

Impediments on the path to academic success in an IS degree programme: a South African perspective

Irwin Brown*, Imtiaz Moola, Ariefah Mugjenkar, Michael Sands†

*Department of Information Systems University of Cape Town

ABSTRACT

The aim of this research was to investigate impediments to success (in terms of pass marks) in an information systems degree programme. A programme at a South African university was used as the basis for investigation. A mixed method research approach was employed whereby semi-structured interviews were carried out with 14 students and 2 staff members, in addition to a quantitative survey amongst a larger group of learners. In this paper we report on findings derived from the qualitative data. This data was analysed using coding techniques taken from the grounded theory methodology. The end result was a framework showing that the major impediments related to the students (1) environmental context, (2) approach to academic work, (3) prior programming experience, (4) communication skills and (5) teamwork difficulties. The implications of these findings are discussed.

KEYWORDS: Information Systems Education, Academic Success, Impediments to Success

1 INTRODUCTION

The demand for tertiary-qualified IS specialists has significantly increased in South Africa, and indeed world-wide [1]. Despite this demand, there have been far fewer students majoring in IS than in the *dot com boom* era. IS departments are therefore investigating ways of attracting students to major in IS. They are also focusing on ways to improve pass marks amongst students that choose to major in IS. This paper contributes towards the latter goal through identification of factors that impede IS students from achieving academic success (in terms of pass marks) in IS degree programmes.

Most studies on student success tend to focus on one specific factor at a time [2, 3, 4]. Academic success, however, is impacted by a variety of interrelated factors. The interrelatedness of influencing factors has not been sufficiently addressed in literature. This study aims to make a contribution by investigating how a range of interrelated factors come together to impede student success (in terms of marks) in an IS degree programme. Many of the studies investigating this phenomenon relate to IS degree programmes in developed countries. The South African context is different to that in many developed countries, hence the need for an investigation that addresses specifically our local environment. The study aims to develop a theoretical framework that future studies can use as a basis for examining impediments to IS academic success.¹

The paper is divided into six sections. After this

introduction, a conceptual background section provides a brief overview of the impediments to success acknowledged in previous studies. The research methodology section describes the planned research approach. In the data analysis section the analysis and findings are presented. The implications of the findings are then discussed, after which the paper is concluded and recommendations for further research outlined.

2 CONCEPTUAL BACKGROUND

The multidisciplinary nature of IS is widely recognised [5]. Most IS syllabi reflect its socio-technical nature, with students required to develop both technical (e.g., programming) and social (e.g., teamwork and communication) skills [6]. Despite this, the functionalist paradigm nevertheless pervades many undergraduate IS syllabi, with *the focus largely on technology and business functions and only limited time spent on [broader] social concepts in IS* [7]. This multidisciplinary nature is often a challenge to students conceptualisations of IS, and hence to success in their studies. Impediments to success relate to both the academic difficulties of acquiring the requisite skills and the problems students encounter related to the environment and context in which they are studying. The literature on impediments to success refers to a broad view of the success concept. Academic success is however defined very narrowly in this paper as being related to marks achieved for IS subjects. The focus is on students majoring in IS. Impediments identified from literature include a lack of prior programming experience, poor communication skills, teamwork difficulties, and environmental difficulties such as language

Email: Irwin Brown Irwin.Brown@uct.ac.za

barriers, conflicting cultural values, and gender stereotyping. Many of these identified factors arise from studies done in countries other than South Africa, and are possibly not directly applicable or relevant. The aim of this study will be to investigate their relevance in a South African context.

Prior Programming Experience In many IS degree programmes, prior programming experience is not a pre-requisite, and courses are designed with the assumption that students do not have any experience [8]. In recent times students entering IS degree programmes have become quite diverse in their levels of programming experience. Some have programmed for years, either at home or school. Others enter with very little idea about what the programming process entails [9]. Students with prior experience tend to have an initial advantage. Whether or not this advantage is maintained depends on the students attitude towards programming as well as the type of language the student has previously learnt [10]. Prior programming experience may serve as a disadvantage, and may cause resistance to the adoption of a new programming style [8]. Students with prior programming experience often rely too much on this experience and eventually find themselves lagging [11].

Communication Skills The Computing Curricula [12] distinguishes between five major computing disciplines: Computer Engineering, Computer Science, Software Engineering, Information Technology (IT) and Information Systems (IS). IS specialists, it is noted, *should be able to analyze information requirements and business processes and be able to specify and design systems that are aligned with organizational goals* [12]. Strong written and verbal skills are necessary for IS specialists to be able to interact with various organizational stakeholders, and speak the language of both IT and the business. Interpersonal and documentation skills are extremely important for the effective development of information systems [13]. In order to develop such skills, IS degree programmes include written and oral communication skills training [13]. Many students do not initially possess the communication skills necessary to handle the softer side of IS practice [2]. As such, they encounter difficulties related to shortcomings in their communication skills levels.

Teamwork Difficulties IS professionals are required to work on projects as part of multi-disciplinary teams. Many IS degree programmes require students to work in teams on real-world projects and assignments in order to develop these skills. Conflicts within teams frequently arise [14]. A major reason is freeloading [15]. Freeloading is when the more responsible members within a team complete the major parts of the deliverable and the irresponsible members receive credit for work they did not complete [16]. Apart from the associated negativities, projects and exercises

completed by teams have a positive effect on individuals and their productivity [17]. Le Jeune [18] suggests that students perform best when working in teams as they are constantly exposed to new challenges.

Language Barriers The number of non-English-speaking students enrolled at English-medium universities in developed countries such as Australia, the UK and USA has risen dramatically over the past decade [19]. IS courses include assessments of written work and oral presentations, which affect the performance of those not proficient in the English language [19]. Many such students are concerned about English academic instruction, and have identified English proficiency as a critical success factor [20]. This is to some extent the case too for students at South African English-medium universities who may come from educational contexts where English has not been the medium of instruction, or has been poorly taught.

Cultural Values Culture shapes students views about IS as a field of study [21]. It also pre-determines an individuals communication preferences as well as behaviours [3]. Problems often arise when the IT products which students are expected to use in their IS courses are not aligned with the students cultural values [22]. Particular technologies may hinder a students ability to employ a communication style inherent to his or her culture [3]. These communication styles are often crucial to a students performance [3]. One of the most significant differences amongst cultures is their traits of either individualism or collectivism [23]. Some cultures tend to support the notion of collectivism, while others value individualism [24]. Such cultural values may directly relate to a students ability to work in teams. A lack of skill in this area may have a negative effect on student success [25].

Gender Stereotypes The misperception of information systems as a hard, male-oriented computing discipline is quite pervasive [26]. Impediments to the success of females in an IS degree are attributed to, among other reasons *the larger pool of more qualified and experienced male professionals, the lack of female role models and mentors, and established discriminatory factors* [27]. Across the globe women are under-represented in the IT profession [28]. In South Africa only 27

Despite these impediments, there is evidence that females that have the opportunity to study IT perform just as well as their male counterparts [29]. In fact the dropout rate in South African universities is often more of a problem for males [30]. Thus the impediments to success relate to the stereotypes that constrain females rather than gender per se. The individual differences theory put forward by Trauth [31] confirms this. According to this theory, individual identity, and individual and environmental influences result in differing experiences for IT among women, making it difficult to generalize similar patterns for all women [31].

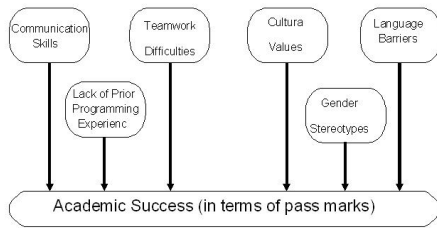


Figure 1: Impediments to Academic Success (in terms of pass marks) in an IS Degree Programme

Summary The six key factors identified in the literature review as being impediments to academic success have been combined to form a framework, shown in Figure 1 below. These factors are a Lack of Prior Programming Experience, Poor Communication Skills, Teamwork Difficulties, Language Barriers, Cultural Values and Gender Stereotypes. The factors were derived from a variety of studies in countries other than South Africa. Their relevance to the South African context needs to be established hence the framework will serve as an initial sensitising device to investigate the phenomenon in more detail in a South African context.

3 RESEARCH METHODOLOGY

This section describes the research methodology and justifies the approach. The sample, data collection methods, and analysis procedures are explained.

3.1 Research Strategy

The study used a combined deductive and inductive approach. The deductive component is evident in that a theoretical framework was firstly derived from literature (Figure 1). The aim was not to test the relationships implied from this framework through quantitative statistical analysis. The major reason for the framework was for it to serve as an initial sensitizing device to guide the qualitative enquiry and interview questions. Through the qualitative enquiry it was expected that the nature of the impediments to academic success would be elucidated. An inductive approach was evident in that once data was gathered analysis proceeded by inductively identifying concepts using grounded theory techniques. Data was gathered from a single case, as described next.

3.2 Contextual information on the case

A South African English-medium university, which had an established IS department was used as the basis for empirical investigation. The department is housed within the business faculty. The IS department offers a range of undergraduate and postgraduate programmes and courses, from first year up to PhD level. In addition to courses for IS majors, IS service courses are offered to non-IS majors. The focus of this study was on the undergraduate IS major programme.

Instrument	Sample
Qualitative Interviews	4-6 students to partake in interviews from the IS Honours class
Qualitative Interviews	4-6 students to partake in interviews from a third year IS class
Qualitative Interviews	4-6 students to partake in interviews from a second year IS class
Qualitative Interviews	2-4 lecturers from the IS department

Table 1: Sampling Plan for Qualitative Data

The IS undergraduate major programme is fashioned after the international IS 2002 Curriculum [12]. In the first year, students complete 2 IS courses (IS fundamentals and programming), in addition to other business courses. In the second year, there are 4 IS courses database systems, systems analysis, systems design and implementation, and IT architecture, as well as several business courses. In their third year, students carry out a major systems development project. They also enroll for IS courses in e-Commerce and IT applications in addition to business courses. Successful completion of the 3-year programme may lead to the award of a Bachelors degree. There is a 4th year Honours programme, which includes further study of the IS body of knowledge, an empirical research project, a systems development project, and community service. Throughout the programme a strong emphasis is placed on teamwork.

The demographic profile of the students studying IS as a major (at the time of the study) reflected the diversity in the University. 39

3.3 Sampling Procedure

Students served as the primary research subjects whilst staff were used as a secondary source to validate the data gathered and to gain an appreciation of the historical context of the IS degree programme being offered. A stratified sampling procedure was used for the data collection with the student subjects drawn from amongst second, third and Honours year IS students. First year students were not included as they had not yet completed their first year IS major courses, and as such academic success (in terms of final marks) could not yet be determined. The sample was obtained by separating the population into mutually exclusive sets, and then drawing samples from each set [32]. The sampling plan followed for the qualitative data collection is shown in Table 1 below.

3.4 Data Collection Procedure

25-30 minute semi-structured interviews were conducted with informants. The interview questions were mostly open ended. Interviews were conducted over a period of 1 to 2 months. Both students and lecturers were contacted via email and asked to participate in the study. Those who agreed were provided with a

letter by the researcher, which outlined the purpose of the study.

3.5 Data Analysis Procedure

Interviews were recorded with the use of a laptop, microphone and recording software. Once interviews were completed they were loaded into a software program called Express Scribe. This software tool assisted in the transcribing of interviews.

Grounded Theory Techniques Matavire and Brown [33] identify several ways in which *grounded theory* has been employed in IS research. In one strand of research only the techniques of the methodology are employed, often as a means to analyse data. This was the stance adopted in this study, whereby grounded theory techniques taken from Strauss and Corbin [34] were used to analyse the data. The classical grounded theory methodology on the other hand typically begins with data collection, analysis and literature review proceeding together more or less in parallel [35].

This investigation began with the derivation of an initial sensitizing theoretical framework from literature (Figure 1). The framework served as a guide for interview questions. In analysing the gathered data, though there was awareness of the concepts emanating from literature, these were not imposed on the data. Rather concepts were allowed to emerge, after which they were compared with the initial literature-based framework. This is in line with the constant comparative analysis technique of the grounded theory approach [34].

The three coding phases of the grounded theory method as described by Strauss and Corbin [34] were employed, namely open coding, axial coding, and selective coding respectively. In the open coding phase, key concepts were identified and grouped into higher order categories. In the axial coding phase, relationships between the core categories were identified and validated based on evidence in the data. Finally, in the selective coding phase, the theoretical framework was refined and trimmed, and described in the form of a diagram and story line. The three coding steps were performed iteratively.

4 DATA ANALYSIS AND FINDINGS

4.1 Respondent Demographics

For the interviews, 14 students and 2 lecturers participated. Of the students, 7 were third year and 7 were Honours. 8 were male and 6 were female, with representation drawn from African, Coloured, White and Indian groups respectively.

4.2 Major Categories and Concepts

Five major categories of impediments emerged through the qualitative data analysis. The major concepts related to the students (1) environmental context, (2) approach to academic work, (3) lack

of prior programming experience, (4) communication skills difficulties, and (5) teamwork difficulties. Each of these categories will be elaborated on in terms of their key concepts, and implications will be drawn.

4.2.1 Environmental Context

In the environmental context category 4 main concepts were identified, these being gender stereotypes, historical inequities, language barriers and financial need. Each will be discussed in turn.

Gender Stereotypes Several respondents mentioned that a stereotype exists around females in the IS/IT field. This stereotype is based on the *bias where people say woman cant code or women are IT illiterate*. Some male respondents were of the opinion that *guys are more into the technical side of things like coding*. A female interviewee opined that *because of the environment and the social structures they make people think that ok coding is not for me, its more of a guys job and because of that mindset you put that barrier there for yourself*. Some indicated that females are *not given the opportunity to practice*. *We are female and the guys are selected to be the coders. They said we can do documentation*. A lecturer's viewpoint was that females *perform just as well, sometimes better* in the programming courses.

Discussion and Implications The analysis clearly shows that it is gender stereotypes and not gender per se that acts as an impediment. It confirms the assertions from literature that there still exist gender stereotypes in the IT field, derived largely from societal views [26]. These carry over into the field of study and are evidenced by some female students lacking confidence in their ability to code, and accepting roles such as documenters when placed in systems development groups. IS departments at universities need therefore to be pro-active in debunking some of these myths by working closely with other stakeholders in educating society and high schools in particular. Free and open discussion on gender stereotypes should be engendered in classes to help surface hidden assumptions, and ensure that the status quo is not replicated in student project group work.

Socio-economic Inequities Several interviewees in discussions of culture spoke about their privileged background rather than cultural values per se. For example, an interviewee from a privileged background noted that he was *always exposed to different kinds of technology*. He further reasoned that *if you maybe come from [another] background you don't have that same kind of exposure*. Another interviewee stated that *because of the opportunities I was given I am more inclined to computers now. So it has made IS a lot easier for me*. A lecturer interviewed indicated that some students *don't do so well because they lack the previously developed skills. I realise how difficult it is for some of those kids*. A student also noted the

impact of family background: *if you come from a background where the general community within a family have not come from an academic background. its like you venturing into a new arena. Cause theres no real support at home.*

Discussion and Implications The literature refers largely to cultural barriers as an impediment, especially with regards to international students who travel to study at universities in western countries [19]. The uniqueness of the South African context comes to the fore in this analysis, as it is shown that rather than culture per se being the core impediment, it may be the socio-economic inequities in our society. The distorted distribution of resources between advantaged and disadvantaged schools is evident in the learners who enter university from these schools. There are stark differences in levels of preparedness for tertiary education. Academic development programmes have been instituted in universities to help students from disadvantaged backgrounds to reach their full potential. These programmes should be adequately resourced to ensure that students that have the aptitude and propensity to succeed in IS are able to do so, regardless of socio-economic background.

Language Barriers Several respondents who did not use English as home language indicated that they were comfortable with and proficient in the use of English. Some, on the other hand, did not enjoy using it. Those who felt they lacked proficiency in English noted that there were often times when they did not fully understand assignment requirements, which could have influenced their success (in terms of marks) in the IS degree programme. One interviewee felt that if assignment requirements were phrased in her home language she would better understand them. It was declared: *it sometimes takes longer for me to understand.* It was also noted that *it is not always that you understand something from the writers perspective.*

Discussion and Implications The literature points to language as being a barrier for international foreign language students who come to study at English medium universities [20]. South Africa has 11 official languages, and it is for this reason that language presents as a barrier for some students. Recent research points to a deeper problem whereby many South African students are forced from a young age to learn how to learn in a foreign language [36]. This is in contrast to many other countries where instruction in the mother tongue from a young age provides for a firm foundation for secondary and higher education. In dealing with misunderstandings of assignment requirements due to factors such as language difficulties, Ngambi and Brown [37] demonstrate the efficacy of educational technology as a possible means to address this problem.

Financial Need Some students were compelled to work to cover the cost of travel and study expenses. As

stated: *I work and study. I require finances to get to varsity and to cover university costs.* Other students lacked finance to purchase or upgrade home computers which would have assisted them in completing their degree. It was noted: *I need to upgrade my PC at home, I can't cause I don't have money.* A lecturer noted the following: *I have seen some students passing while working night shift to pay for their education . 50%, in my eyes is not really a very good result for an IS 3rd year student, but if that is the condition that the student had to work and pay for themselves. I think its excellent, and those students normally become very good workers.*

Discussion and Implications Lack of financial resources is a major barrier to student success, accounting for large drop-out rates amongst students from disadvantaged backgrounds. For some that manage to continue, the horrendous conditions under which they have to live and study present as significant challenges, once again accounting for apparently lower academic performance when compared to the privileged [38]. Some students manage to find work, and are required then to devote time and effort to earning an income, sometimes to the detriment of their studies. The impact is particularly strong for students that come from schools that have under-prepared them for university. For such students, adequate financial resources are a necessity, so that they can dedicate their energies to studying, and making up for the shortcomings in their previous education. It is incumbent on national institutions to be cognizant of and proactive in addressing these realities if the gap in average performance (as assessed by marks) between advantaged and disadvantaged students is to be closed.

4.2.2 Approach to Academic Work

Although the category of *approach to academic work* did not appear in the initial framework (Figure 1) it emerged quite strongly from the data collected. Three major concepts that belong to this category are *time management, attitude towards study* and *alternative perceptions of success.*

Time Management Some interviewees indicated that having to commit time to other activities impeded academic success. For example, as discussed in the prior section on environmental context, those who had financial difficulties very often had to work longer hours to maintain their enrolment at university. Non-work commitments were also mentioned. One interviewee noted: *I suppose if I knew less people who enjoy partying and staying out late I would be in a bit better frame of mind to work better the next day* Another interviewee stated that *I have got other things I do as well just sport and going out a lot, like a party animal.* Yet another indicated, *I was involved in [community activity] for 3 years. And that obviously chowed time.*

Discussion and Implications Self-motivation and discipline are a necessity for success in a tertiary environment. Some students lack the maturity to deal with the freedoms perhaps not previously held whilst residing at home with parents. As such, they may struggle to balance their time between work and leisure activities.

Attitude towards Work Many interviewees noted that commitment, passion and enthusiasm concerning their degree and future career contributed positively to their success. Several interviewees on the other hand noted that negative attitudes to study acted as an impediment. It was stated: *if your work ethic is poor you gonna really struggle with IS cos its alot of hard work* Another noted *thats what I lack hard work, that consistency throughout the year.*

Discussion and Implications Having clear career goals and direction helps students in overcoming some of the tedium encountered while studying. IS as a career is not well understood in high schools [1]. As such students may venture into the IS stream without a clear understanding of where it will lead to. This may affect work attitudes and hence academic performance. First year IS courses need therefore to be designed so as to bring forward a clear understanding of the discipline and the career opportunities it provides.

Alternative Perceptions of Success Alternative perceptions of success emerged as a key concept. Pure academic performance as measured by course results was not the sole criteria by which students determined their success. Most students agreed that obtaining 50 percent was not sufficient to be considered as being successful. However, there were several who suggested that success should be measured by the skills obtained and that could be used in the working world. For one student success comprised of *learning all the skills necessary to be a good business analyst, such as the written, presentation, analysis and teamwork skills.* Another indicated: *I think that [I have] come away with a much broader skill set than I came in with. So, ya Im fairly happy about that.*

Discussion and Implications The identification of this concept indicates that academics are perhaps fixated too much on high marks as an indicator of success, and justifies why perhaps a broader perspective is needed. The narrow success definition adopted in this study ignores broader indicators of learning, and individual students goals. There is indeed evidence that in some instances students may in fact pass tutorials and tests without having sufficiently grasped the core of what they ought to have learned [37].

4.2.3 Lack of Prior Programming Experience

Prior programming experience was not a pre-requisite for entering the IS degree programme. Nevertheless,

all students interviewed felt that prior programming experience was an advantage. Those with no prior programming experience felt that those who did had *more time to experiment. Logically they can do things better.* Another interviewee agreed stating that *they understand the syntax and how to code where as me I know absolutely nothing so at least they have a foundation to build on.* Some felt that although students with prior experience have an initial advantage *if you really wanted to gain that extra bit in coding you could easily achieve it by just putting in a few extra hours.* Respondents who did have prior programming experience were of the opinion that understanding programming basics from the onset gave them an advantage. An interviewee indicated they were *able to stay ahead and always be able to program at the level that was needed for the IS degree.* It was further noted that you can *just work on improving your programming rather than learning how to do it.* A lecturer identified a disadvantage: *You could easily lose the guy who is good already, because he gets bored if you dont give him sufficient challenges.*

Discussion and Implications The strong influence of prior programming experience on academic success is perhaps an indication that the subject is being too strongly emphasized in the degree programme. IS graduates are typically employed as IT project managers, business analysts or developers rather than heavy-duty technical programmers. The strong emphasis on programming may be a reflection of the functionalist techno-centric paradigm that pervades many undergraduate IS degree programmes. Byrne and Lotriet [7] argue for a rethink of this paradigm, as is the case in postgraduate IS degree programmes where students are exposed to alternative conceptualizations that highlight the strongly social nature of the IS discipline.

4.2.4 Poor Communication Skills

When asked if written and presentation skills contributed to success in the IS degree, the answer from all respondents was an emphatic yes. Some indicated their writing skills were problematic. As stated: *For me written part is a lot more difficult.* For those who were not entirely comfortable with their communication skills it was felt that an improvement in these skills would lead to an improvement in their IS results. It was stated: *If your written skills were better you'd have better documents and faster.* Another noted: *If I had maybe a bit more development of my presentation skills I think it would definitely help.*

Discussion and Implications Written and presentation skills need to be continually honed throughout the IS degree programme. The ability to communicate in various ways with diverse stakeholder groups is a necessary competency in IS. The above analysis illustrates that students recognize this need, and do not simply dismiss these competencies as less important *soft* skills.

4.2.5 Teamwork Difficulties

Several respondents agreed that there were positive benefits to working in teams, especially where these were functioning well. In such circumstances, the teamwork was deemed to have a positive effect on academic performance. Many respondents also indicated that group politics was an issue in team work and that there were differences in the way people work and perceive the outcomes. Many respondents did not favour group work even though they were aware of its benefits. The following responses indicated how students felt about teamwork: *Its hell so far* and *Working in teams is much more stressful than working on your own* and *The problem is getting everyone to contribute*. It was mentioned that when working in a team it is sometimes necessary to pull up other team members who may not have succeeded if working alone. Of those who felt that teamwork was having a negative effect on their performance in the IS degree, one stated: *I feel that the quality of my work decreased [because] of working in a group but then again maybe it didnt and Im just arrogant*.

Discussion and Implications The role of teamwork in the teaching and learning of IS is well-recognised [39]. Despite the problems and difficulties students encounter, they recognize its value. Where teams work well together, the combined effort leads to exceptional performance. Where there are dysfunctional traits in teams, performance is negatively affected. Careful facilitation, team management, and assessment is required to minimize these negative effects on individual students overall performance [39].

4.3 Relationships between Categories

Relationships between categories were identified by employing the axial coding technique of the grounded theory methodology. With this technique, relationships are identified at the concept rather than category level [34]. The process was carried out using a combination of methods. Firstly, general patterns were identified in the data, which gave an indication of relationships between categories. Secondly, statements of relationship between concepts were found that gave a clear indication of where categories were linked. Between any two categories there were often several relationships, depending on the number of related concepts across categories. Each of the identified category to category relationships will be discussed in turn with illustrative examples.

4.3.1 Environmental Context and Poor Communication Skills

Communication skills were discussed in terms of competencies related to making verbal presentations and writing technical and academic reports. Several environmental factors were mentioned as impacting on communication skill levels. For example, a student whose home language was not English [environmental factor] acknowledged that difficulties with English

sometimes contributed to problems with essay writing *when it [was] like more technical stuff*. A pattern was also observed across interviews. Students that reported being exposed to communication development activities beyond basic essay writing and the *occasional oral at school* were generally more confident in their ability. Some of the extracurricular activities mentioned included public-speaking, drama, voice training, and generally reading alot. It can be inferred then that students from environments where the opportunity or motivation to participate in some of these activities is lacking may be less confident in their communication skills. There was also an alternative perception that limitations in communication skills had more to do with individual aptitude and personality, and less to do with prior skills development.

4.3.2 Environmental Context and Lack of Prior Programming Experience

Lack of prior programming experience was shown in several ways to be linked to the environmental context. A general pattern was observed in the data, whereby White students tended to have had prior programming experience, either at school or home. Several Black students also had prior programming experience, but this was less often the case. This can be attributed to historical inequities. Former white-only schools (still very often made up of a majority of white students) are generally well-resourced with computing facilities, and teachers able to teach programming. Disadvantaged schools on the other hand have neither the resources nor the teachers to provide computing as a subject. These schools are typically located in poverty-stricken enclaves created by the former apartheid regime to oppress black people. Students coming from these schools do not have prior programming experience.

Societal gender stereotyping was also found to have a negative impact on prior programming experience. It was stated by a female student that due to this stereotype *most of the guys in the class have coded way before we even knew what it was*. Another female student confirmed this stereotype by stating that *where I come from computers are just for guys, and as a lady trying to get into that field you already got pressure from people around you*.

4.3.3 Environmental Context and Team Work Difficulties

Some of the difficulties relating to team work emanated from the environmental context. For example, due to gender stereotyping, in some groups it was observed that *the guys are selected to be the coders. They said we [females] can do documentation*. Assignment of roles based on such stereotypes is likely to cause team conflict. Other environmental conditions affecting team work related to issues such as safety concerns for students (females especially) who have to work late on team projects. As stated by one student *you cant*

really work until that late because you have to be home at a certain time. Another student alluded to family concerns when asserting that *IS is very time consuming* *Im not allowed to spend late nights on campus.*

4.3.4 Environmental Context and Approach to Academic Work

The impact of environmental context on approach to academic work was most marked when considering students who had to work and study due to financial constraints. For these students, time management is of utmost importance. As stated by a lecturer: *I have seen some students passing while working night shift to pay for their education .*

4.3.5 Poor Communication Skills and Academic Success (in terms of marks)

All respondents agreed that communication skills affect academic success in terms of marks. Assessed course deliverables included presentations, writing of essays, technical documents, academic literature reviews and empirical research reports. Some students were of the view that too much emphasis was placed on the presentation component in assessment of systems development projects. As stated: *You work for 6-9 months on a SD [systems development] project and ultimately you are marked from one 2-hour presentation and so your presentation skills are a lot of what drive that.* Various assessment strategies have been employed to mitigate this effect.

4.3.6 Lack of Prior Programming Experience and Academic Success (in terms of marks)

Almost all respondents agreed that those with prior programming experience had an initial advantage which seemed to last throughout the degree programme. As such, their marks were on average always higher. This observation reflects how pervasive programming skill requirements are in all years of the degree programme and could be an indication that it is being emphasized too strongly. It was also suggested that the strong influence of prior programming experience may be due to the way in which introductory programming was being taught. As a respondent noted: *its pitched at a level just high enough to miss people who havent done programming before and low enough to kind of bore everyone who has.* Adjusting the manner in which programming is taught may help mitigate the effects of prior programming experience.

4.3.7 Teamwork Difficulties and Academic Success (in terms of marks)

Teamwork was seen as contributing positively to academic performance if teams worked well together. Where teams were dysfunctional and ridden with problems there were negative impacts on performance and hence marks. As stated by a respondent: *being put in a team when you dont know the people or none*

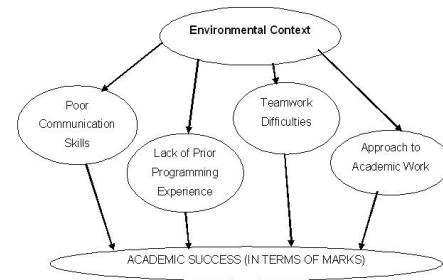


Figure 2: Refined Theoretical Framework: Impediments to Success (in terms of marks) in an IS Degree Programme of you are good in the skills that are required to get you through, then it will serve as a negative.

4.3.8 Approach to Academic Work and Academic Success (in terms of marks)

The approach to academic work clearly had an impact on academic success in terms of marks. Those with poor time management skills indicated they had problems balancing work and pleasure, which affected their marks. Poor work ethic and motivation was also reported as negatively affecting marks. Finally, those who viewed success in terms of a broader perspective beyond just marks were not fixated on obtaining the highest possible result. Rather they were focused on gaining the required skill set for their careers and acquiring knowledge. As such, their marks were not always as high as those who perhaps were focused primarily on results.

4.3.9 Summary

Throughout the process of open and axial coding, selective coding was also employed. Selective coding involves refining the framework, ensuring only the key concepts and relationships remain, and pulling together the major categories. Figure 2 below is an illustration of the refined framework.

The refined theoretical framework shows that various environmental contextual impediments (gender stereotypes, historical inequities, language barriers and financial need) impact and influence the inter-related impediments of lack of prior programming experience, poor communication skills, teamwork difficulties and approach to academic work (time management, attitudes toward work, and alternative perceptions of success). These academic impediments have a direct influence on student academic success as reflected by marks. The environmental context may be thought of as being the core category, as it influences all other categories. The observations highlight the difficulties of dealing with poor academic performance in countries such as South Africa where many of the impediments are embedded in the environmental context, outside the direct control of educators. Issues, such as historical inequities, societal stereotypes, and poor quality schooling require multi-pronged coordinated interventions encompassing diverse stakeholders, of which higher education is but one.

5 OVERALL DISCUSSION AND IMPLICATIONS

The refined theoretical framework in Figure 2 bears some similarity to that initially developed through literature review in Figure 1. In the latter framework several impediments (gender stereotypes, historical disadvantage, language barriers and financial need) are recognized as being contextual having an indirect impact on academic success (in terms of marks) through the other more academic-oriented impediments. For instance, historical inequities (a contextual factor) indirectly impacts academic success (in terms of marks) through factors such as lack of prior programming experience, poor writing skills (e.g., as a result of poor schooling), etc. Where there is financial need, some may have to devote a large portion of their time to working, which means insufficient time is spent on mastering skills such as programming (time management). The academic impediments directly impact on student performance and hence academic success in terms of marks. The revised framework of Figure 2 thus embodies all of the impediments identified in Figure 1.

Some of the original concepts from Figure 1 have been redefined. For example cultural values were identified in the initial framework as a key impediment. Based upon the analysis of data in this study, which takes cognizance of the South African environment, it was recognized that it was not culture per se, but historical inequities that presented as an impediment. An additional category labelled *Approach to Academic Work* was also identified. The category entails concepts such as time management, attitudes towards work, and alternative perceptions of success.

Many of the issues identified are generic, and not necessarily unique to the IS discipline. Nevertheless, the richness provided by qualitative data analysis helps to illustrate how these factors manifest in the context of an IS degree programme. The framework is valuable for IS departments as it identifies key environmental and academic impediments that need to be addressed to improve academic performance of students. It is of concern that gender stereotypes are still so prevalent. Much needs to be done to change societal perceptions around these stereotypes. Also better understanding of the IS discipline to clarify how it differs from other computing disciplines needs to be engendered in society. The strong influence of prior programming experience raises questions as to whether programming is being too strongly emphasized in IS degree programmes, or suggests that the manner in which it is being taught at university is possibly flawed.

6 CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

This paper has presented an exploratory study investigating impediments to academic success in an IS degree programme. Key environmental and aca-

ademic impediments were identified, and relationships between them elucidated. Environmental contextual factors were found to indirectly impact on academic success through impediments such as poor communication skills, lack of prior programming experience, team work difficulties and approach to academic work. Future research can investigate what teaching and learning strategies can be or are being used to mitigate the effects of these impediments on student success.

The original study gathered both qualitative and quantitative data. Due to limitations in the quantitative data gathering and analysis, concerning operationalisation of constructs and lack of validity of the measuring instrument the quantitative aspect was not reported on in this paper. Future research that wishes to employ a mixed method approach should ensure that the tenets of good qualitative as well as quantitative research are followed.

The research employed a combined deductive and inductive approach. The deductive element was evident in that an initial theoretical framework was developed from literature to guide the inquiry. The inductive element was exemplified by the fact that an emergent grounded theory approach was used to analyse the resultant data. The initial framework to some extent restricted the scope of the research, as it served as a guide for interview questions. The concepts that emerged through data analysis, although inductively derived from the data, still closely resembled those in the initial framework. To develop a more encompassing and theoretically saturated framework of impediments, a study that follows classical grounded theory methodology as espoused by Glaser and Strauss [35] should be employed.

Future research can also test and extend the framework by focusing on one major category for each investigation (e.g., teamwork difficulties) and examining the concepts in each category in greater depth. A positivistic, hypothetico-deductive approach may also be adopted to test the framework. Rigorous measurement instruments for the major concepts could be developed and the collected data analysed using sophisticated statistical techniques.

Academic success was defined very narrowly in terms of marks awarded to students. Future research might expand this definition of success to encompass all aspects of this multi-faceted concept. Conflicting views and their resultant effects can then more clearly be elucidated.

The study has focused primarily on the views of students. A broader holistic picture can be developed by obtaining views of secondary and tertiary-level IS educators and administrators. The study was based on an IS degree programme at a single university. Comparative studies could be conducted to establish whether the same set of factors emerge by repeating the study at other universities, and in different countries.

Rather than look at impediments, future studies might also examine enablers and seek to understand how certain students succeed despite facing major en-

vironmental and academic impediments.

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