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A Student Retention Model:
Empirical, Theoretical and Pragmatic Considerations

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Abstract

This research-in-progress paper draws on an extensive body of literature related to student retention. The purpose of this study is to develop a student retention model utilising student demographic data and a combination of data from student information systems, course management systems and other similar tools to accurately predict academic success of students at our own institution. Our research extends Tinto's model by incorporating a number of components from Bean's, Astin's and Swail's model. Our proposed eclectic model consists of seven components, identified as determinants of student retention. The strength in the model lies in its ability to help institutions work proactively to support student retention and achievement. The proposed research methodology to be used in this study is "a mixed-methods concurrent triangulation strategy". The results are expected to indicate which of the factors are most important in developing an information system to predict and suggest interventions to improve retention.

Keywords

Retention, Higher Education, Eclectic Model, Mixed-Methods, Triangulation.

INTRODUCTION

Improving student retention has been a focus in higher education (HE) research for quite some time and the research and literature on retention internationally is voluminous. However, improving student retention and success remain a priority for Australian universities as the Commonwealth Government has included retention (along with progression rates and student experience data) on its list of indicators for funding of higher education (DEEWR 2009). There exists some national studies which indicate the possible magnitude of the research and theory exploring the individual, social and institutional factors which impact student retention in Australian higher education (Adams et al. 2010; Krause 2005; Maher and Macallister 2013; Nelson and Creagh 2013; Phillips et al. 2011). An initial step towards a more informed theorising of the student retention phenomenon is to define the term *retention*. Retention is the "ability of an institution to retain a student from admission through graduation or degree completion" (Seidman 2005 pp 14). To meet this goal, universities are collecting large volumes of data relating to their students and the educational process. These vast amounts of data are stored in the student information systems (SIS); including student interactions with various educational technologies such as learning/course management systems (LMS/CMS); and in various databases such as admissions files, library records and other systems (Tair and El-Halees 2012). Moreover, the large volumes and the increasing complexity of different kinds of data sitting in different computational environments (LMS, social media tools, cloud based storage etc.) make it hard to collate them for analysis. To deal with complex and large volumes of data, analytics and technologies have to be introduced to effectively transform available "big data" into information and knowledge to support decision making (EdFutures 2013). Some examples of analytics in the academic domain include business analytics, educational data mining, academic analytics, learning analytics, predictive analytics or action analytics. van Barneveld and colleagues have attributed the various definitions to these listed terms and the level where the analytics are focused (van Barneveld et al. 2012).

Higher education institutions (HEI) usually measure retention in terms of retention rates (also called continuation rates) and graduation rates (also called completion rates). Literature shows that around three decades ago, retention was also measured as program, course and term completion rates (Fife 1980). We found that student retention was difficult to quantify as there are many variables involved in the calculation of retention rates such as student demographic variables, academic variables, initial student aspirations and motivational variables, student personality and value variables, institutional variables and interaction variables.

The opposite of student retention is attrition, often used interchangeably with retention. Attrition is defined as a "student who stops attending their programme or course of study at an institution in consecutive terms and does not respond to institutional intervention" (Seidman 2005 pp 14). Researchers have reported definitional issues associated with the term retention. We noted sixteen overlapping terms associated with retention. For instance: success, progression, persistence, goal attainment, completion, achievement, transfer, attrition, deferral, withdrawal, drop-out, early departure, failure, wastage, discontinuation and stop-out. By identifying and distinguishing these terms has allowed us to be critical in terms of understanding the context of student retention and to define a set of categories of student retention or attrition behaviours as shown in Table 1. According to Leys (1999), some examples are the differences between: HEI departure and HE departure; course departure and HEI departure; transfer from different modes of programmes (part-time to full-time transfer and vice versa); forced (through failing examinations) and unforced (some students will withdraw before being asked to leave) departure; negative reasons (failing a course) and positive reasons (perception of better prospects elsewhere or starting a career); attendance; and graduation. In our opinion, while considering any definition, it is important to identify if the definition is from the perspective of the individual student or the institution. Within this paper, the above mentioned overlapping terms are used as the authors of the cited articles have used them. In order to include a broad review of the literature as possible, we prefer to use the term retention because it deals more specifically with the enrolment and successful completion of studies by a student.

Table 1. Student Retention Behaviours

Types of Student	Description of Behaviour
The persister	A student who is continuously enrolled without any interruption. S/he is also known as the stayer or retained student.
The stop-out	A student who left the institution for a period of time and then returned for additional study.
The transfer	A student who begins studies at one institution and then transfers to another.
The attainer	A student who dropped out prior to graduation, but after attaining a particular goal.
The drop-out	A student who left the institution and did not return for additional study at any time. S/he is also known as a leaver.
The slow-down	A student who goes from full-time attendance to taking just a few courses. S/he is also known as a part-time student.

It is important to note the highlighted rows: "the transfer" and "the slow-down". There is an ongoing debate in the HE sector (administrators and marketing team) about the transfers that many students who leave university are not "lost to the system". They may re-enrol at another university either immediately or in later years or they may come back to the same university to enrol in a different course. From the students' perspective, transferring is a normal and not necessarily a negative activity. On the other hand, from the perspective of the institution where the student was first enrolled, the student has dropped out. However, to calculate student retention and success at a university is a complex process. A very recent paper providing an Australian perspective by Maher and Macallister shows a number of studies that focus on strategies to improve retention. Maher and Macallister (2013) identify the following factors vital to student retention: pedagogy, class structure, nature of assignments, institutional factors, personal factors, activities that help students' feeling part of the supportive learning community (which extends beyond the lecture theatre), students' informal interactions with peers and academic staff. Students involved in such interactions feel valued and having a bond already established with lecturers, they are more likely to seek support which eventually enhances the likelihood of their academic success.

Moreover, retaining a student is very important for an institution to carry out its mission and key objectives. It is also important to reflect on attrition because one of the most serious problems facing the HE sector today is that so many students leave before finishing their studies. Therefore, the question researchers, employers, institutions, students and families of students are currently most interested in is, "why do students leave the institution before completing a degree?" According to Campbell, when a student(s) drops out, it directly or indirectly affects the student themselves, the institution and the society (Campbell 2007). The student(s) are affected because they lose huge future career and income potential. The institution they leave is affected because of lost reputation, revenue and opportunity to make a difference in the student lives. Finally, the society is affected because of the need for an educated work force that is able to compete in the global marketplace. A high rate of attrition is not only a business problem for HEIs but a failure of an institution to achieve its purpose.

The foremost objective of this study is to develop a student retention model utilising student demographic data and a combination of data from SIS, LMS/CMS and other similar tools to accurately predict academic success of

students at our own institution. With the current maturity of LMS/CMS and others, institutions can take advantage of the increased access to data (despite the privacy concerns, which is beyond the scope of this paper). This accessible data can help to track many aspects of student performance and behaviour to develop new analytical techniques to predict retention. As a result, retention models which were once too expensive, complex and distributed can now be developed into an intelligent early warning system. Given the wide deployment of LMS/CMS, Australian higher education could greatly benefit from exploration of these systems as part of a larger retention system. Lastly, it can provide information to higher education administrators and students to facilitate their decision making.

Next we review relevant literature on student retention identifying factors related to retention and foundational retention theories. Following that we present our proposed eclectic model for student retention. The paper concludes with our proposed research method and future work.

LITERATURE REVIEW

There have been growing interests to predict student academic performance and retention within higher education since the 1980s. The results of this research have led to the construction of theories and descriptive models, development of admissions formulas and assessment tools (Campbell 2007). Research on retention has investigated the factors affecting student retention as well as validated the effect of these factors on various student populations. Most of these studies have been performed in US, UK and Europe. The findings of these studies may not necessarily be applicable to Australian higher education with a different culture and education system. In this context, it is necessary to develop an initial student retention model and framework to improve the student retention and success in Australian higher education institutes. Numerous studies have sought to identify models and sets of variables to explain what causes students to persist or to depart in higher education. For most students, deciding to leave higher education is not the result of a single factor. Rather, it is the result of a combination of complex and interconnected factors that develop over time.

Summary of Factors Influencing Retention

There are a number of academic and non-academic, traditional and non-traditional, commuter and resident and minority student group related factors to retention as found in the research literature. Table 2 is compiled by the authors to present a summary of factors related to student retention.

Table 2. Factors Influencing Retention

Factors	Bean & Metzner 1985	Johnson 1994	Davies & Elias 2003	Swail 2004	NAO Report 2007	Yorke & Longden 2008	Douglas 2009	Jensen 2011	Sternberg 2013
Background Characteristics	X			X	X	X	X		X
Academic	X	X	X	X	X	X		X	X
Institutional/ Environmental	X	X	X	X	X	X		X	X
Social/Campus Integration	X	X		X	X	X		X	
Attitudes/ Psychological	X			X	X	X	X	X	X
Intention	X				X				
Personal/ Family		X	X		X		X	X	
Financial/ Economic			X	X	X	X			X
Health	X						X		

Foundational Retention Theories

The literature on student retention and attrition describes an extensive collection of theories and models that could be used (alone or in combination) to explain why students leave educational institutions. The study of student retention began with the work of Vincent Tinto (1975) on the examination of student drop-out characteristics. Since that time, the research has transformed from the study of drop-out characteristics to the development of holistic models of retention and attrition from the perspective of student-institution interaction. Again, student retention has been investigated for various student populations (first year students or senior students) and different institutional settings (students attending for two or four years). The results found that retention is influenced by three attributes of student cohort, namely, institution types (public, private, vocational

education and training institutions or higher education institutions, e.g. university), chosen study majors or disciplines (computer science, business, nursing, information systems) and with cultural background of students. Some of the studies of student retention in HE have specifically focused on the development or construction of predictive models to identify and explain the complex interactions of factors that contribute to students' intention to persist (Bogard 2011; Delen 2010; Yu et al. 2010). Other researchers also provide an empirical validation of theoretical retention models (Bogard 2011). While studies and models for student retention vary in many ways, the basic notion remains the same, that is, retention is influenced by a number of complex factors. Therefore, the responsibility for improving retention is a shared responsibility between the institution and the student (Campbell 2007). Typically, the researchers in this domain have incorporated individual, environmental and institutional characteristics in their models as being effective predictors of student retention. Since, student retention is by definition a process that occurs over time, theoretical models tend to be longitudinal, complex and contain several categories of variables that reflect both student and institutional characteristics. Four widely used theories are presented next.

Vincent Tinto's Theory of Student Departure (1975)

This is the first and perhaps the most cited theory of student retention. The interactive model developed by Tinto in 1975 (and updated in year 2000 and in more recent papers) seeks to explain the student withdrawal process. The model emphasises on two main variables, goal commitment and institutional commitment. These, in turn, are conditioned by academic integration and social integration (for definitions see later section Component 4). Both academic and social integration depend on input variables of the student (pre-entry attributes), the family environment and the institutional experiences. Tinto stated that as integration increases (both academic and social), the students' commitment to their personal educational goals and participation within the institution also increases. On the other hand, Pascarella and Terenzini (1991) extended this view by stating that "negative interactions and experiences tend to reduce integration" (pp 53) which ultimately leads to withdrawal. Tinto's theory of student departure can be summarised as, students tend to remain in the institution (they got admission into) when they have clear goals for themselves and perceive that their institution is a powerful vehicle in achieving their goals.

John Bean's Explanatory Theory of Student Retention (1980)

Another influential model is Bean's model (1980) which was derived from the theory of organisational turnover and psychological theories (attitude-behaviour theory, coping behavioural theory, self-efficacy theory and attribution theory) which lead to academic and social integration. He suggests that four sets of variables influence student retention. The first set includes academic variables as measured by grade point average. The second set of variables concern the student's intention to leave, which is expected to be influenced by psychological outcomes (institutional quality, satisfaction, goal commitment and stress) and academic variables. The third set of variables are background and defining variables (high school performance and educational goals). The final set of variables are environmental variables (finances, hours of employment, family responsibilities and opportunity to transfer), which have a direct effect on students' decision to retain or leave.

Alexander Astin's Theory of Involvement (1985)

Astin's Student Involvement Theory states that students learn by becoming involved. His theory emphasises that the factors important to student retention are effective in terms of the degree to which a student was involved in the institution. In 1993, he proposed the "Input-Environment-Outcome" (I-E-O) model to serve as a conceptual framework for studying student retention. The purpose of the model was "to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions" (Astin 1993 pp 7). The fundamental elements of the I-E-O model are inputs, environment and outcomes. Astin (1993) identified 146 possible input variables (student demographics, background and previous experiences), 192 environmental variables (institutional characteristics, students' peer group characteristics, faculty characteristics, curriculum, financial aid, major field of choice, place of residence and student involvement) and 82 outcomes (student's characteristics, knowledge, attitudes, beliefs and values after exposure to the institutional environment) variables.

Swail Watson's Geometric Model of Student Persistence and Achievement (1995 – updated 2004)

Watson's conceptual framework for student retention differs from others by placing the student at the center of the model. The fundamental elements of the conceptual model are: cognitive, social and institutional factors. Cognitive factors relate to the intelligence, knowledge and academic ability a student brings with him or her to the university environment. These factors may be measured by variables such as, course selection and completion in high school, aptitude or extracurricular involvement in academic related areas. Social factors refer to the external factors that characterise the students, such as, ability to interact effectively with other people,

family and peer support, personal attitudes, cultural history, the development or existence of career goals, educational legacy and the ability to cope in social situations. Institutional factors refer to the practices, strategies, culture and ability of the institution to provide appropriate support to students during the study years, both academically and socially.

Next, we present our proposed model which is based on the above mentioned theories and models keeping in mind current educational setting (such as more online components in units of studies compared to earlier decades).

A PROPOSED ECLECTIC MODEL FOR STUDENT RETENTION

Based on a review of the literature, we proposed an eclectic model for student retention. An eclectic model instead of postulating a special dynamic, indicates sets of variables involved in the academic process and allows the stakeholders and users (researchers, administrators and others) to find out how these variables act on specific populations and institutional settings. In the process of developing our proposed model, we have considered the dramatic change of student-institution interaction evolved over the time. Examples for institutions includes, developments in the contestability of marketing and funding, admissions recruitment, use of LMS/CMS, the rise of blended learning, online learning and MOOCs (massive open online courses) and integration with industry. Examples for students includes, developments in student knowledge and access to HE and ubiquitous content, use of digital technologies in their learning and social media. Therefore, building on Tinto's original model (1975), we add a number of components from Bean's, Astin's and Swail's. The four models are the most widely recognised models in the domain and claim that retention was affected by the integration between the students and the institution. Each of these models has a significant illustrative and explanatory power. A framework which presents an integration of components from these models may present a considerable improvement over a model taken alone (Swail 2004). All these models offer an essential understanding into the theoretical basis for exploring the factors that describe and help to understand and predict a student's decision making to persist or leave. The components of these models are selected as theoretical concepts for best description of characteristics of students. We believe that the combination of these existing retention models provide a threshold for a conceptual framework for thinking about the dynamics of dropping-out and incorporate great illustrative influence as compared to theory taken alone. Figure 1 shows our proposed integrated theoretical model to understand student retention.

While "student retention models remain useful in illustrating the problems and processes' relating to student retention, the relationship between college and student is lost between the simplicity and complexity of the various models" (Swail 1995 pp 13). Therefore, without a clear explanation of what the model represents, it is difficult for administrators and practitioners to fully comprehend the significance of the model and how it relates to institution policy. Our eclectic model consists of seven components. These components are identified as determinants of student retention. These components are: cognitive aspects, social aspects, initial commitments, learning environment, institutional aspects, later commitments and decision to persist or retain.
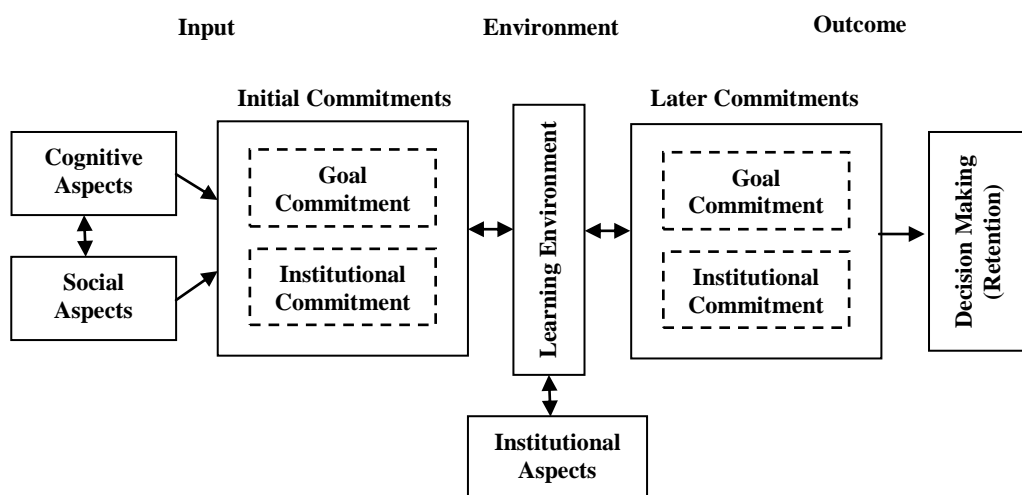

Figure 1: Proposed Eclectic Model of Student Retention

The selection of these components was based on characteristics, requirements, issues and other features identified in the literature relevant to student retention. Therefore, we believe that these seven components combine to provide a solid foundation for student growth, development and retention. The model components are further broken down into various factors or variables. On the theoretical level, this model helps us to

understand persistence and retention, how various factors or variables may interact and how the institution is involved in the retention process. The strength in the model lies in its ability to help institutions work proactively to support student retention and achievement. The cognitive and social aspects of the student are vital components of our proposed model because without knowing enough about student background (academic and social), it is challenging for the institution to make prudent decisions on whom to admit.

Component 1: Cognitive Aspects

Cognitive aspects refer to the intelligence, knowledge and academic ability a student brings with him/her to the learning environment. These characteristics of student(s) may be measured by family social status, parental formal education, skills, gender, race or ethnicity, age, academic aptitude, high school performance or achievement, enrolment status, residence or location, critical thinking and problem solving ability, academic related extra-curricular activities and others.

Component 2: Social Aspects

The second component related to student retention and performance is the set of social factors impacting on students. Social aspects may be measured by finances, hours of employment, family responsibilities, attitude towards learning, religious background, social coping skills, cultural values, family and peer influence and others.

Component 3: Initial Commitments

The above mentioned cognitive aspects and social aspects combine to influence the initial goal and institutional commitments that the student brings to the university environment. Goal commitments represent the degree to which the student is committed or motivated to get a university degree. Institutional commitments represent the degree to which the student is motivated to graduate from a specific university. These commitments may or may not change during the student's time at university as a result of the degree of integration into the academic and social systems of the university.

Component 4: Learning Environment

According to Pascarella and Terenzini (1991) the university learning environment is described as "an active force that not only affords opportunities for change-inducing encounters but can also, on occasion, require a student to respond [to change]" (pp 57). The learning environment and related variables could have a dramatic effect on student achievement and ultimately persistence at their institute. We looked at the learning environment as an environment where academic and social integration can take place. Academic integration is defined as a student's perceived academic performance and intellectual development while social integration is defined as the quality of a student's relationships with both the peer group and the faculty (Pascarella and Terenzini 1983). Tinto (1993) points out that both types of integration do not need to be equal but some level of academic and social integration must occur in order for students to persist at the college or university. In addition, Tinto also points out that both types of integration may have a reciprocal relationship. For example, if a student is very connected in the academic life by spending too much of his time in study then the student may have a lack of social integration in the university. As a result, this may have a negative consequence with regard to student retention. Learning environment may refer to faculty culture (professional interests, values and orientations), organisational structure, administrative policies and decisions, institutional size, admissions standards, academic standards, educational or career aspirations and campus life (being a member of a student organisation, attending study skills workshops, attending PAL-peer assisted learning, working in campus and library usage). While other factors may also have a role in the individual students' decision to remain, the learning environment plays an important role in the students' development and ability to achieve their educational goals.

Component 5: Institutional Aspects

An educational institute is undoubtedly a place where students come to change their lives and may result in the biggest social change they have ever experienced. Tinto's (1975) research shows that some psychological factors are related to almost all students at some level such as stresses of first year and lack of confidence, anxiety and pressure in minority and low-income students. The important thing to understand is how the institution reacts to such students to determine retention, persistence and completion. For this study, the institutional aspect relates to the ability of the institution to provide appropriate support to students during the education years, both academically and socially. Research shows that issues related to course availability, content and instruction affect a student's ability to persist. However, support such as tutoring, mentoring and career counselling also helps a student to survive. In addition, a flexible set of programs that the institute offers can also help to meet the diverse needs and attributes of individual students. The institutional factors are directly related to the learning

environment because it is the institute that forms the foundation for a student's learning success by participating and supporting students' academic and social development.

Component 6: Later Commitments

The social and academic integration taking place at the learning environment of a student may lead to new levels of goal commitment and institutional commitment. Tinto states that "in the final analysis, it is the interplay between the individual's commitment to the goal of college completion and his commitment to the institution that determines whether or not the individual decides to drop-out from college" (Tinto 1975 pp 96). Later research supports Tinto's statement that a student's level of institutional commitment at this stage has a direct effect on the student's decision to stay or leave university.

Component 7: Decision Making – Student Persistence and Retention

An important component of the model just like other models described earlier, is student decision making relating to student persistence and achievement. Tinto (1975, 1993) describes the decision making process regarding goal commitment and drop-out. Bean (1980) describes intent to leave and Astin (1985) identifies value conflicts and career indecision among the important variables that a student controls through the set of social and cultural values introduced to them.

PROPOSED RESEARCH METHOD AND FUTURE WORK

To calculate the retention rates (percentages) at any HEI is not sufficient to understand or address the retention. An information system (IS) is needed to model the whole process using the factors identified via an initial model that are then translated into a technological framework supported by the institutional processes to suggest interventions. In agreement with Chacon and colleagues (Chacon et al. 2012), we believe that what is needed is the use of academic/learning analytics involving a multi-step process to improve retention and student success. Our initial milestone is to develop a model of the factors or components influencing student retention and success (which we have achieved so far). The next step is to develop an operational or technological framework (based on the eclectic model) that instantiates rules as prescribed by the model for collecting data relative to the desired variables from specific sources and measuring those variables (by expressing them through commonly accepted scales). Then, one has to implement this operational framework using IS. Finally, one needs institutional processes that interpret the system outcomes and translate them into interventions that resolve student issues. Thus, we begin with the theoretical and move toward the practical as a future work of this study. To avoid confusion, it is important here to differentiate between the scope and coverage of our proposed eclectic model (included in this paper) and the operational framework (future work). Readers should remember that our proposed eclectic model is indeed a "conceptual model" and the components identified are just the guidelines to begin the design and implementation of the operational framework. The future framework will provide a more in-depth view to administrators and practitioners with a menu of activities, policies and practices to consider during the planning and implementation of a comprehensive campus-based retention program.

Keeping in view the bigger objective of this study, that is, to develop an operational framework (to identify the variables affecting the retention of students at our own institute), we will use a mixed-methods approach. A mixed-method approach in research is where qualitative and quantitative approaches are combined. A number of terms are used for this approach such as convergent methodology, multi-method or multi-trait, convergent validation, triangulation, integration, synthesis and quantitative & qualitative methods (Creswell 2003; Creswell and Plano Clark 2007). According to Greene and colleagues (Greene et al. 1989), there are five major purposes for conducting the mixed-methods approach: (1) triangulation (seeking convergence and corroboration of results from different methods and designs studying the same phenomenon); (2) complementarity (seeking elaboration, enhancement, illustration and clarification of the results from one method with results from the other method); (3) initiation (discovering paradoxes and contradictions that lead to a re-framing of the research question); (4) development (using the findings from one method to help inform the other method); and (5) expansion (seeking to expand the breadth and range of research by using different methods for different inquiry components).

For this study, the main purpose for conducting mixed-methods approach is triangulation. To be more specific, we will use the terminology of Creswell (2003) as the appropriate description of the overall design of this study. We will call this "a mixed methods concurrent triangulation strategy". This means that "quantitative and qualitative data are collected and analysed at the same time. Priority is usually equal for both forms of data. Data analysis is usually separate and integration usually occurs at the data interpretation stage" (Hanson et al. 2005 pp 229). This strategy is the best known to researchers and can also result in well-validated and substantiated findings (Creswell 2003). This approach will consist of two phases. The first phase will use a quantitative approach, for example a survey. The second phase of this study will use a qualitative approach. Qualitative data will be obtained from focus groups of persister students and a survey of staff members (counsellor, student

support officers and others). Data analysis will be separately conducted in both phases using statistics, information visualisation, data mining and text mining or content analysis. Then, results from both phases will be compared, integrated and interpreted.

Figure 2 shows a visual diagram of the concurrent triangulation strategy to be used in this study. Figure 2 shows quantitative and qualitative in capital letters. According to Morse (2003) notation system for mixed methods strategies, the capitalisation means that the priority is equal between the two approaches.
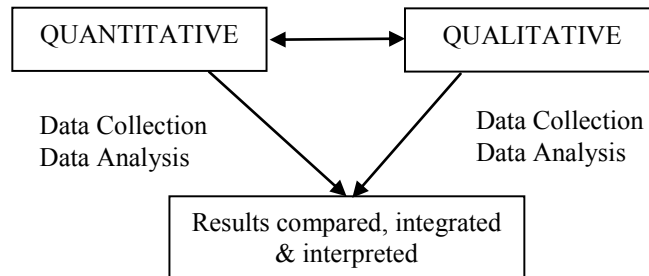

Figure 2: A Visual Diagram of the Mixed-Methods Concurrent Triangulation Strategy

The researchers will use this approach because of the following reasons (Creswell and Plano Clark 2007; Johnson and Christensen 2004; Johnson and Onwuegbuzie 2004): it can answer a broader and more complete range of research questions; integrating qualitative and quantitative approaches can overcome the weaknesses and utilise the strengths of each approach; applying the mixed-methods approach can improve insights into and understanding of the data, which might be missed when using a single approach; integrating qualitative and quantitative data can provide strong evidence for conclusions; and triangulating the data from different methods increases the validity of the results and the conclusions.

It is important that practitioners understand the relationship between the framework's components. Most notable is the ability of campus departments to work together toward common goals and focus on students' needs (Noel et al. 1985 and Smith et al. 1985 as cited in Swail 2004). From an organisational perspective, it is difficult to imagine how any of the components could work effectively without links to other areas. For instance, financial aid offices work closely with recruitment and admissions offices, while academic services must work in tandem with departmental efforts in curriculum and instruction. The framework attempts to develop additional links, such as those between student services and academic services, where the notion of Tinto's theory of academic and social integration (1975, 1993) is most relevant. The link of recruitment practices with pre-college academic support programs is a good example of how a campus-wide support network can help students persist toward graduation. Thus, interrelation of the seven components within the framework should be a major consideration for practitioners and developers.

CONCLUSION

The aim of this study is to expand our understanding of student retention. This study is expected to contribute to a better understanding of the factors that influence student retention. In addition, how to collect, collate and integrate data residing in different university systems to track many aspects of student performance and behaviour to develop new IS such as, intelligent early warning systems. Eventually, such systems can provide information to higher education administrators and students to facilitate their decision making.

In this study we intend to use academic/learning analytics involving a multi-step process to improve retention and student success. As a first step, an eclectic model has been developed that brings together the various student retention theories to explain student retention at our own institute. The proposed model will then be translated into an operational framework. Moreover, this operational framework will be implemented using IS supported by the institutional processes to suggest interventions. Early warning systems or early alert systems for at-risk students focus on students' academic well-being and give students the help they need to succeed academically. The findings of this study are expected to be useful to the HE sector by contributing towards understanding the factors, developing useful techniques and strategies and designing IS to improve student retention.

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