them or your involvement in the study can you please contact the researcher by email no later than two weeks after the questionnaire completion.

	Please delete as applicable
1. I have read the aforementioned information.	YES / NO
2. I have had the opportunity to ask any questions and to discuss the research study.	YES / NO
3. All my questions (if any) have received satisfactory answers.	YES / NO
4. I understand what the purpose of this study is and how I will be involved.	YES / NO
5. I do not require any further information but am free to request it at any time.	YES / NO
6. I have had enough time to decide to join the study.	YES / NO
7. I agree to take part in this research study	YES / NO

Further explanation for students

Study Name: Higher Education Student Engagement Questionnaire (2013-2014) 2014 – 2015

Name of investigator: Alexandros Chrysikos

Introduction

We are carrying out a research project which studies the factors that lead to low student retention in 1st year Undergraduate Students. This in turn affects the students' academic experience. The purpose of the Student Engagement Questionaire is to diagnose and map the factors that lead 1st Year Undergraduate Students to low retention. The data collection is followed by a data analysis which results in a list of factors that affect 1st Year Students' activity and learning experience.

Aim of Student Engagement Questionnaire

The Student Engagement Questionnaire is part of research that focuses on the factors identified by the questionnaire and then aims to enhance and improve your experience now and in the future. The collected anonymised data will also be used as part of the author's PhD thesis which investigates the reasons of low student retention and connects them with behavioural patterns.

Methods

The Data collection is conducted via a questionnaire. All questions used are Likert – type questions. A copy of the questionnaire is also provided **(see sample Engagement Questionnaire).**

Ethical issues

All answers will be treated with complete confidentiality and all data will be anonymised before the Data Analysis. Furthermore, all student IDs is being asked for so that your responses can be linked to the information you provided the university when you enrolled (such as age, gender, and ethnicity). Once your student ID has been used for this purpose, it is removed from the data set before analysis. If you wish to be completely removed from the questionnaire we will be able to do this up to two weeks after your questionnaire completion. Any responses which mention specific individuals, modules or courses will also be anonymised.

Once the data has been anonymised and analysed, it may be shared with colleagues across the university to help identify where we can improve the student experience and be shared as well with other universities to support, enhance and improve Higher Education sector good practice. The final research findings will be published in journals and/or at research conferences.

All the aforementioned issues are also briefly addressed before the start of the Student Engagement Questionnaire. The participants have the chance to read a brief Introduction of the questionnaire's purpose.

Contact us

Before completing the following consent checklist, if you have any questions or would like further information, please do not hesitate to contact me at the following email address: xxxxx.yyyyyyy@hud.ac.uk

Appendix 3: First Engagement Questionnaire

Your Student ID number is: ....

Engagement Questionnaire	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1. It is important to me to graduate from university.	❍	❍	❍	❍	❍
2. I am confident that I made the right decision in choosing to attend this university.	❍	❍	❍	❍	❍
3. It is likely that I will re-enrol at this university.	❍	❍	❍	❍	❍
4. It is not important to me to graduate from this university	❍	❍	❍	❍	❍
5. Getting good grades is not important to me.	❍	❍	❍	❍	❍

Appendix 4: Engagement Questionnaire

Your Student ID number is: ....

Engagement Questionnaire	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1. Since coming to this university, I have developed close personal relationships with other students.	❍	❍	❍	❍	❍
2. My non classroom interactions with faculty have had a positive influence on my personal growth, values and attitudes.	❍	❍	❍	❍	❍
3. Few of the faculty members I have had contact with are generally interested in students.	❍	❍	❍	❍	❍
4. I am satisfied with the extent of my intellectual development since enrolling in this university.	❍	❍	❍	❍	❍
5. It is important to me to graduate from university.	❍	❍	❍	❍	❍
6. The student friendships that I have developed at this university have been personally satisfying.	❍	❍	❍	❍	❍
7. My non classroom interactions with faculty have had a positive influence on my intellectual growth and interest in ideas.	❍	❍	❍	❍	❍
8. Few of the faculty members I have had contact with are generally outstanding or superior teachers.	❍	❍	❍	❍	❍
9. My academic experience has had a positive influence on my intellectual growth and interest in ideas.	❍	❍	❍	❍	❍
10. I am confident that I made the right decision in choosing to attend this university.	❍	❍	❍	❍	❍
11. My interpersonal relationships with other students have had a positive influence on my personal growth, attitudes, and values.	❍	❍	❍	❍	❍
12. My non classroom interactions with faculty have had a positive influence on my career goals and aspirations.	❍	❍	❍	❍	❍

13. Few of the faculty members I have had contact with are willing to spend time out of class to discuss issues of interest and importance to students.	❍	❍	❍	❍	❍
14. I am satisfied with my academic experience at this university.	❍	❍	❍	❍	❍
15. It is likely that I will re-enrol at this university.	❍	❍	❍	❍	❍
16. My personal relationships with other students have had a positive influence on my intellectual growth and interest in ideas.	❍	❍	❍	❍	❍
17. Since coming to this university, I have developed a close, personal relationship with at least one faculty member.	❍	❍	❍	❍	❍
18. Most of the faculty I have had contact with are interested in helping students grow in more than just academic areas.	❍	❍	❍	❍	❍
19. Few of my courses this academic year have been intellectually stimulating	❍	❍	❍	❍	❍
20. It is not important to me to graduate from this university.	❍	❍	❍	❍	❍
21. It has been difficult for me to meet and make friends with other students.	❍	❍	❍	❍	❍
22. I am satisfied with the opportunities to meet and interact informally with faculty members.	❍	❍	❍	❍	❍
23. Most of the faculty I have had contact with are genuinely interested in teaching.	❍	❍	❍	❍	❍
24. My interest in ideas and intellectual matters has increased since coming to this university.	❍	❍	❍	❍	❍
25. Few of the students I know would be willing to listen to me and help me if I had a personal problem.	❍	❍	❍	❍	❍
26. I am more likely to attend a cultural event (for example, a concert, lecture or art show) now than I was before coming to this university.	❍	❍	❍	❍	❍
27. Getting good grades is not important to me.	❍	❍	❍	❍	❍
28. Most students at this university have values and attitudes different to my own.	❍	❍	❍	❍	❍
29. I have performed academically as well as I anticipate I would.	❍	❍	❍	❍	❍

Appendix 5: The 'unfolding matrix'

The following is the completed 'unfolding matrix' with raw data amalgamated from a series of interviews (focus groups). The data are analysed, coded, theme-grouped and developed into assertions.

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
1	Submiting assignments on time			No	pressure from flatmate who was good student	People said that this was critical	Learned how to study for University level	Learned to work as a good student	
				No	Having flatmates as classmates as well is very helpful because they co-operate epspecially when they have common problems	In high school did not work from early which is a habit that I kept in University as well	It is crucial to have tutors that make sure that tutorial work is done right		Support from tutors is importnat in ot make sure that assignments are done correctly
					Having flatmates in the same class is bad especially when I work with other students froma common class		If you have a realistic action plan for the assignments, helps you to finish on time. As a result, usually you get higher grades.		
							University level is higher than the high school level		It is important to be aware of previous succesful methods and the methods are used in our days
				Yes	Lecturers/Tutors encouraged to complete assignments before deadline	Already informed about its importance from high school teachers	Motivated to complete assignments in advance		Realised how important is to complete assignments in advance and its benefits
				No		Without stress work quality is higher	Stress helps to work effectively	Better understanding on how to work effectively	
				No	Finf areas in the campus that inspire to study (i.e.library)	Completing the assignments early was a high school habit	If you plan your work in advance, you feel less stressed		

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
2	Academic support / Use of learning support services	2 to 3 times per month		Yes	Friendly tutor arranging coffee brakes	Informed about the available resources during the induction week	Tutors are friendly in and out of class hours	for advice from people (tutors) with greater knowledge	All questions have to be asked, there is no 'silly' question
									Crucial to know those who can support and help you
					Class with many students leaving no time for questions	Though it is not needed in University level but I realised is very important	I know that support services are available but I have not used them yet		Based on what you do/don't know seek for help when necessary
					Drop-In sessions with smaller number of students offers more effective learning		Participating in support sessions you have the opportunity to know your tutors better	Networking with your tutors might help your academic success	Getting to know your tutors bettercan lead further studies opportunities (i.e. research)
					Learned for other students who were attending the support session		Prefer to attend but not asking questions	Sense of what works and what doesn't	
		Once every other week		No	Low quality, unprofessional class organisation		Prefer structured learning environments than Q&A support sessions		

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
3	Low attendance in Academic support / Use of learning support services			Yes	Not feeling comfortable to apporach the tutor in order to ask questions		Do not feel comfortable to ask questions in fornt of another group of people	Knowing myself and how I feel comfortable, I tried to find my own ways to solve problems	
					The class/group setup makes it difficult to ask questions that the answers are known by everyone		The group set-up does not feel comfortable enough in order to ask questions		
				No	Feels more comfortable to go with a friend and talk to the tutor than talking to her/him during the tutorial with people you don't know	Better to meet tutor on face-to-face set up on her/his own time	You can develop relationships with tutors outside office and help sessions hours	Knew what worked for me and stuck with that - didn't really want to try something new	Very important to create such relationship with your tutors

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
4	Asking for support from friends			No	firends from who knew from before and new friends	Important to have emotional help when needed while you are at University		Critical to have a network of good friends available to help and support you	

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
5	Being part of a learning community	1st year undergraduate computing studies		Yes	Being in same classes and accomodation halls with people form the same learning community, helps to make friends	It is easy to get bored being with the same people all the time	Prefer not to live with best friends. In that way you have various places to go.		
					Lived on the same floor with my classmates		make friends with students who live in the same floor/block at the halls and be in the same class with them as well	Networking with other people is very important so, I made sure to meet many people	Ceating a network with other classmates/students where we can help each other (ncluding major students)
							made good friends from the same learning community		
					The accomodation hall facilities offer a nice environment for studing and living		Made 6 good friends so far		
					I haven't made friends only from my class (learning community)	In general, I am very social so it is easy to make friends	Made choices about which activities to participate based on friends made so far		I prefer to get involved with different activities on campus than class actvites

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
6	Tutor/Lectures communication via e-mails	almost daily		Yes~	using electronic services means no need to co-ordinate schedules	Previous experience from e-mailing tutors in high school	Not all the instructos respond quickly	Offering one more option for a different mean of getting info	
				No		Being able to communicate with people is very important skill	Perfect way to ask for help from people with greater experience		Use it appropriietly and the right time in order to ask for help

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
7	Difficulties with class tutor	1st term & half 2nd		Yes - Tutor with very challenging teaching methods	Students frustration when all they wanted was help	Students being frustrarted and trying to understand what the tutor was teaching	You can't always have everyone thinking the way you think		Leanred to work in a challenging environment
				Yes - Tutor who does not offer challenging material to students in order to motivate them	Students need guidance and more challenging material to deal with	Be patient with the tutor trying to find a way to make him/her motivate them	Learned to work with people who have a different way of thinking		Learned to work with people who have a different way of thinking

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
8	Generally my University is friendly	Daily		Yes ~	Friendly university, with people willing to help		Satisfied with my choice as this is a friendly University		
					Friendlier then my school environment		A friendly environment can increase University		
				No			Outdor activities with friendly people		It is critical to share interests and interact with other students
							People are always willing to help		
				No	Induction week helped a lot on that	Very important for people who come from different areas in the country and EU/ international students	All students asked mentioned that have afriendly welcoming from friendly people		A welcoming enviroment helps you to quickly become part of the University society and as a result help other new students

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
9	Recrational activities (sports, societies, socialising)	2 to 4 times per week			Appropriate in order to maintain life balance	Need more shopping opportunities - as way to clear your mind (shopping therapy)	Most of leisure centers or uni gyms offer services of good quality		Healthy lifestyle - leisure centers that offer an oulet for mental health and stess
						Leisure Activities helps you create a more stable mindset together with personal health which leads to more efficient studying			

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
10	Personal Tutor	1st Academic Year		Yes	easily accesible person; always available on appointments	Critical to meet and get to know new people			
				Yes	Not as experience and knowledgeable as I expected. Not always willing to help	Expecting that my personal tutor would be good at his/her job	Unfortunately, not all tutors are good at their jobs and knowledgeable about procedures and policies		In order to do well, I need the support from other people of the University who are knowledgeable
					Very frinedly personal tutor who is also willing to help other students as well		Having a knowledgeable personal tutor is very important because you also feel safe for your future decisions		My personal tutor has a full understanding of my goals and where I want to go. Positive and knowledgeable

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
11	Induction week	Week before start of classes		No			Friendly and helpfull people		
							University is a friendly place		
					Met new friends during induction activities		You get the opportinuty to meet new people and make good friends		A friendly environment helps you in the academic success
						The transition to universit level is very important for a succesfull 1st year and not only	The first weeks of university are very important to make new friends as well as meet your tutors	Generally, university is a stressful environment	University life is more comfrortable when you have friends and good relationships with your tutors

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
12	Getting helps from tutors			Yes	Tutors give us advice which part of the learning community experience	there are times that yo need to ask for help	It is helpful for assingments/coursework	It is not always easy to ask for help	
				No			Other students who are ahead of me in coursework can help me as well		When you study with friends and ask for help from tutors helps you create a network of people who can be helpful
							Tutors help me to know what needs to be done for classes, labs and assignments		
				Yes			Acadmic-focus groups help me in my studies		
				No	Feels very good when you know there is someone who can help you with your studies		Studying with groups of friends helps me more		It is always good to study and have tutors who are willing to help you

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
13	Enjoyable social life / fit in with my course people			Yes	academic interactions	People from different positions on a course can help each other due to course sequence			
				No	societis, work, helps to make more friends nad socialise				
				No	students activities and classes helped me to make new friends			Already knew that moral support in university is needed	Having a group of people (friends even better) that can support you is helpful
		1st and 2nd week of first term		Yes	formed a computing society and people and friends from the learning community		academicaly focused groups help with classes		
							creating bonds with people is beneficial		
					made good friends in the learning community (classes)		It is very helpful to have friends from the same classes who also live with you or near you. You can ask for help almost anytime		
							Societies environment is not always as advertised		
					mainly interact with students from the same class		In class competion for good grades is much less among friends		
					made very good friends with people I met during the induction week. We are also classmates	learning across disciplines			

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
14	Making relationships with tutors	Rarely		Yes	face-to-face relationships can lead to better learning		having a professional tutor is critical for your studies	if i didn't have good relationships with my tutors I wouldn't be able to have good progress	
				Yes			Good relationships with tutprs can offer you the opportunity for a very good letter of recommendation		
							In small size classes is easier to make reltionships with yout tutors	prefer small size classes; helps to make relationships with your tutors	feeling comfortable with your tutors helps you progress better
					Meeting tutors in the introductory sessions at the start of the academic year		tutors tend to be less intimidating when you meet them out of class		when you are uncomfortable helps you to be more motivated
							Interacting with your tutor in out-of-class hours creates stronger relationships with them		tutor support is valuable (as an advice as well as connections)
							making good relationships with your tutors (personal ot not) is important		
							discussing with your tutor out of course context subjects makes them look friendlier	tutors are not approachable and they are not willing to help on student success	
		Very often		No	the feeling that you personally know your tutor is reassuring		Getting a letter of recommendation from your tutor is important. Making relationships with them in advance, helps on that.		the benefits of creating relationships are realised in the future

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
15	Having a balanced life			No			Used trial and error method in order to find a good balance		not always easy to keep the balance but it is important to fullfil class duties and keep healthy
							having a balanced life is very important; that's why I joined societies		No balanced life means not succesfull in university
							keeping a balanced life is crucial but uni-work sometimes disturbs it		
					It is very important to have a balance bwteen study-time and personal time		I have not a balanced uni-life; trying to find a job and socialise		Prioritisation is very important for a succesful university life (social and academic)

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
16	Living with students from the same learning community	1st academic year		Yes	living in the same flat with classmates made things easier (assignments, in-		other students had common issues in classes		
					beneficial social environment		encouraged by my flatmates/classmates not to miss classes		Supporingt and helping each other helps to complete coursework on time
		1st academic year		Yes	students help each other in coursework and in the classes as a group		Motivated to complete assignments in advance		Better to work woth classmets than be on your own
		1st academic year		Yes	I share most of my classes with the students I live with		being in the same learning community/class does not necessarily mean strong friend-relationships		
		1st academic year		Yes	support on my academic studies from other studetns	interacting with students from the same class	helps to meet new people quickly (otherwise I would have only few friends)	Critical to have a network of good friends available to help and support you with class material	enjoy to network with other students and get benefitted from their knowledge and help them as I can

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
17	Not interacting with students in the same residence	1st academic year		No	I do not want to interact by choice		Prefer to be alone in roder to study; focus better		you can have support from other people;it doesn't always have to be from classmates/flatmates
				Yes	I had different interests with the students I was living with so, I started interracting wth students from another block		better to have your firends in another building		I didn't get on well with my flatmates
							when you already have friends, it is difficult to connect with new people		

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
18	Problems with personal tutor	1st academic year		No	only few personal tutors available	personal tutor do not reply to my e-mails and it is difficult to book an apointment	Manged to seee my personal tutor and is there for me only in great need		managed to find ways to be succesful without having to meet the person who causes me problems
				No			I was not aware of important university policies and procedures; and my personal tutor was not helping me		
				No			I understand the importance of having a knowleadgable personal tutor - I have changed tutor and thinks are better now		
							my experience with my personal tutor was not in the beggining but later it was improved		lack of suppport from personal tutor - made things very stressful

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
19	Structured/unstructured courses	1st academic year			changing deadlines, changing classes and tutors - does not meet my expectations	prefer a structured and organised course	organising by using electronic calendars		had to stay focused and well organised in order to keep up with these classes
							keeping a list with things to do		
							prefer a well strucutred course with specific milestones and deadlines - it helps students to progress smoothly		In order to be effective, I need good course structure and deadlines

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
20	Interacting with other students at the same course	1st academic term		No	met a student who was living in tha same accomodation with me		very important to connect with fellow students		interaction with other students is helpful
							important to connect and interact with students from the same course		interation with follow students is important as I will be seeing them in all from now on
							students form the same class provide help on studying methods and completing assignments		
							all students have similar problems; the feeling that you belong in a small learning society with common interests and issues is great		all students go through the same process (classes, assignments, tasks) - being with people who go through the same thing makes you feel better

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
21	Learning to study	on-going (since the start of 1st term)		No		Used similar tecnhiques that I used in high school. They proved to be helpful	I do activities that help me on studying		
							reading books,even if not required, adds to my learning and helps me in the courses		
		On-going (since the start of 1st term)		Yes	trial and error in order to find the right method and place to study	I didn't know how to study on univerity level and tried to use my previous high school experience	Studying in the university library helps me a lot	knew that going to university meant that I had to learn how to work in a more professional way	better understanding of what is needed for effective studying
				Yes			revise more than one time in the day before assignment submission or test (helps my performance		
							Listening to mucis while studying aids my productivity		
							house where I live is very quiet which helps me to focus		
							prefer to have people around me-when alone I am easily distructed		
							learning effective studying methods and skills form other people who are aware of the know-how - always based on what best suits you		getting advice form people with expertise and knowledge can be used for your own benefit
				Yes			Procrastinating on homework does not lead to success		
							procrastination is the thief of time		
							studying is like work -it is not fun		

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained
21	Learning to study	On-going (since the start of 1st term)		Yes			there are people who are willing to do whatever it takes to complete their work (working without enough sleep)		even in difficulties it is critical to stay focused on your work and be positive. Is is also good to ask for help from other students
		On-going (since the start of 1st term)		Yes			disagrees with previous point through a realistic action plan and svhedule you can achieve academic success		being succesful is possible - all you need is to be organised on what you do
		On-going (since the start of 1st term)		Yes		critical to learn study methods that work best	study methods learned (taking notes, revising notes)	having a realistic action plan can help be a succesful student	as you age you always learn new techniques/skills, improve the existing ones and gain experience
							classmates methods helped me a lot as they worked for me		realise that you cannot always work alone - there are laso other people (students, tutors) around you with greater experience and knowledge than you and it is goo to take advantage of them
							working with other students helped me to find ways for more effective studying		
							asked from tutors to suggest me methods for effective learning/studying		
						exams in high school were easy	need to find new studying methods of university level		
						when I was in high school I did not have to study much - university is whole new experience for me	learned new studying methods in order to be succesful on my in-class tests		

Appendix 6: The 'unfolding matrix' Template

	Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained

Appendix 7: Focus Group Interview consent form

Higher Education Student Engagement Interview 2014

This student engagement interview is commissioned by Alexandros Chrysikos PhD student of a UK university. This form is part of our commitment to transparency regarding our research when working in partnership with other HEIs.

Aim of Student Engagement Interview

This student engagement interview is part of the university's work in identifying the 1st year student experience and how the university creates a sense of engagement and belonging during your studies. The aim of the research is to enhance and improve your experience now and in the future. The collected anonymised data will also be used as part of the researcher's PhD thesis which investigates the reasons of low student retention and connects them with behavioural patterns.

Institution's commitment for data operation

Student answers will be treated with complete confidentiality and all data will be anonymised before analysis. Student IDs are being asked for so that student responses can be linked to information provided to the university when students enrolled (such as age, gender, and ethnicity). Once students' IDs have been used for this purpose, they are removed from the data set before analysis. If students wish to be completely removed from the survey we will be able to do this up to two weeks after the interview. Any responses which mention specific individuals, modules or courses will also be anonymised.

Once the data has been anonymised and analysed, it may be shared with colleagues across the university to help identify where we can improve the student experience. It will also be shared with other universities to support, enhance and improve Higher Education sector best practice. The final research findings will be published in journals and/or at research conferences.

Contact us

Before completing the following institutional approval checklist, if you have any questions or would like further information, please do not hesitate to contact me at the following email address: xxxxx.yyyyyyy@hud.ac.uk

Respondent Consent

The researcher has attempted to provide a clear summary of the research study within the above document. This Interview Consent form is provided to check that you understand the purpose of the study, your role within it, and that you are happy to participate in the study. Please delete as applicable in the first table below, and if you have answered YES to all the checklist statements, please confirm your consent by adding your name and the date to the second table. Please can you then save and email this document to the researcher as soon as possible by email (xxxxx.yyyyyyy@hud.ac.uk).

If you feel you require further information or clarification prior to consenting to the study please can you contact the researcher as soon as possible. Similarly if you have any concerns regarding either the questions asked, your responses to them or your involvement in the study can you please contact the researcher by email <u>no later than two weeks after the interview</u>.

	Please delete as applicable
8. I have read the aforementioned information.	YES / NO
9. I have had the opportunity to ask any questions and to discuss the research study.	YES / NO
10. All my questions (if any) have received satisfactory answers.	YES / NO
11. I understand what the purpose of this study is and how I will be involved.	YES / NO
12. I do not require any further information but am free to request it at any time.	YES / NO
13. I have had enough time to decide to join the study.	YES / NO
14. I agree to take part in this research study	YES / NO

NAME……………………………………………………………………………………DATE……………………………………

Your participation is completely voluntary.

Thank you for your contribution.

Kind regards

Alex

Appendix 8: PGR - Project ethical review form

University of Huddersfield

School of ComputinG and Engineering

<u>Project EthicAL REVIEW FORM</u>

Applicable for all research, masters and undergraduate projects

Project Title:	Mapping behavioural – related retention factors using a learning community lens: A mixed methods approach.
Student:	Alexandros Chrysikos
Course/Programme:	PhD in Computing
Department:	School of Computing and Engineering
Supervisor:	Dr. Rupert Ward
Project Start Date:	March 2012

ETHICAL REVIEW CHECKLIST

		Yes	No
1.	Are there problems with any participant's right to remain anonymous?	☒	☐
2.	Could a conflict of interest arise between a collaborating partner or funding source and the potential outcomes of the research, e.g. due to the need for confidentiality?	☐	☒
3.	Will financial inducements be offered?	☐	☒
4.	Will deception of participants be necessary during the research?	☐	☒
5.	Does the research involve experimentation on any of the following?		
	(i) animals?	☐	☒
	(ii) animal tissues?	☐	☒
	(iii) human tissues (including blood, fluid, skin, cell lines)?	☐	☒
6.	Does the research involve participants who may be particularly vulnerable, e.g. children or adults with severe learning disabilities?	☐	☒

7. Could the research induce psychological stress or anxiety for the participants beyond that encountered in normal life? ☐ ☒

8. Is it likely that the research will put any of the following at risk:

(i) living creatures? ☐ ☒

(ii) stakeholders (disregarding health and safety, which is covered by Q9)? ☐ ☒

(iii) the environment? ☐ ☒

(iv) the economy? ☐ ☒

9. Having completed a health and safety risk assessment form and taken all reasonable practicable steps to minimise risk from the hazards identified, are the residual risks acceptable (Please attach a risk assessment form) ☐ ☒

STATEMENT OF ETHICAL ISSUES AND ACTIONS

If the answer to any of the questions above is yes, or there are any other ethical issues that arise that are not covered by the checklist, then please give a summary of the ethical issues and the action that will be taken to address these in the box below. If you believe there to be no ethical issues, please enter "NONE".

Student IDs are requested for mapping responses to socio-demographic data. Given this accesses student records the mapping will be undertaken by the main supervisor (Head of Department) with the initial survey results collected by a member of the PINS team. Students will be made aware that only aggregate data will be used and individual students will not be identified as part of the analysis or any subsequent publication. The PhD student will only have access to the data once student IDs have been removed hence making individual student identification to the PhD student impossible given the large sample size.

STATEMENT BY THE STUDENT

I believe that the information I have given in this form on ethical issues is correct.

Signature: Alexandros Chrysikos Date: 23/09/2013

AFFIRMATION BY THE SUPERVISOR

I have read this Ethical Review Checklist and I can confirm that, to the best of my understanding, the information presented by the student is correct and appropriate to allow an informed judgement on whether further ethical approval is required.

Signature: Rupert Ward Date: 23/09/2013

SUPERVISOR RECOMMENDATION ON THE PROJECT'S ETHICAL STATUS

Having satisfied myself of the accuracy of the project ethical statement, I believe that the appropriate action is:

The project proceeds in its present form	
The project proposal needs further assessment by an Ethical Review Panel. The Supervisor will pass the form to the Ethical Review Panel Leader for consideration.	✓

RETENTION OF THIS FORM

- The Supervisor must retain a copy of this form until the project report/dissertation is produced.
- The student must include a copy of the form as an appendix in the report/dissertation.

OUTCOME OF THE ETHICAL REVIEW PANEL PROCESS, <u>WHERE REQUIRED</u>

	Tick One
1. Approved. The ethical issues have been adequately addressed and the project may commence.	☐
2. Approved subject to minor amendments. The required amendments are stated in the box below. The project may proceed once the form has been amended in line with the requirements and signed by the Supervisor in the box imediately below to confirm this.	☐

I confirm, as Supervisor, that the amendments required have been made:

Signature: ______________________ Date: ______________

3. Resubmit. The areas requiring further action are stated in the box below. The project may not proceed until the form has been resubmitted and approved. ☐

4. Reject. The reasons why it will not be possible to address the ethical issues adequately are stated in the box below. ☐

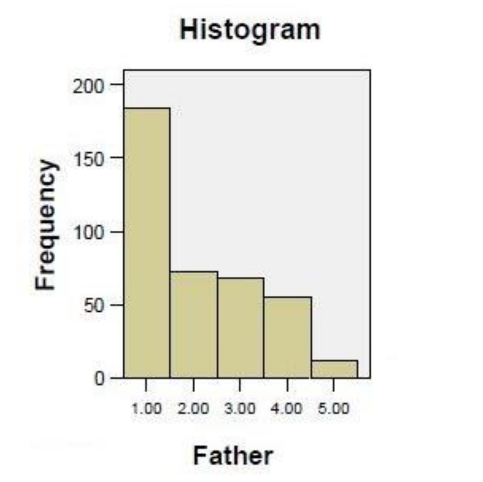
For any of the outcomes 2, 3 or 4 above, please provide a statement in the box below.

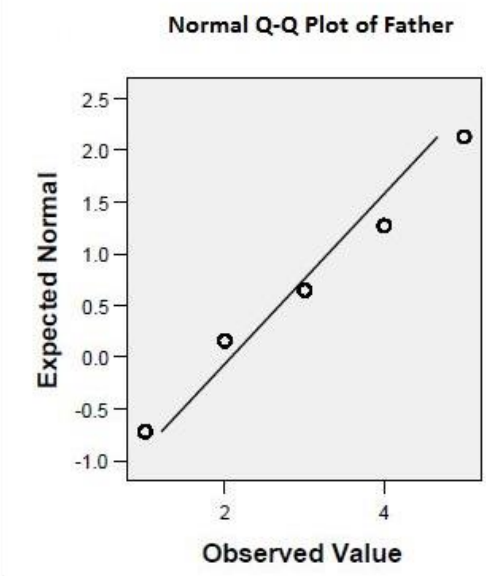
AFFIRMATION BY THE REVIEW PANEL LEADER

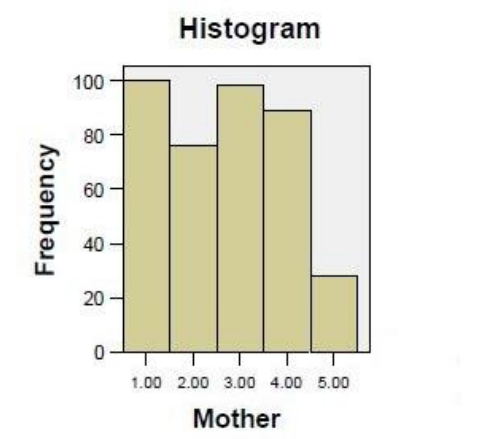
I approve the decision reached above by the review panel members:

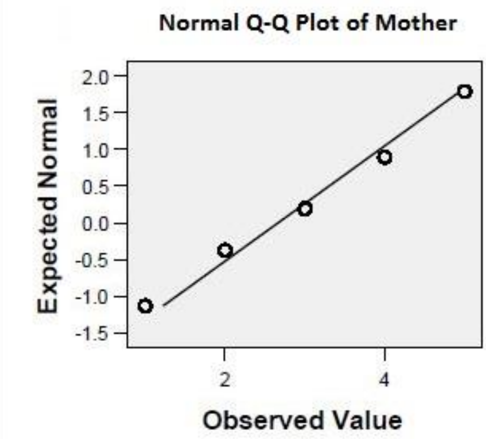
Signature: ____________________ Date: ____________

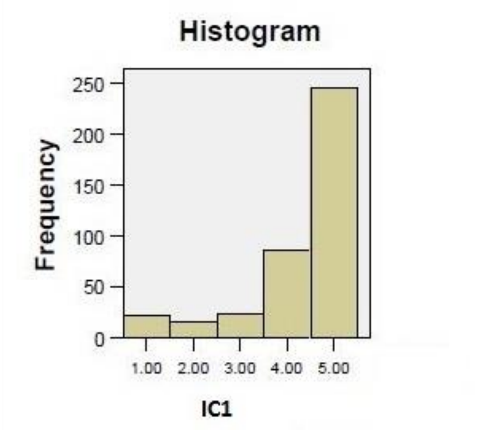
Appendix 9: The Frequency Histograms and the Normality Plots for Each Variable.

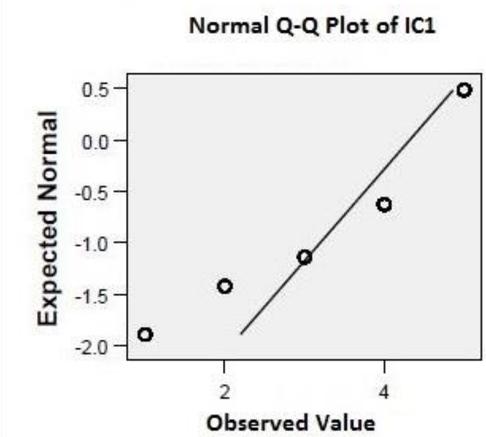


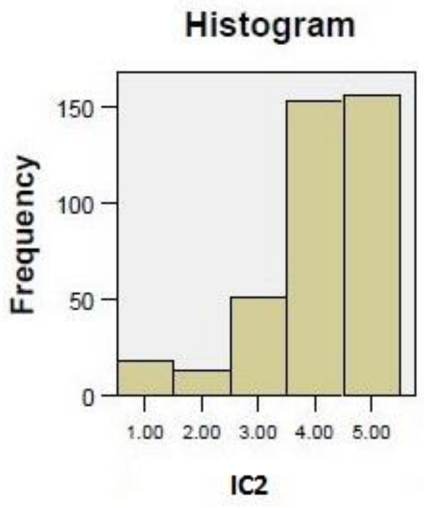


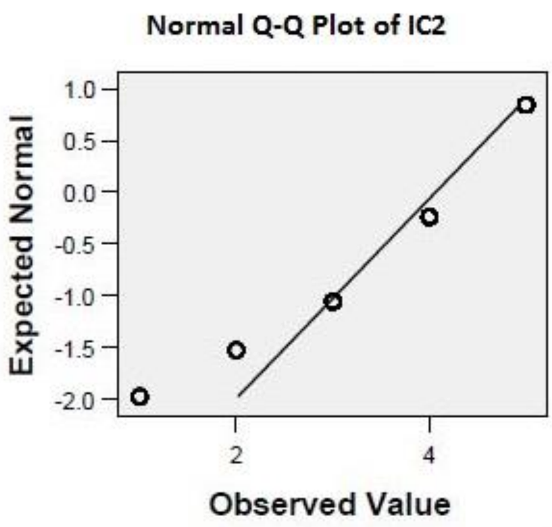


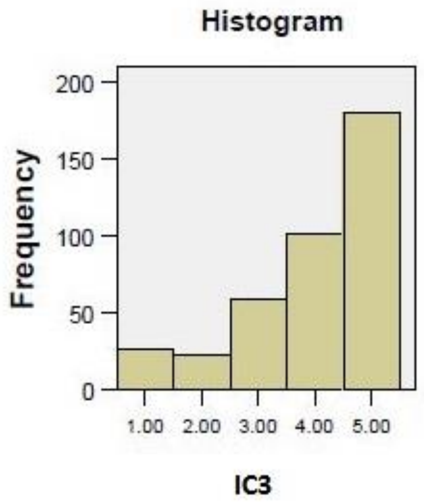


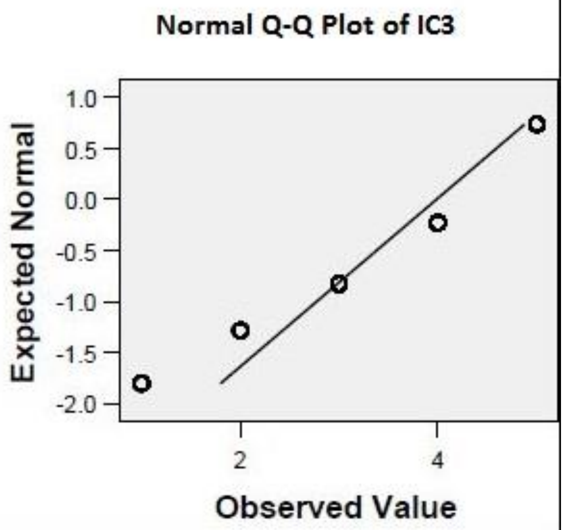


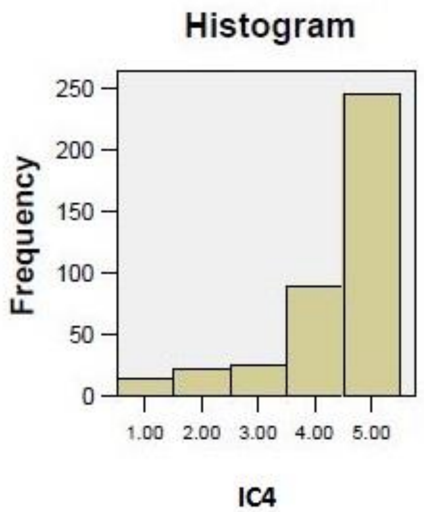


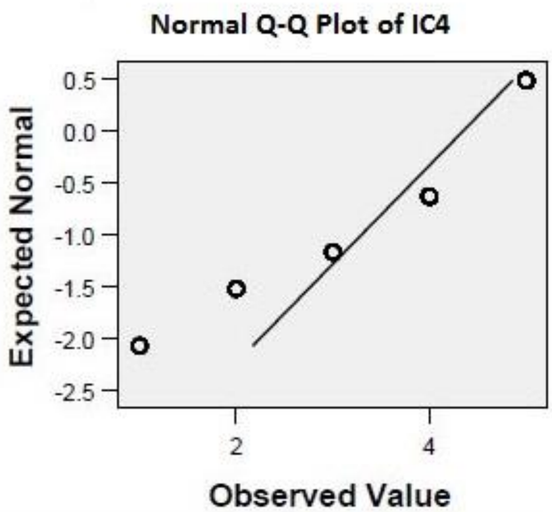

Histogram
Frequency
150
100
50
0
1.00 2.00 3.00 4.00 5.00
IC2

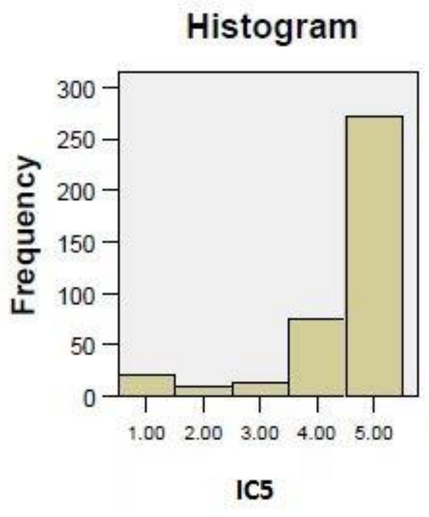

Normal Q-Q Plot of IC2
Expected Normal
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
Observed Value

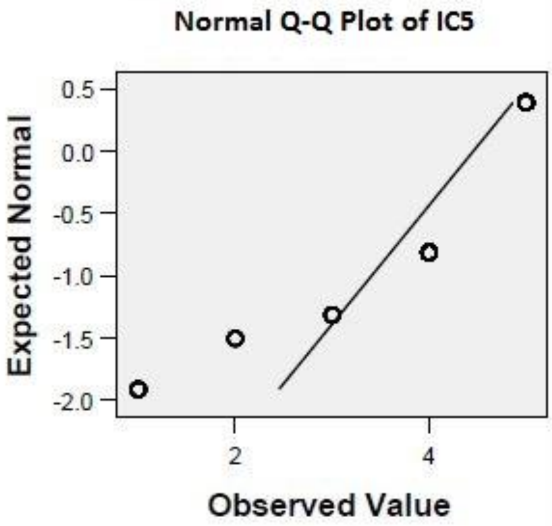

Histogram
Frequency
200
150
100
50
0
1.00 2.00 3.00 4.00 5.00
IC3

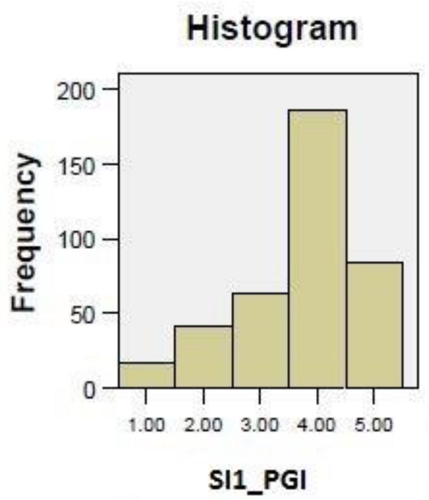

Normal Q-Q Plot of IC3
Expected Normal
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
Observed Value

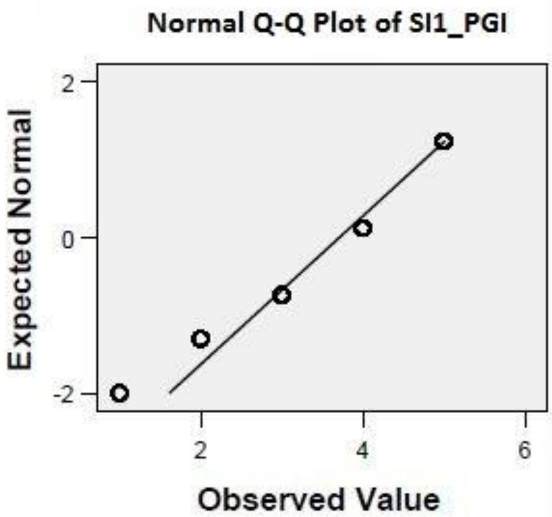

Histogram
Frequency
250
200
150
100
50
0
1.00 2.00 3.00 4.00 5.00
IC4

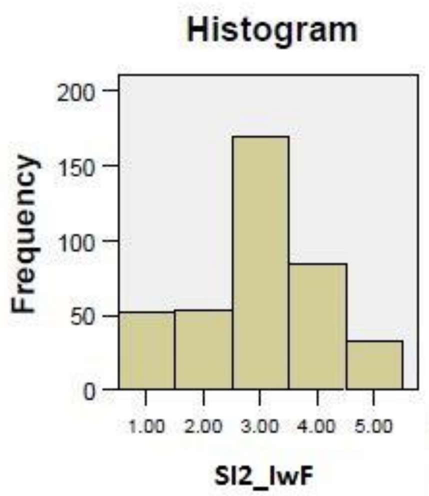

Normal Q-Q Plot of IC4
Expected Normal
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
2
4
Observed Value

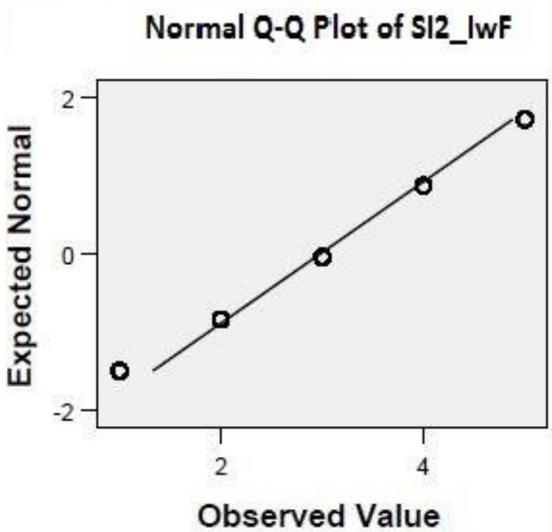

Histogram
Frequency
300
250
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
IC5

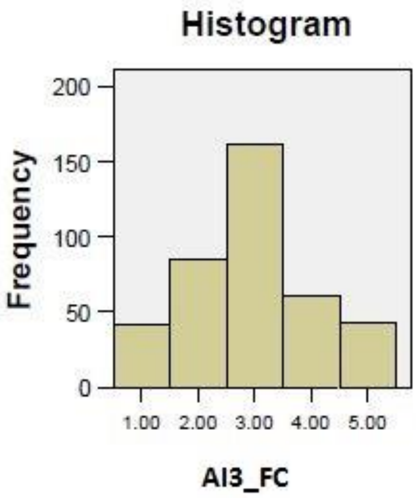

Normal Q-Q Plot of IC5
Expected Normal
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
Observed Value

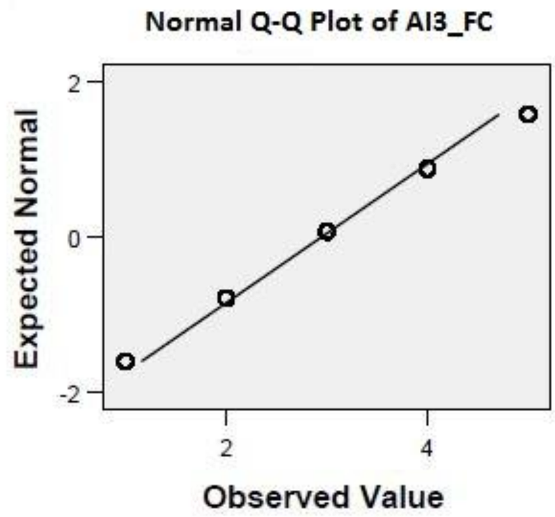

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
SI1_PGI

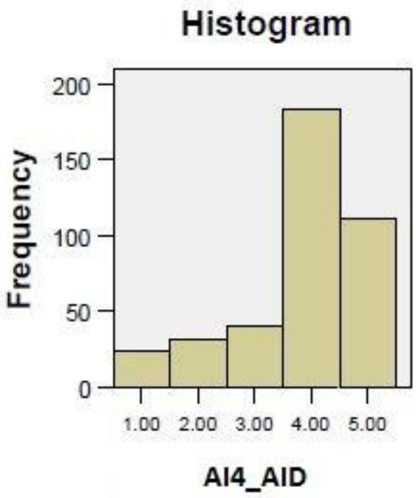

Normal Q-Q Plot of SI1_PGI
Expected Normal
2
0
-2
2
4
6
Observed Value

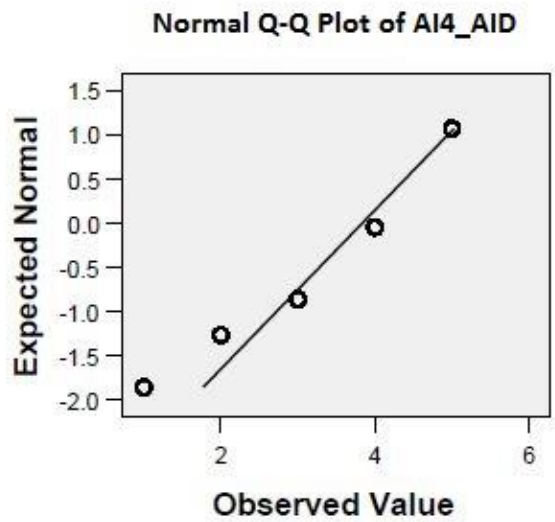

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
SI2_IwF

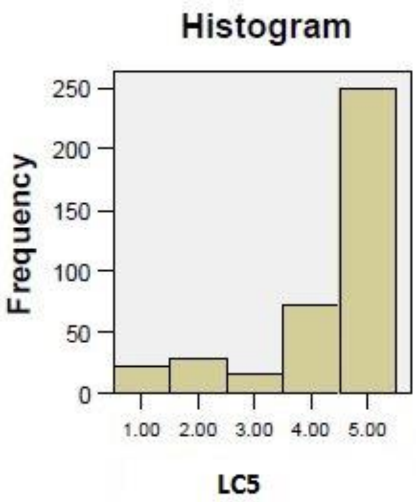

Normal Q-Q Plot of SI2_IwF
Expected Normal
2
0
-2
2
4
Observed Value

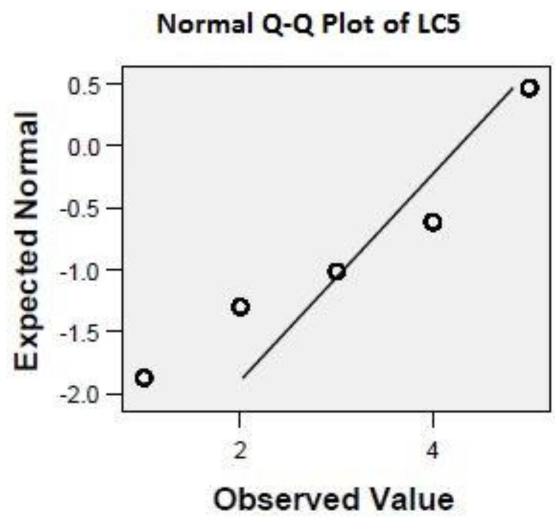

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
AI3_FC

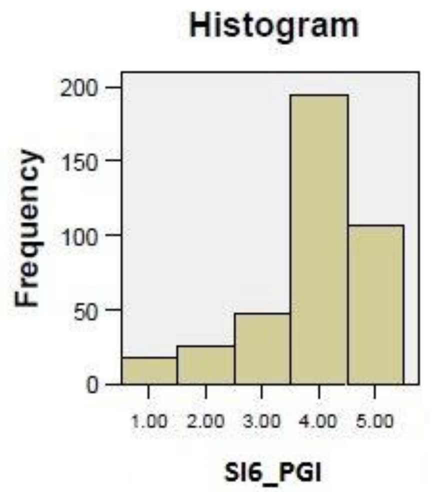

Normal Q-Q Plot of AI3_FC
Expected Normal
2
0
-2
2
4
Observed Value

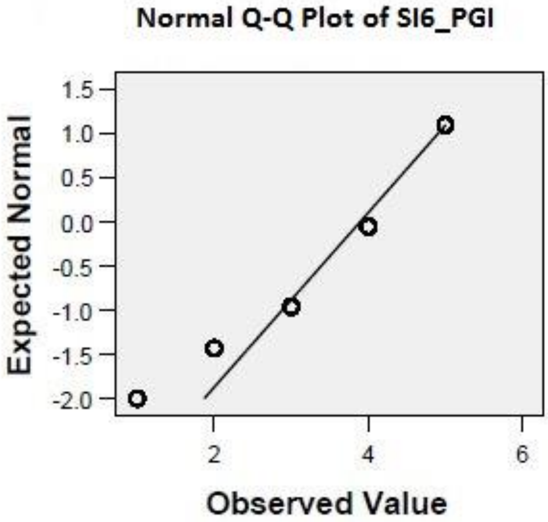

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
AI4_AID

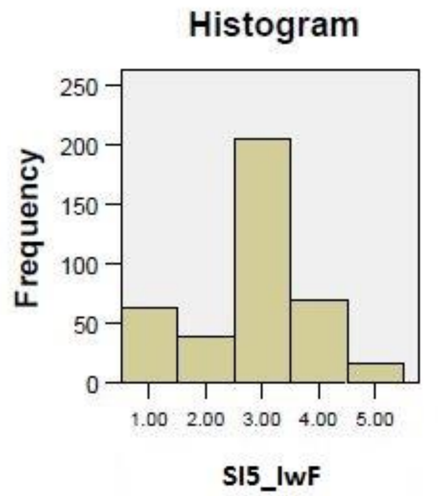

Normal Q-Q Plot of AI4_AID
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
6
Observed Value

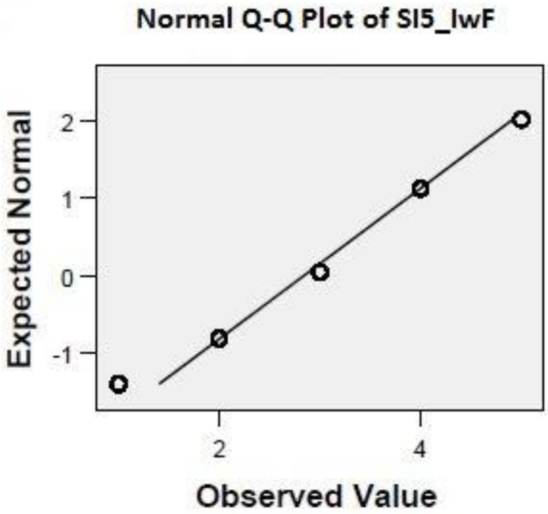

Histogram
Frequency
250
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
LC5

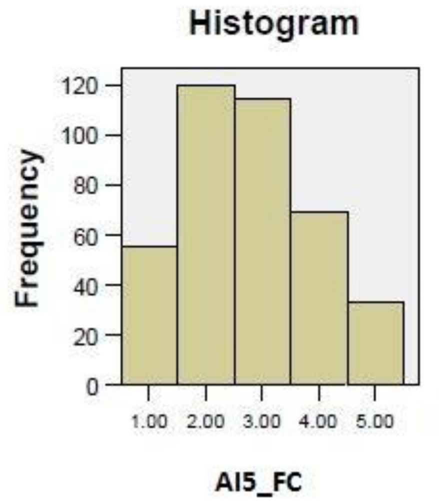

Normal Q-Q Plot of LC5
Expected Normal
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
Observed Value

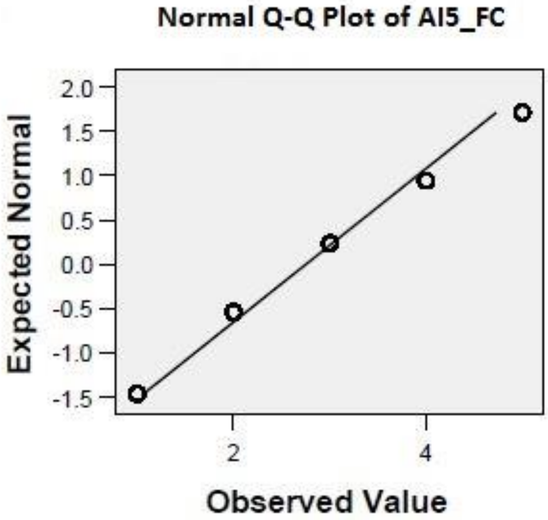

Histogram
Frequency
0
50
100
150
200
1.00 2.00 3.00 4.00 5.00
SI6_PGI

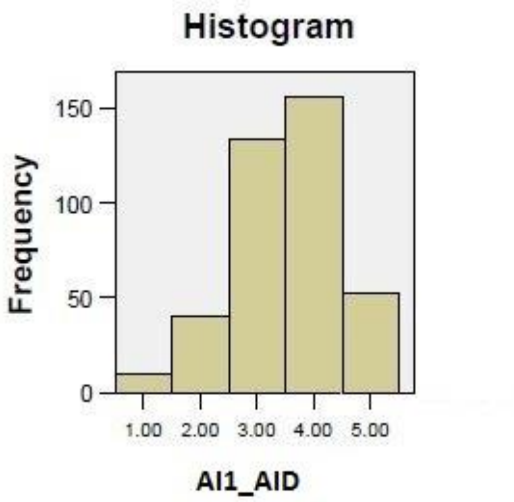

Normal Q-Q Plot of SI6_PGI
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
6
Observed Value

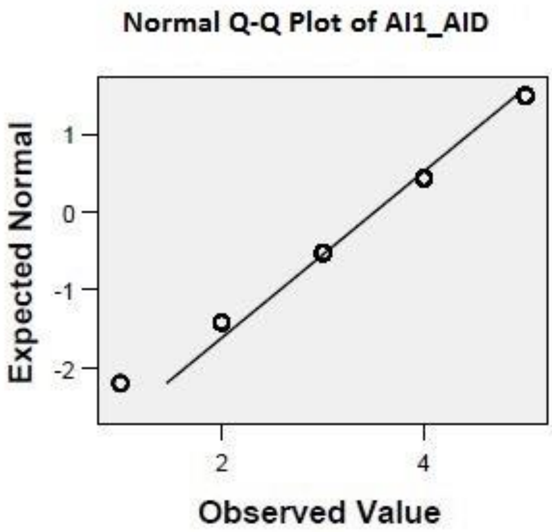

Histogram
Frequency
0
50
100
150
200
250
1.00 2.00 3.00 4.00 5.00
SI5_IwF

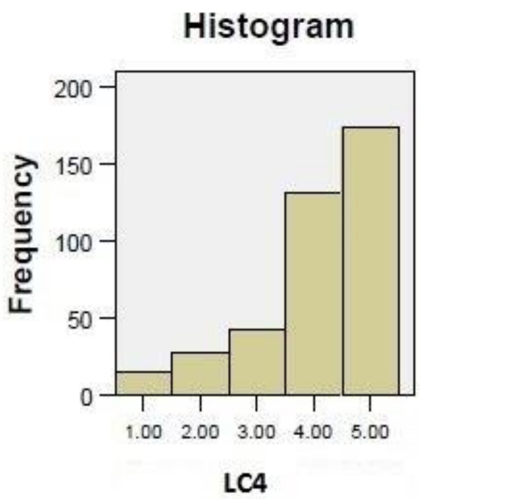

Normal Q-Q Plot of SI5_IwF
Expected Normal
2
1
0
-1
2
4
Observed Value

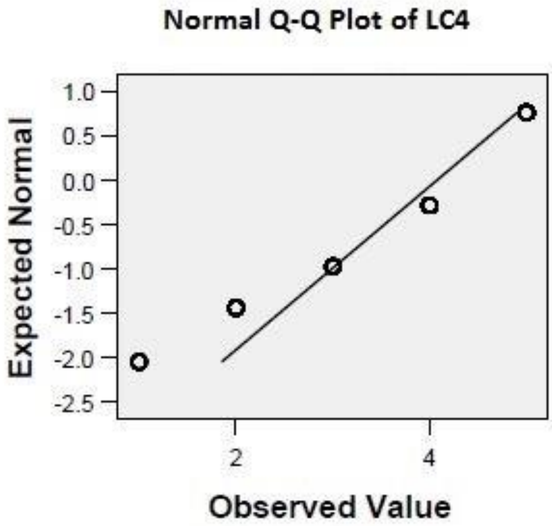

Histogram
Frequency
0
20
40
60
80
100
120
1.00 2.00 3.00 4.00 5.00
AI5_FC

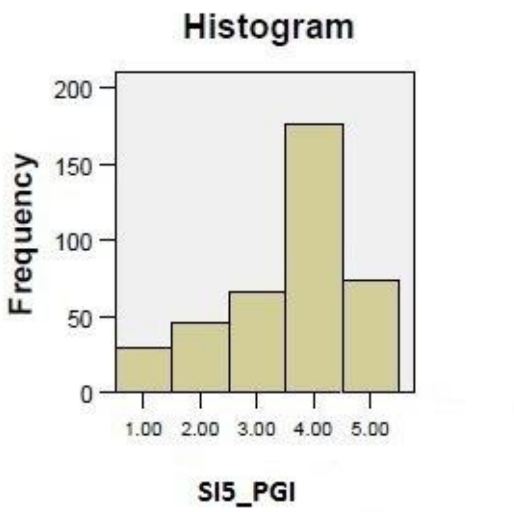

Normal Q-Q Plot of AI5_FC
Expected Normal
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value

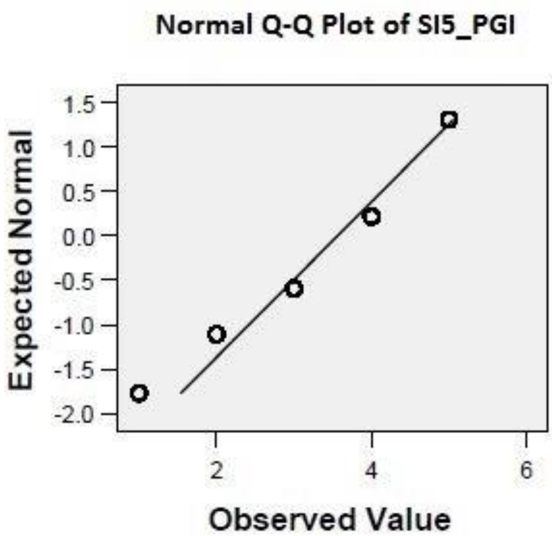

Histogram
Frequency
150
100
50
0
1.00
2.00
3.00
4.00
5.00
AI1_AID

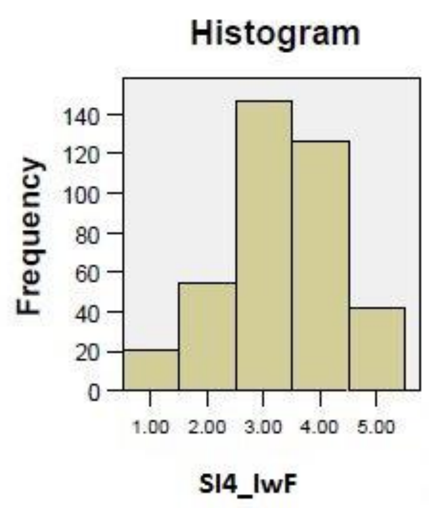

Normal Q-Q Plot of AI1_AID
Expected Normal
1
0
-1
-2
2
4
Observed Value

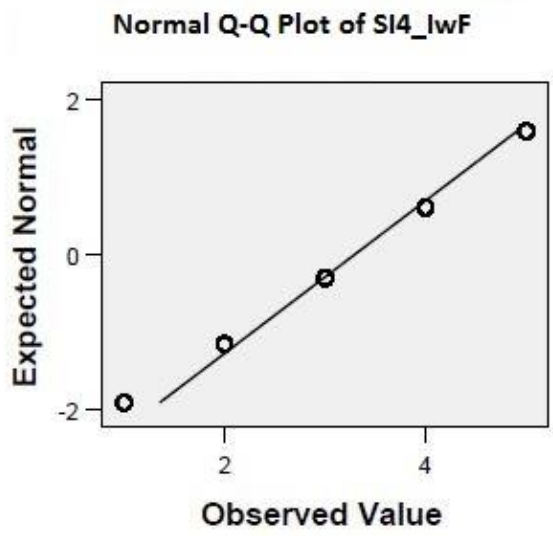

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
LC4

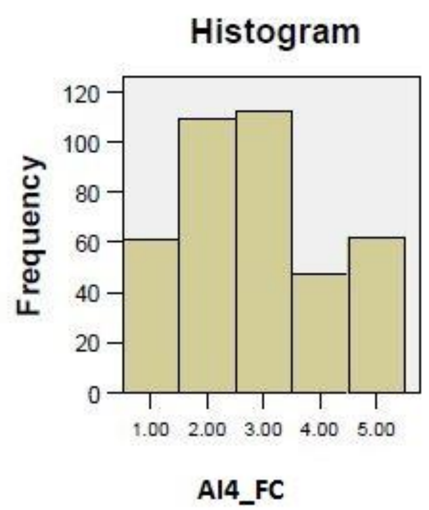

Normal Q-Q Plot of LC4
Expected Normal
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
2
4
Observed Value

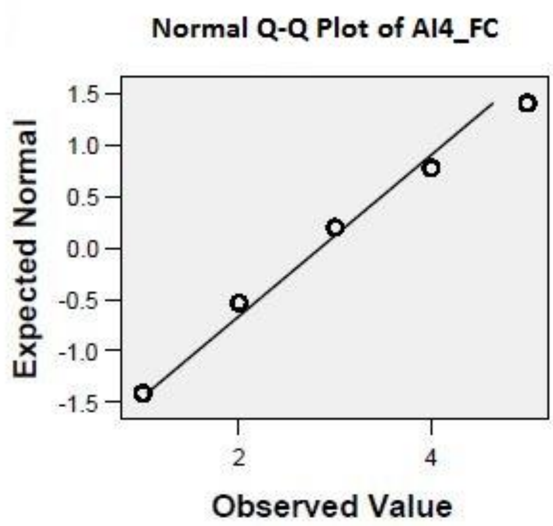

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
SI5_PGI

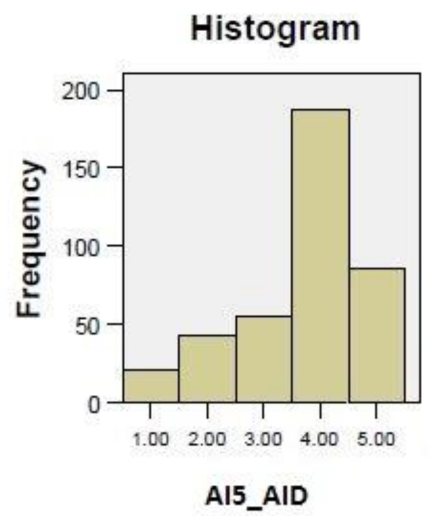

Normal Q-Q Plot of SI5_PGI
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
6
Observed Value

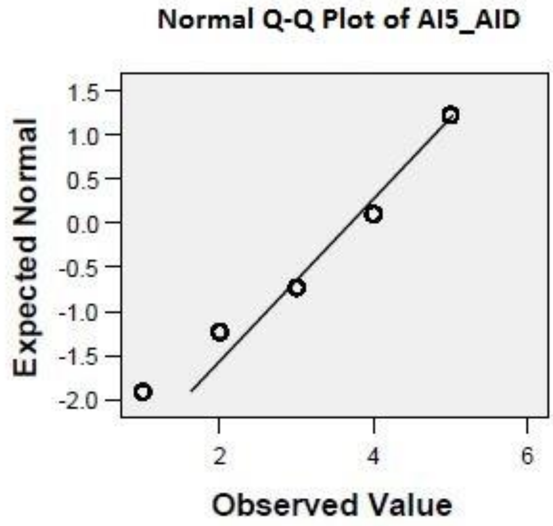

Histogram
Frequency
140
120
100
80
60
40
20
0
1.00 2.00 3.00 4.00 5.00
SI4_IwF

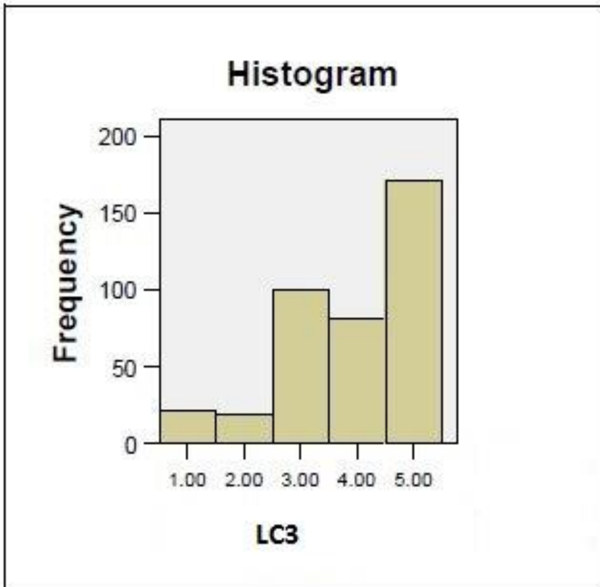

Normal Q-Q Plot of SI4_IwF
Expected Normal
2
0
-2
2
4
Observed Value

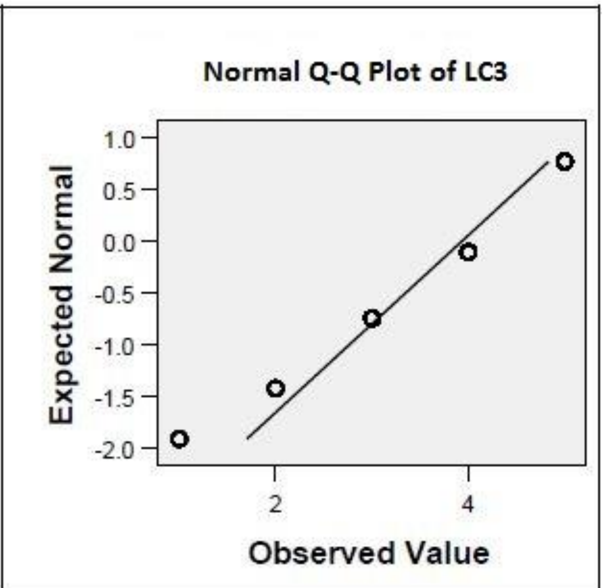

Histogram
Frequency
120
100
80
60
40
20
0
1.00 2.00 3.00 4.00 5.00
AI4_FC

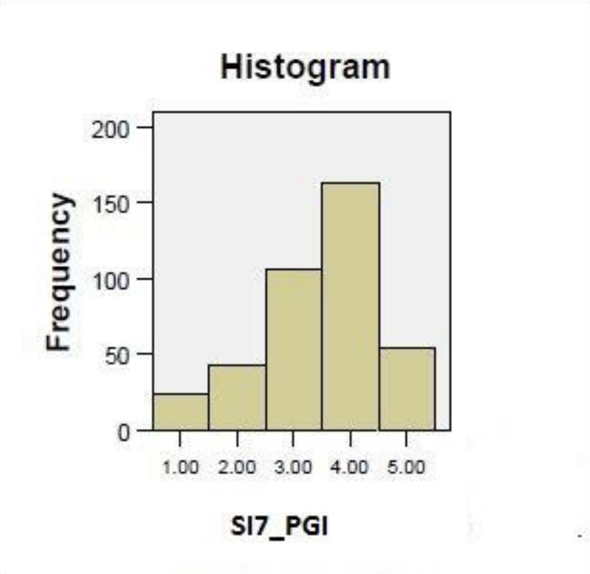

Normal Q-Q Plot of AI4_FC
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value

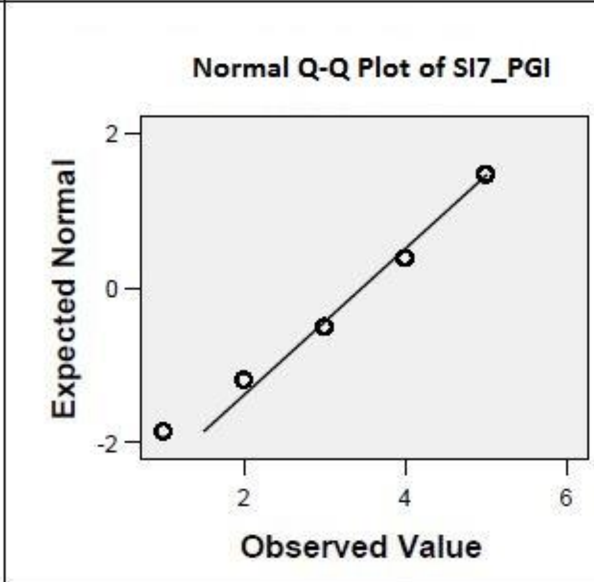

Histogram
Frequency
200
150
100
50
0
1.00 2.00 3.00 4.00 5.00
AI5_AID

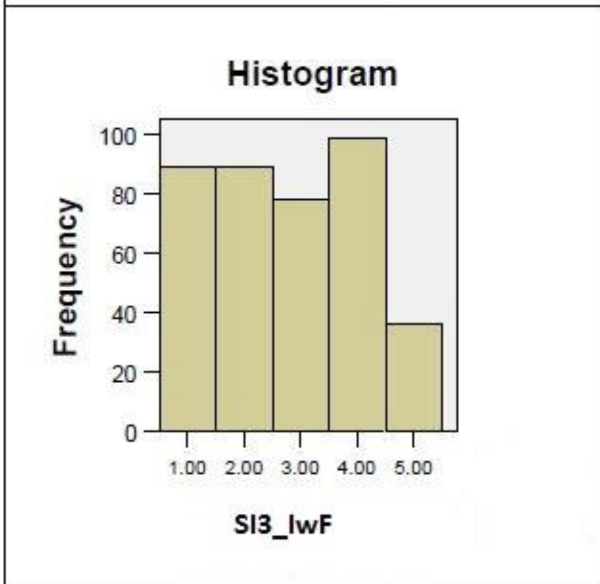

Normal Q-Q Plot of AI5_AID
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
6
Observed Value

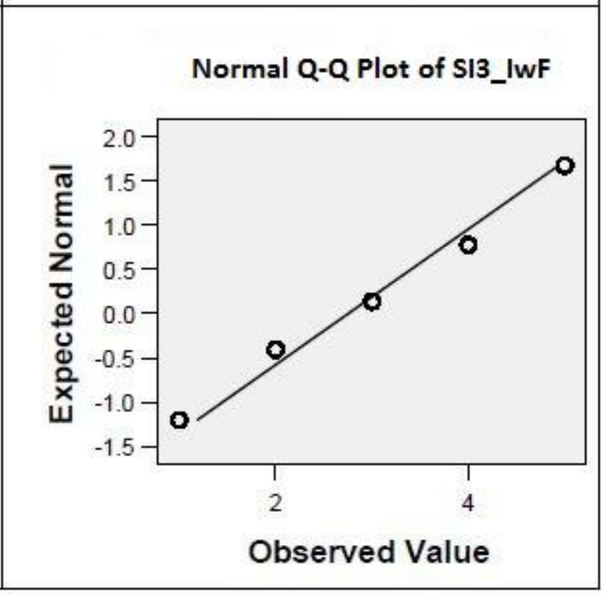

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
LC3

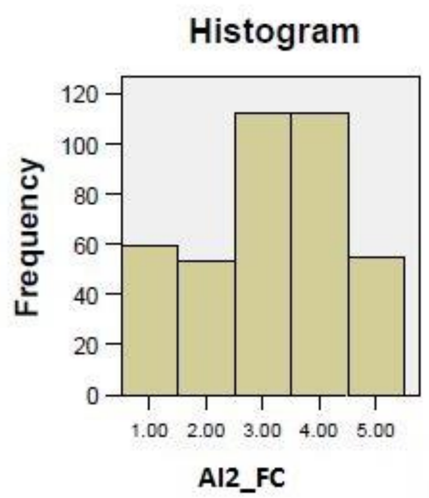

Normal Q-Q Plot of LC3
Expected Normal
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
Observed Value

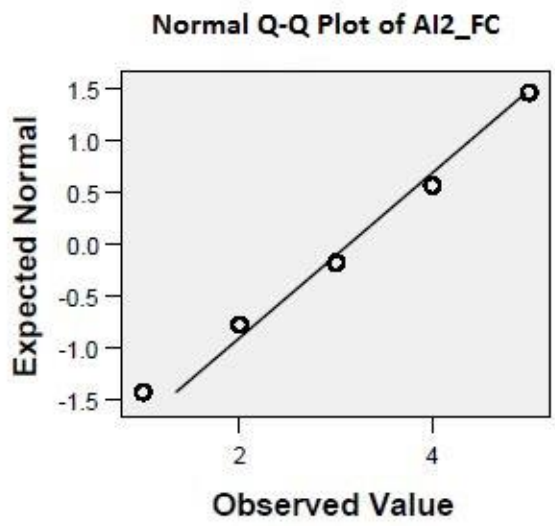

Histogram
Frequency
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
SI7_PGI

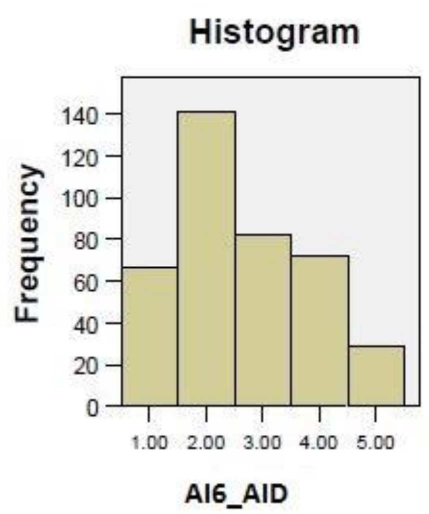

Normal Q-Q Plot of SI7_PGI
Expected Normal
2
0
-2
2
4
6
Observed Value

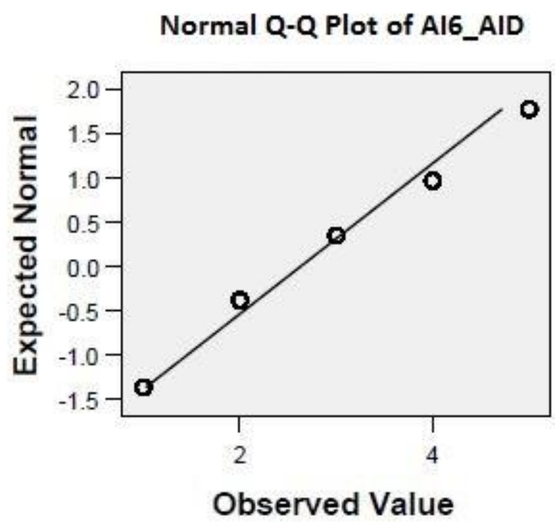

Histogram
Frequency
100
80
60
40
20
0
1.00
2.00
3.00
4.00
5.00
SI3_IwF

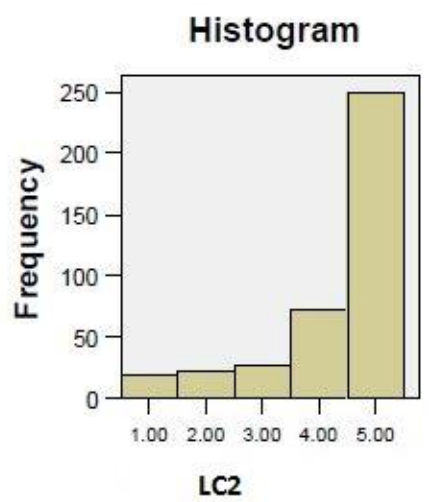

Normal Q-Q Plot of SI3_IwF
Expected Normal
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value


Histogram
Frequency
120
100
80
60
40
20
0
1.00
2.00
3.00
4.00
5.00
AI2_FC


Normal Q-Q Plot of AI2_FC
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value


Histogram
Frequency
140
120
100
80
60
40
20
0
1.00
2.00
3.00
4.00
5.00
AI6_AID


Normal Q-Q Plot of AI6_AID
Expected Normal
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value


Histogram
Frequency
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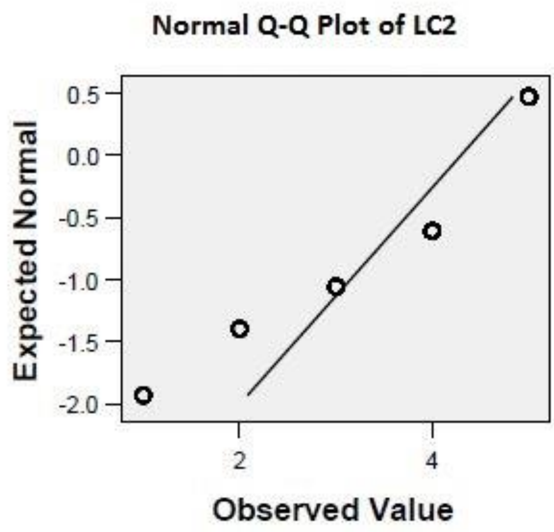
200
150
100
50
0
1.00
2.00
3.00
4.00
5.00
LC2


Normal Q-Q Plot of LC2
Expected Normal
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0.0
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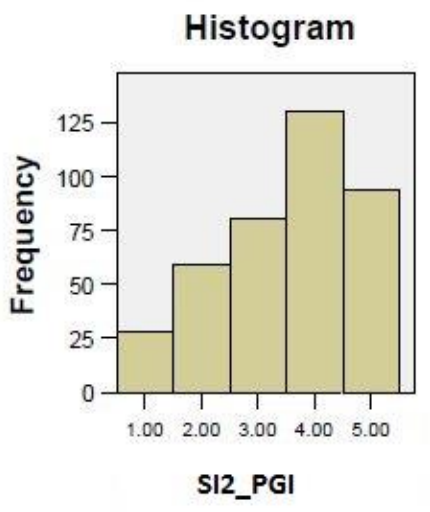
-1.0
-1.5
-2.0
2
4
Observed Value


Histogram
Frequency
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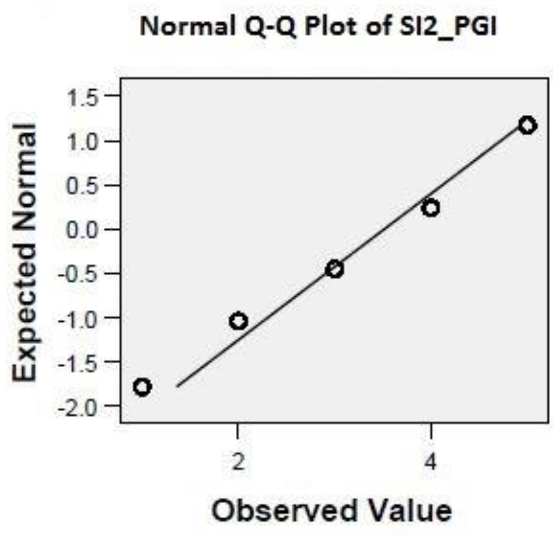
75
50
25
0
1.00 2.00 3.00 4.00 5.00
SI2_PGI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-1.5
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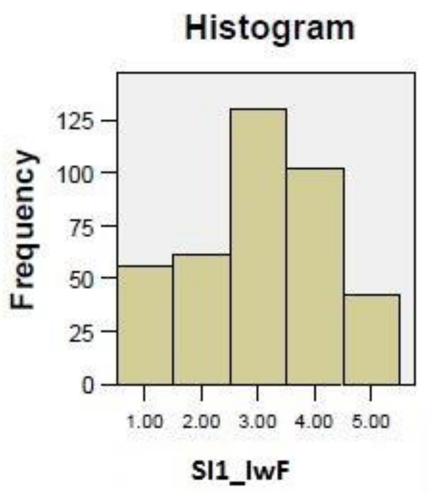
2
4
Observed Value


Histogram
Frequency
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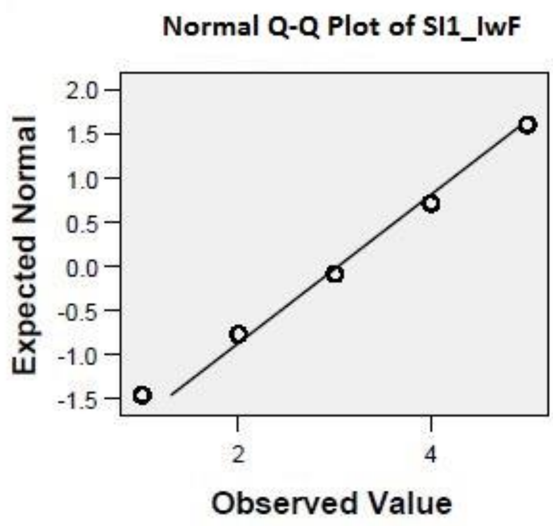
75
50
25
0
1.00 2.00 3.00 4.00 5.00
SI1_IwF


Normal Q-Q Plot of SI1_IwF
Expected Normal
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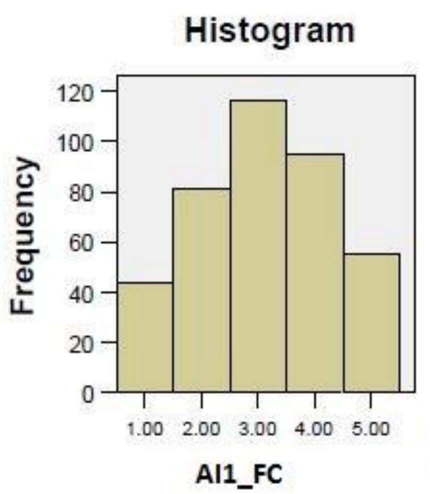
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value


Histogram
Frequency
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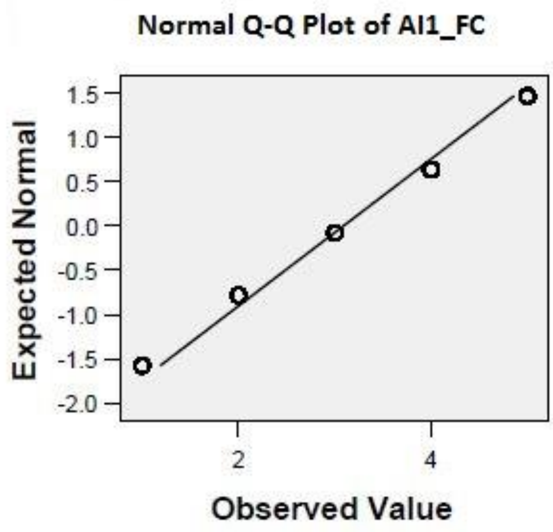
80
60
40
20
0
1.00 2.00 3.00 4.00 5.00
AI1_FC


Normal Q-Q Plot of AI1_FC
Expected Normal
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0.5
0.0
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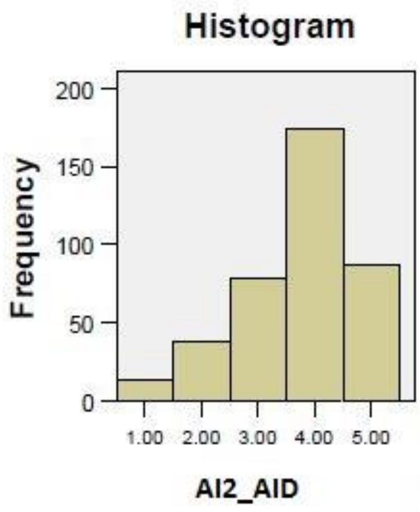
-1.0
-1.5
-2.0
2
4
Observed Value


Histogram
Frequency
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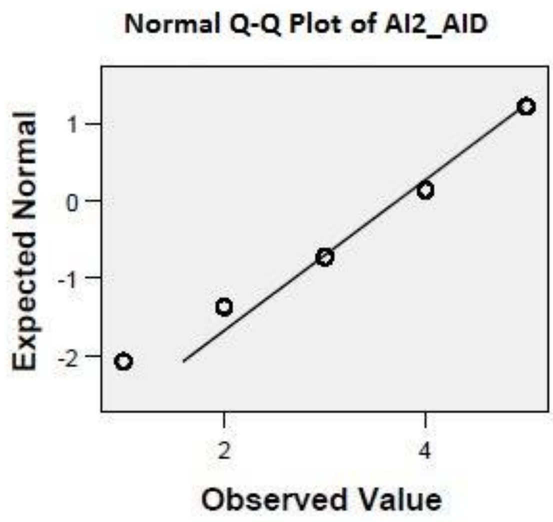
150
100
50
0
1.00
2.00
3.00
4.00
5.00
AI2_AID


Normal Q-Q Plot of AI2_AID
Expected Normal
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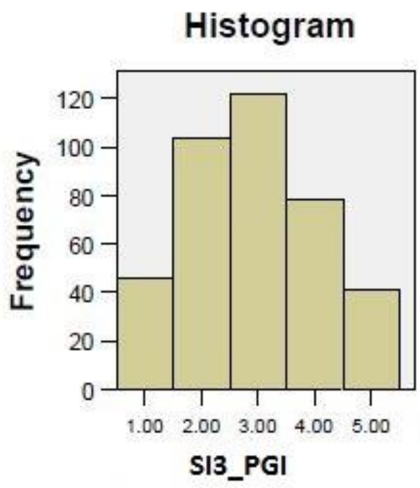
0
-1
-2
2
4
Observed Value


Histogram
Frequency
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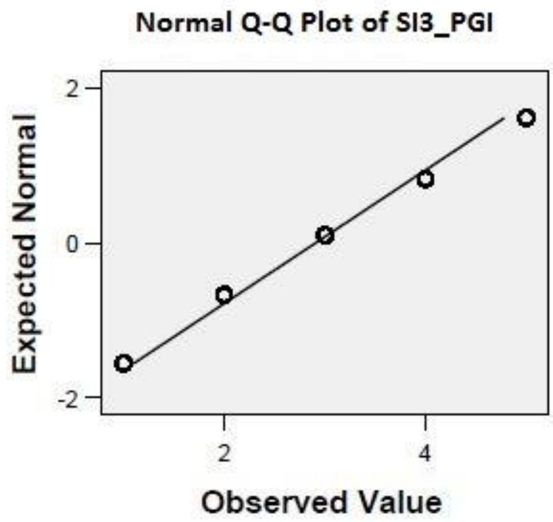
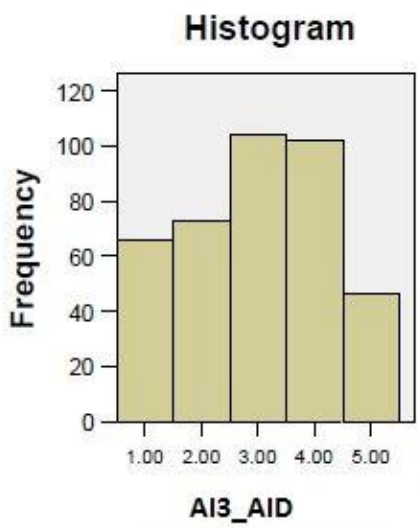
60
40
20
0
1.00
2.00
3.00
4.00
5.00
SI3_PGI


Normal Q-Q Plot of SI3_PGI
Expected Normal
2
0
-2
2
4
Observed Value


Histogram
Frequency
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100
80
60
40
20
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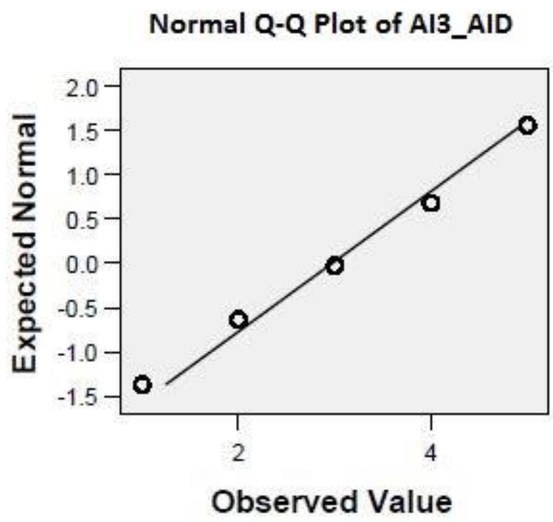
1.00
2.00
3.00
4.00
5.00
AI3_AID


Normal Q-Q Plot of AI3_AID
Expected Normal
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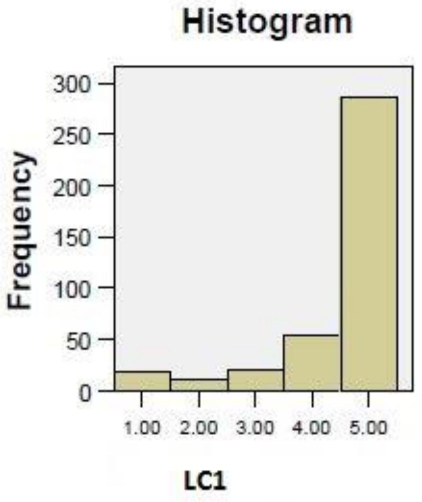
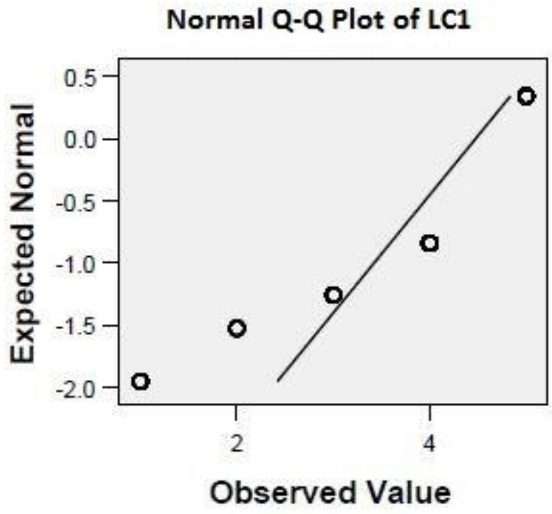
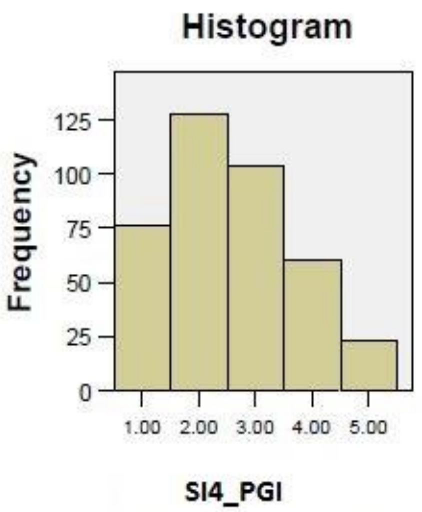
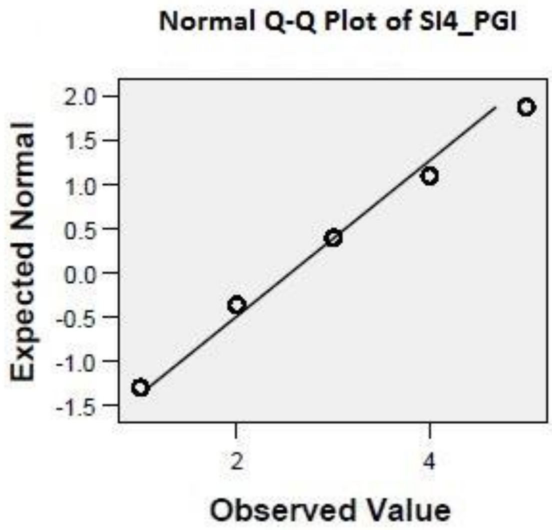
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value


Histogram
Frequency
300
250
200
150
100
50
0
1.00 2.00 3.00 4.00 5.00
LC1


Normal Q-Q Plot of LC1
Expected Normal
0.5
0.0
-0.5
-1.0
-1.5
-2.0
2
4
Observed Value


Histogram
Frequency
125
100
75
50
25
0
1.00 2.00 3.00 4.00 5.00
SI4_PGI


Normal Q-Q Plot of SI4_PGI
Expected Normal
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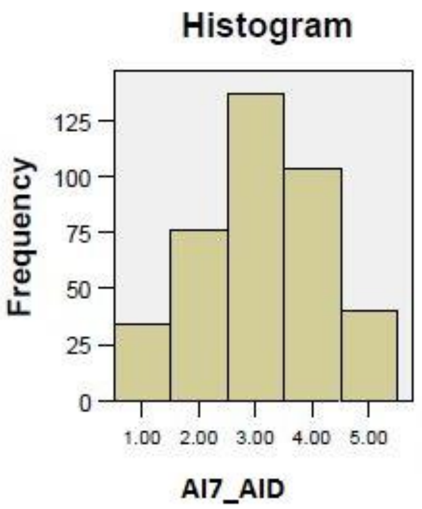
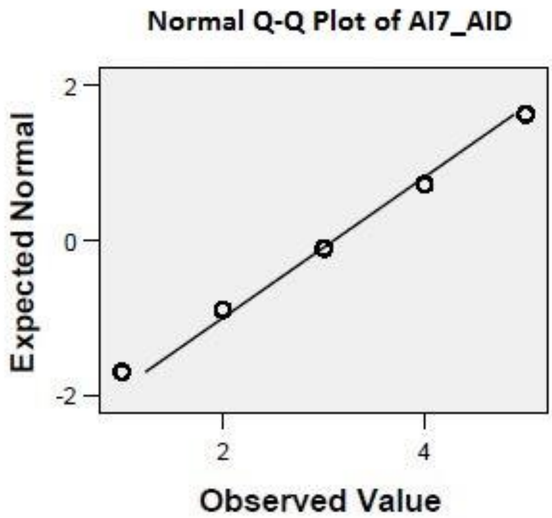
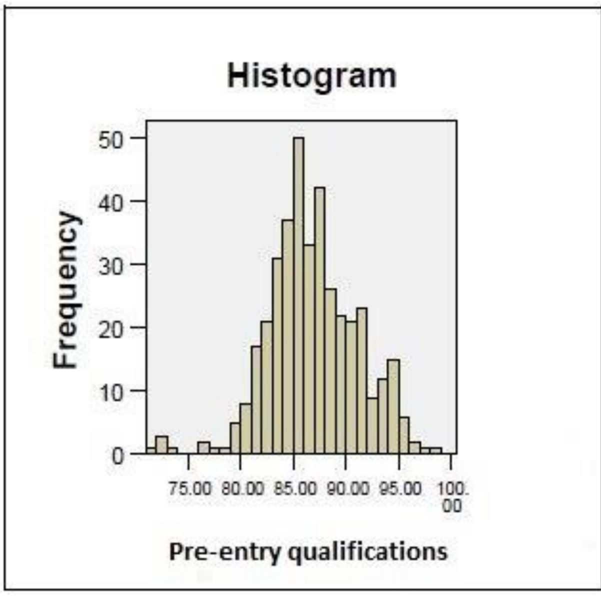
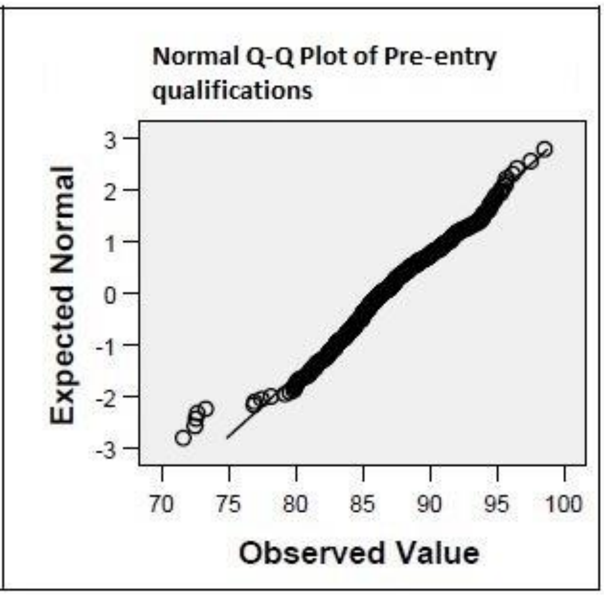
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
2
4
Observed Value


Histogram
Frequency
125
100
75
50
25
0
1.00 2.00 3.00 4.00 5.00
AI7_AID


Normal Q-Q Plot of AI7_AID
Expected Normal
2
0
-2
2
4
Observed Value


Histogram
Frequency
50
40
30
20
10
0
75.00
80.00
85.00
90.00
95.00
100.00
Pre-entry qualifications


Normal Q-Q Plot of Pre-entry qualifications
Expected Normal
3
2
1
0
-1
-2
-3
70
75
80
85
90
95
100
Observed Value

Appendix 10: Institutional Approval Form

Higher Education Student Engagement Survey

This research survey is commissioned by a research student from the School of Informatics. This form is part of my commitment to transparency regarding my research when working in partnership with a Higher Education Institution.

Aim of Student Engagement Survey

This engagement survey is part of the University's work in identifying the 1st year student experience and how the University creates a sense of engagement and belonging during your studies. The aim of the research is to enhance and improve your experience now and in the future. The collected anonymised data will also be used as part of my PhD thesis which investigates the reasons of low student retention and what can be done in order to aid improving it.

Institution's commitment for data operation

Your answers will be treated with complete confidentiality and all data will be anonymised before analysis. Your student ID is being asked for so that your responses can be linked to the information you provided the University when you enrolled (such as age, gender, and ethnicity). Once your student ID has been used for this purpose, it is removed from the data set before analysis. If you wish to be completely removed from the survey we will be able to do this up to <u>two weeks</u> after your survey completion. Any responses which mention specific individuals, modules or courses will also be anonymised.

Once the data has been anonymised and analysed, it may be shared with colleagues across the university to help identify where we can improve the student experience. It will also be shared with other universities to support, enhance and improve Higher Education sector best practice. The final research findings will be published in journals and/or at research conferences.

Contact us

Before completing the following consent checklist, if you have any questions or would like further information, please do not hesitate to contact me at the following email address: (here was my email address – now removed).

Respondent Consent

The researcher has attempted to provide a clear summary of the research study within the above document, the sample Engagement Survey and the Ethics Protocol provided. This institutional approval form is provided to check that you understand the purpose of the study, your role within it, and that you are happy to participate in the study. Please delete as applicable in the first table below, and if you have answered YES to all the checklist statements, please confirm your consent by adding your name and the date to the second table. Please can you then save and email this document to the researcher as soon as possible by email (here was my email address – now removed).

If you feel you require further information or clarification prior to consenting to the study please can you contact the researcher as soon as possible. Similarly if, completing the survey, you have any concerns regarding either the questions asked, your responses to them or your involvement in the study can you please contact the researcher by email <u>no later than two weeks after the survey completion</u>.

	Please delete as applicable
15. I have read the aforementioned information.	YES / NO
16. I have had the opportunity to ask any questions and to discuss the research study.	YES / NO
17. All my questions (if any) have received satisfactory answers.	YES / NO
18. I understand what the purpose of this study is and how I will be involved.	YES / NO
19. I do not require any further information but am free to request it at any time.	YES / NO
20. I have had enough time to decide to join the study.	YES / NO
21. I agree to take part in this research study	YES / NO

NAME………………...........................…………………………………...................DATE……….……...............................

Your participation is completely voluntary.

Thank you for your contribution.

Kind regards

Alex

Approval Date: __/__/__
Expires: __/__/__

Appendix 11: Focus Group Pilot Study Protocol

The focus group pilot study emphasized on issues and barriers faced by first year undergraduate computing students in learning communities. According to Padilla (2009) the learning communities' students can be more successful because they can develop their heuristic knowledge more easily in the learning communities than elsewhere.

The interview questions were based on Tinto's and Padilla's theories that emphasise on students' reasons for dropping out. These reasons are characterised as permanent, temporary, and also include the probability that these students could be seeking entry to some other course. In addition, the author tried to identify if the students had already discussed their thoughts of dropping out with anyone else, their academic and social experiences and what alterations the university could apply in order to aid students who experience any kind of complications and improve student retention. Nonetheless, of more interest were students' experiences, negative and positive, and how those experiences have contributed it student success. As a consequence, students were questioned to consider and respond to various questions regarding the broad topics of academic success, and involvement on campus. Furthermore, it was important to comprehend the challenges encountered by first year computing students at the university studied, but also the obstructions they or their peers have met while in university. As a result, the cover term for the initial data vector was "*experiences*".

Additionally, it was critical that students will answer each question considering not only their experiences, as well as their peers' experiences. By definition within this model students participating at the focus groups were successful in overwhelming barriers and including heuristic knowledge into their student lives at the university studied. On the other hand, student who were not successful do not have an opportunity to have their voices heard since they are no longer enrolled at the university.

Continuing from the previous discussion about the cover term, the following questions were explored while completing the matrix with each of the focus groups. Specifically:

1. Describe a student whom you believe is successful. Success means that the (s)he is a consistently good student in class and/or is on-track to graduate on time. What are the specific situations that these students had to deal with in order to be successful? What kinds of situations have they encountered (academic advising, university residence etc.)? What non-academic concerns exist (involvement in social life, work, personal relationships with other students on campus, family back home etc.)? Do you have peers who could not overcome these obstacles? If yes, where are they now? And are they still enrolled in university?
2. Define the experiences that you or your peers had to overcome in order to a successful student that have not been mentioned?
3. Describe any situations that you or your peers have been able to address easily? Specifically: How did they/you address them? How did they/you know how to address them?

   If, by this point, learning community participation had already been mentioned, then the following questions were asked:

4. While in your first academic year, you participated in a learning community at the current study's university. Your learning community experience may have consisted of having shared courses with students from similar disciplines to yours, sharing a house or a flat with other students, or a combination of both previous mentions. What were the experiences you had as part of a learning community? And have they helped you as a student at this university, so far?

   Follow up question: How did your learning community experience help you to encounter any problematic situations?

   If, by this point, learning community participation had not been directly mentioned, then the following questions were asked:
5. A few of you have noted your learning community experience. How you or your peers' experience in a learning community did help you or them as a student(s) at the university so far?

Follow up question: How did your learning community experience help you to encounter any problematic situations?

6. How do you think your academic and social experiences as a first year computing student has helped the experiences that were previously listed and discussed?
7. What in your opinion has not been noted or defined as a challenge for students attending this university but could be an obstacle in a student's way to success?

Appendix 12: Focus Group Pilot Study Results

Using the ‘unfolding matrix’ in the focus groups pilot study assured that participants’ responses would generally fell into the pre-defined categories. Nevertheless, when taken as a whole the data appeared to support learning communities’ theoretical foundations. Specifically, those related to Tinto’s (1993) requirement of integration as a necessary condition for university success. Consequently, this lead to the first assertion that: **Learning communities can help students to become academically and socially integrated to the university studied.**

Academic and social integration, connected with students’ commitment to university and/or outside endeavours, are Tinto’s theoretical model of student retention indications. According to Tinto (1993, 2012) it is important that students have the ability to develop their social and academic systems in both informal and formal ways.

The formal academic integration includes attending labs and classes, using library facilities, and various activities related to student success. The informal side is also equally important. Specifically, the informal academic integration incorporates students’ interactions with faculty. Students’ interaction with faculty members outside classroom may have a positive effect on student retention, as those interactions “*may have a normative effect on students’ socialisation to the attitudes and values of the academy*“, but also develop an increased “*bond between the institution and student*” (Pascarella & Terenzini, 2005, p. 147). On the other side, the formal social integration includes extracurricular activities, while informal social integration includes interaction with peers. As Tinto (1993, 2012) noted, “*higher levels of interaction can lead to higher level of persistence and graduation*”.

The focus group participants mentioned that as part of their learning community participation, they usually created study groups consisted of students from other learning communities as well. In addition, they usually sought advice from classmates (peers) as academic resources. The data analysis also showed that students enjoy living with other students from the same learning community, because it helped a lot in the formation of study-groups and academically based interactions with their peers. Nevertheless, apart from the academic integration, students also pointed out that living with other students affected their interaction with peers and social networks. In addition, students addressed that their learning communities experience affected their decision to follow certain extracurricular activities.

These aspects of academic and social integration signify to the author that learning communities have an important role, especially when it comes to the development of support networks and systems. This is connected with the second assertion derived from the focus group pilot study data analysis: **Support systems, consisting of many different levels of interactions, are integral to students' success.**

Student support networks and systems are organised into two main categories: interactions connected with students in general, regardless of the fact that they were in a learning community, and interactions connected with the participations in a learning community (Tinto, 1993, 2012). These interactions include: students interacting with other students in the same courses, same accommodation, students interacting with students from different classes or higher levels, and students interacting with faculty members, academic advisors and staff. In Appendix 5: The 'unfolding matrix' can be found examples of these relationships that were found in the focus group pilot study data, indicate students' appreciation and need for these interactions.

Sedlacek (1999, 2004) noted that the sixth variable is based on the notion of having a support person. This person is someone that students can turn to and ask for guidance or advice. Initially Sedlacek (ibid) suggested a support system like a faculty member or other non-university aged adult, and while some students pointed out that they took advantage of their professors' availability, the overwhelming levels of support came from the students' peers. In some occasions, students created relationships with other students centred on their own self-appraisals and comprehension that they would not be able to succeed without additional help (ibid). In the focus group pilot study, while many interactions were helpful and positive, students mentioned negative interactions as well (for examples see Appendix 5: The 'unfolding matrix').

Even if the negative interactions may appear antithetical to the support systems concept, students identified that these interactions really led them to discover alternative means of getting things accomplished in order to be successful. In general, these interactions are also referred into Tinto's (1993) notions of informal social and academic integration, which enhance the appropriate conditions for student success and persistence in university. Nevertheless, the negative experiences are also the foundation for the third assertion depicted from the focus group pilot study data analysis: **Students must be able to conduct academic processes outside the normal protocols, if they want to succeed academically**.

This assertion is supported by Sedlacek's (1999, 2004) non-cognitive variables (specifically his eighth variable), where students need to gain knowledge in a given field. According to Sedlacek (1999, 2004) the successful implementation of this variable is defined by a student who has "*culturally or unusual related ways of obtaining information and demonstrating knowledge*". Furthermore, Sedlacek mentioned that this concept is connected with students who work within the system in order to achieve goals in non-traditional ways (for examples see Appendix 5: The 'unfolding matrix').

Students have also noted that they would prefer to ask help with their studies from other peers, instead of consulting university support services. Their justification for this was that peers can be more friendly and helpful. In the focus group pilot study data analysis students identified cases were students resulted in an improved grade, while the assistance received from a peer (for examples see Appendix 5: The 'unfolding matrix').

The stories and threads evident in the 'unfolding matrix' indicated a trial and error process, and then revealed other means to accomplish a task. Specifically, they signified that a level of challenge is appropriate for success. Students stated that they do not prefer to just receive assistance, but also want to be involved with disseminating information as well as assist other peers (for examples see Appendix 5: The 'unfolding matrix').

One of the methods utilised for the focus group pilot study data analysis included environmental psychology, specifically, where the environment influences behaviour. The students addressed various aspects related with campus and certain locations, which were highly conductive to study and interact with peers from both social and academic standpoints. These interactions were mostly identified in student residence environments (i.e. shared house, student accommodation flat). The fourth assertion is: **Student residence environments offer to student physical locations that can be used by them for social and academic interactions**. The 'unfolding matrix' analysis pointed out several cases in which students took advantage of these areas. Furthermore, the focus group pilot study participants indicated their satisfaction for these areas. In addition, it is critical to mention that the participants identified that other areas such as, libraries were also conductive to study groups. Some students also noted that study skills acquired in pre-university education, if ever, helped them in their first year at university.

The fifth assertion identified is related to all four assertions previously addressed. This assertion is connected with Harmon and King's (1985) concept of previously applying learned knowledge and acquiring new knowledge from situations to be used later. The participants in the focus group pilot study revealed that when a student has previous knowledge about a class subject or a situation (i.e. class-difficulties, making friends) allowed them to be more successful. The application of previously acquired knowledge, as well as the subsequent knowledge accumulation is the basis for the fifth assertion: **Students are looking for opportunities in order to apply past knowledge about a situation or a subject to current issues and look for solutions to apply in future scenarios.**

This assertion is derived from the analysed 'unfolding matrix' data, which were collected during the focus group and subsequent review of the recording. In almost every exemplar in the matrix, the participant students discussed mentioned the importance of the past experiences that helped them be successful in completing a given task or overcoming obstacles.

Most of these comments were based on the experiences connected with the participant students' academic life. Social life helped students to gain skills that were proved to be useful when they formed study groups. The new knowledge gained during study groups was also academically oriented. Students realised, usually through the trial and error method, the value of making friends as first year students, what their strengths and weaknesses were, but also that specific environments were either extremely disadvantageous to studying or extremely helpful.

Finally, it is interesting to mention that most of the knowledge used for success seemed to be theoretical knowledge such as information students gained from books. The knowledge acquired tended to be more heuristic in nature. As some of the participants mentioned: "*living with other students is helpful*" or "*the university library is a good place to study*". This does not mean that students do not learn during their classes or from their readings. The students learn and apply the acquired knowledge in the context of classes. Nevertheless, the participants, with regard to the non-academic knowledge application, were able to see how one skill or heuristic knowledge gained in one class can be broadly applied.