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1	Qualifications	Matric , MCSE, MCTS, MCITP, A+ and N+,VOIP, CCNA, MS SQL server, IIS, Active directory, Microsoft SharePoint, Small Business Server 2003/2011.
2	Experience	Knowledge of accounting practices/systems, customer service experience, strong experience in network fundamentals, have a basic understanding of MSSQL and other SQL variants, extensive experience in Windows Server operating systems, effective problem resolution and troubleshooting /root cause analyses skills and experience.
3	Expectations	Client liaison, working overtime, pedantic and confident individual to fill this client interfacing role, be able to work in a pressured environment.
4	<b>Skills</b> <b>Soft Skills</b> • Problem solving and critical thinking	Guide users on ICT related issues, configuration and trouble shooting, problem resolution skills, problem solving skills
	Goal Driven	Passionate about IT and customer service, self-starter who can perform duties without constant supervision, planning skills, demonstrate sound work ethics.
	Adaptability and competency	Have flexibility and excellent business ethics, to learn and know company products by heart, ability to work in a multi-cultural environment.
	Teamwork and collaboration	and verbal communication skills, to communicate at all levels, enable edge transfer between team
	Legal	d credit record, adherence to g procedures.
	Critical observation	etail, high attention to detail, show ical, process driven.
	Conflict resolution and nego	ing relationships with direct team, root cause analysis skills and experience
	<b>Hard Skills</b> • Administrative	Perform daily administrative tasks and provide feedback to management, record keeping and recording of relevant activities, administering Email & Web access.
	Financial	Understanding of the financial services industry.
	Hardware	Network configuration, networking and internetworking, troubleshooting, diagnose hardware faults and arrange repairs with the service providers.
	Software	Linux and experience with VOIP and IP technologies, troubleshooting, system maintenance and anti-virus software maintenance, testing and piloting of new IS products with team.



## 5.9 DISCUSSION OF PHASE I FINDINGS

The findings support the literature to an extent, yet also introduce some new underlying perspectives on graduate socialisation from the PGD ICT AIM programme. Over their two week exposure, the graduates were equipped with necessary practitioner skills, which are different

from the skills they use as students at a university level. This would concur with the sentiments of Taylor (2012), for industry and academic collaboration not only teaches graduates the necessary skills but enlightens them about career long competencies and attributes that they will make use of inside and out of their work place.

The PGD ICT AIM graduates had to present themselves professionally even in a warehouse type environment. For all the graduates this was the first time they had signed a contract and interacted with the IT industry. This meant that they had to come in early, conduct themselves professionally and respect company policies. After rotating through the sectors of the refurbishing company, they claimed to have the skills and ability to open up their own IT desktop and laptop refurbishing company.

Findings show that the requirements from industry and government are partly different. Their induction processes also have slight differences. On the one hand, industry organizations are revenue driven, meaning that they want the individuals coming in to have prior experience and add value immediately, even if it is for a graduate position. Because of the revenue driven approach, the refurbishing company introduced the graduates through more individualised tactics, in order to maximise their value.

There were instances of institutionalised integration in the early stages of exposure. Graduates collaborated when needed. This is similar to the study by Handzic & Chaimungkalanont (2004) who found that informal means of socialisation can have a powerful effect if done properly. The researcher found that the process the refurbishing company took was more of a structured chaos and worked for this particular group of graduates. In addition, the study of Saks et al. (2007) underlines the importance of role orientation for graduates. If the graduate knows and understands their role within the organisation, their PC would become solidified. Whether the structured chaos was planned or not is to be further examined.

On the other hand, government do not necessarily have the same problem as industry because of the sheer size of the ICT sector in South Africa. Government are the biggest ICT spend in the country and, based on the data, can afford (or are able) to train graduates until such time as they are ready to add value, since while they are gaining the relevant skills, other people are there to do the work.

## 5.10 PHASE II FINDINGS AND DISCUSSIONS

The dynamic modelling process from Sterman (2000) was used to develop the system dynamics model. In this subsection, the CLD's are modelled from the qualitative data from phase I. The CLD's were modelled using two major questions; "what influences this part?" and "which other parts of the system does this part influence?". In order to keep the model simple, the variables that were expressed frequently in phase I were modelled. This was in an effort to visualise and represent the complex, in-depth, yet easy to understand model, while showing the interactions in the socialisation system, in order to represent an in depth, but simple illustration of the socialisation process including all the stakeholders.

It is important to mention here that some interesting connections were being developed from both the literature and phase I of the data analysis. For instance, graduates are incorporated into the organisation and socialised through learning processes until such a point that they become internal employees. Through this exposure, they learn the various competencies to bridge the skill-expectations gap, and, in the bigger picture, increase the labour market. The variables inside the system are drawn in the CLD diagrams and then migrated into stock and flow diagrams, finally quantified and simulated.

## 5.11 THE SOCIALISATION HIGH LEVEL VIEW

The problem definition in this study already hints at 4 variables for constructing the CLD's, namely, IT is service driven, academic graduate supply, IT industry and government skills demand plus graduate socialisation. Graduate socialisation is placed inside the system as this is not only the goal of the system, but as well the only hint that is part of at least one casual loop.

The variable IT is service driven, and is the only variable from the qualitative analysis in phase I that has a dotted connector. However, the CLD's that were formed used both literature and data from the analysis. In this case, the causal link is assumed to have both a positive and negative polarity towards industry expectations as the field of IT is seen as an enabler to other disciplines. For example, economists and accountants would not be unable to do their job if their

infrastructure is offline or the computer hardware or software is corrupted. For instance, the example could equate to industry increasing expectations, and forcing graduates into working in a pressured environment.

This leads them to (a) understanding business processes, (b) understanding the financial services industry and (c) increasing their resourcefulness. Being resourceful leads graduates into becoming client liaisons and increases chances of them working less overtime, ultimately decreasing their chances of working in a pressured environment. This process describes the balancing loop B1 in figure 20. Working overtime could, however, have a positive effect on the potential to develop if graduates put the socialisation process to good use. Adversely, industry expectations also have a positive influence on (I) goal driven graduates, (II) skills but may have a positive or negative influence on (III) graduate's potential to develop. As graduates may tend to apply themselves more when industry requires high deliverables from them, or sometimes, they may not handle the pressure and end up folding. Industry expectations could directly increase their chances of becoming client liaisons and decrease their chances of working overtime.

The second balancing loop B2 is created between these variables as well. There is cause and effect to resourcefulness, client liaison, industry expectations, goal driven graduates, working overtime and working in pressured environment. Eventually, after becoming a client liaison, the graduate feels responsible for upholding these high standards. In turn, upcoming graduates go through the same process, causing the first reinforcing loop R1. The 2<sup>nd</sup> reinforcing loop R2 is also formed from the relationship between industry expectations, working in pressured environment and resourcefulness. Although academic graduate supply, IT industry and government skills demand also have dotted connectors, they are mapped from literature and not from the qualitative analysis. Similarly to the CLD's formed from the IT as service driven hint, both literature and the analysis data were used to form the CLD's for these two hints.



It is well known that academia draw up the curriculum, generate assessments and create a learning environment. This should be an environment that is suited to provide students with the tools and techniques to develop the necessary skills in order to become graduates (Wells et al. 2009). Therefore, academic graduate supply is assumed to have a positive or negative polarity towards level of qualification. For example, an introduction to 6 variables at a student level would equip graduates in the future. [The variables are stated from (I-VI) below.] These need only be at an introductory level, as moving to the working world is in a different context and requirements would slightly change.

The high level figure 20 shows that (I) the level of qualification have delayed positive or negative polarity on legal knowledge, as IT graduates may study legal practices in their own spare time out of pure interest, or due to what they read and hear about demand from the labour market in South Africa. Conversely, graduates may not favour a legal subject as an elective, simply because they are not interested. However, legal knowledge has a positive influence on conflict resolution and negotiation, which consequently increases graduate socialisation and leads back again to an increased level of legal knowledge. This causes the 3<sup>rd</sup> reinforcing loop R3 in the model.

Additionally, legal knowledge increases the graduate's (II) adherence to standards and procedures and this eventually leads to graduate socialisation. As mentioned before, graduate socialisation had a positive influence on legal knowledge and the relationship between these variables points to the 4<sup>th</sup> reinforcing loop R4 in the figure. For the graduates to adhere to the standards and procedures, it is important for them to understand the organisations value system and culture. This culture in turn shows graduates how an organisation (1) tackles problem solving and (2) applies its critical thinking skills.

The role of academia is to provide a sustained level of qualified ICT graduates that can add to the labour market in an attempt to decrease the ICT skills gap (Breytenbach & de Villiers 2012). Through the years of theoretical training at university, academia should include aspects that focus on building (III) analytical and (IV) logical thinking to the under-graduate's diet.

These two attributes, although delayed, require repetition and consistency to master, but are capable of having a direct impact on decreasing working overtime. Applying these two attributes

to practice may separate and increase the chances of completing work much quicker as graduates learn how to use different techniques. This might eventually lead graduates into becoming client liaisons.

In part, analytical skills influence business and letter writing knowledge as graduates break whole tasks into separate manageable tasks. Once the graduates start to understand the business and letter writing knowledge in industry, it increases their chances of gaining experience and ultimately increasing graduate socialisation. However, a lack of practical IT exposure adversely leads a decrease in business and letter writing knowledge, conflict resolution and negotiation, critical observation, legal knowledge and decreases graduate socialisation. The (V) variable that is positively influenced by the level of qualification is a delayed level of critical observation. Similarly to analytical and logical thinking, gaining these attributes takes practice, consistency and patience. The more observant graduates are, the better their chances are of becoming client liaisons. The (VI) variable that is positively influenced by level of qualification is skills. However, skills will be discussed as a variable under the IT industry and government skills demand hint.

Due the volatile nature of the economic environment (Daud et al. 2011), IT industry and government skills demand is given the premise of having a positive or negative polarity to industry expectations. For example, total skills often include hard and soft skills. There are two variables in figure 20 that positively influence soft skills. These are (1) problem solving and critical thinking skills and (2) adaptability and competency.

Problem solving and critical thinking skills also have a positive influence on innovation, and this leads to an increased effect of R&D which ultimately leads back to increasing innovation. This back and forth casual loop is the basis for the 5<sup>th</sup> reinforcing loop R5. The increase in innovation has now prepared the graduate, and he/she will likely decrease overtime. Effects of R&D cause a positive influence on the graduate's critical acumen, which can be used when dealing with reasoning and understanding. Critical acumen increases the graduate's ability to demonstrate abilities, show results, or something tangible, which then leads to positively influencing potential to develop. Potential to develop is not part of any CLD because potential was not seen as having a direct influence to any result in the model. Potential remains potential until it is put to use.

Adaptability and competency may have a positive influence on ability to work in multi-cultural environments. Without this, graduates will struggle to communicate and will not impact and add value as they would like to. Ability to work in multi-cultural environments may have a positive or negative influence on work ethic. If positive, the relationship will create the 6<sup>th</sup> reinforcing loop R6. If negative, the effect will create the 3<sup>nd</sup> balancing loop of the figure B3. In addition, the work ethic that was produced from these loops is caused by the passion for IT. Passionate IT graduates would in turn not mind putting in the overtime hours; passion also increases the numbers of goal driven graduates available.

Lastly, hard skills are influenced by a combination of technical and administrative skills. Eventually both soft and hard skills influence total skills positively, and this finally increases graduate ability to socialise in the work place. If graduates have these coming out of the university, it may help reduce the expectations from industry.

## 5.12 SYSTEM DYNAMICS - DRILLING DEEPER



Subsection 5.9 discussed the full socialisation high level view. In this subsection the endogenous and exogenous variable for the stock and flow figures were extracted. In order to focus on the research question, only key variables were included. Parts of the 6 reinforcing and 3 balancing loops were also included; see appendix III for simple presentation of loops.

### 5.12.1 *SOCIALISATION KEY VARIABLES*

As stated in the objectives, the purpose of this study was to not solve the problem, but rather to give an in-depth understanding of the environment that graduates will face when entering the working environment. The structure of this model includes the four hints in the socialisation system: service driven IT , academic graduate supply, IT industry and government skills demand and graduate socialisation.

Table 13: Key variables from the socialisation model

Endogenous	Exogenous	Excluded
Ability to work in multi-cultured environments	Administrative skills	Analytical thinking
Adaptability and competency	Demonstrate abilities, show results or something tangible	Business and letter writing knowledge
Adherence to standards and procedures	Passion for IT	Conflict resolution and negotiation
Effects of research and development	Potential to develop	Critical acumen
Goal driven graduates	Technical skills	Critical observation
Graduate level of experience	Understand business processes	Critical thinking
Graduate Socialisation	Understand financial services industry	Hard skills
Industry expectations	Understand organisation values system and culture	Soft skills
Innovation		Client liaison
Legal knowledge		
Level of qualification		
Problem solving and critical thinking		
Resourcefulness		
Skills		
Work ethic		
Work in pressured environment		
Working overtime		



### 5.12.2 STOCK AND FLOW MODELS WITH SIMULATION

This subsection uses stock and flow modelling techniques to draw up the socialisation simulation. Writing a stock and flow model goes a step further from the CLDs in figure 20. It allows the modeller to display more than just the important parts of the system and how they relate. It empowers the modeller to precisely quantify all parts of the key variables in the system and the connections between them using data and simple mathematical equations (Sterman 2000). The figures can be translated directly into mathematical equations because the stocks and flows have precisely defined semantics. These figures can be solved numerically using simulation software. Ceteris paribus thesis figures show an in-depth simulation of how the system might behave overtime (Jackson 2003).

### 5.13 FORMULATING THE MODEL

For more detailed elaboration, figure 20 is turned into a stock and flow model. The model consists of 16 endogenous variables: ability to work in multi-cultured environment (dmnl), adaptability and competency (dmnl), Adherence to standards and procedures (dmnl), Client liaison (dmnl), Effects of research and development (dmnl), Working overtime (dmnl), Work in pressured environment (dmnl) , Work ethic (dmnl) , Skills (dmnl) , Resourcefulness (dmnl) , Problem solving and critical thinking (dmnl), Level of qualification (dmnl), Legal knowledge innovation (dmnl), Graduate Socialisation Industry expectations (dmnl), Graduate level of experience (dmnl), Goal driven graduates (dmnl). The variables are placed at dmnl because they are subject to change at any time.

The model starts with the two most important parts, viz. graduate level of experience and graduate socialisation. In this case the graduate level of experience will be 0, as only graduates coming straight out of a university setting were chosen. Both of these variables accumulate and/or deplete over time, therefore stocks are used to model them. The 15 students from the PGD ICT AIM course are used as an illustration; as a result the maximum number of graduate socialisation will amount to 15. The initial number will be 0, this simply means that no graduate was socialised at the beginning of the course.

There is a flow between these two stocks when graduates with no experience enter the IT industry or government exposure rate. Through exposure they move into the graduate socialisation stock. The flow rate is controlled by a valve attached to the flow pipe, named IT industry and government exposure rate.

In continuation, now that the major parts of the stock and flow model are discussed, the factors that influence the IT industry and government exposure rate are discussed. The first such factor is goal driven graduates. To make the model neat and easy to understand, it is assumed that the number of goal driven graduates is a constant at 15. This is because organisational socialisation is not possible without some sort of effort from graduates. Graduates need to be able to gauge what they would like out of the IT exposure. The second factor is industry expectations. As mentioned before in phase I, there are reciprocal expectations between industry and graduates. Both enter into the psychological contract for different reasons (Silverthorne 2004).

Industry expectations are factors that would make it worthwhile when hiring the graduate. These factors include working overtime, work ethic, resourcefulness, working in pressured environment, adaptability and competency, the ability to work in multi-cultured environments and adherence to standards and procedures. These variables were part of the endogenous variables included under the key variables for the socialisation model. The third factor that influences IT industry and government exposure rate is skills. The level of skills influences the rate of exposure. The skills factor itself is directly influenced by 4 other variables, namely, legal knowledge, effects of research and development, innovation and level of qualification. Other skills sets are generic and would simply be seen as a duplicate to other literature. These 3 factors may be different for other disciplines, but for IT these are the assumptions that are made for this study.

*Table 14:* Variable, stock value, unit of measurement, min value and maximum value variables

<b>Variables</b>	<b>Stock value</b>	<b>Unit of measurement</b>	<b>Min Value</b>	<b>Maximum</b>
Graduate Socialisation	0	Dimensionless	1	15
Graduate level of experience	0	Dimensionless	0	0
goal driven graduates	15	Dimensionless	1	Endless
working overtime	0.25	Dimensionless	0	100
Working in pressured environment	0.25	Dimensionless	0	100
work ethic	0.30	Dimensionless	0	100
Adaptability and competency	0.25	Dimensionless	0	100
The ability to work in multi-cultured environments	0.15	Dimensionless	0	100
resourcefulness	0.30	Dimensionless	0	100
Adherence to standards and procedures	0.25	Dimensionless	0	100
Legal knowledge	0.60	Dimensionless	0	100
effects of research and development	0.50	Dimensionless	0	100
Innovation	0.50	Dimensionless	0	100
level of qualification	0.45	Dimensionless	0	100

The simulation figures are based on literature and phase I. This is because when modelling the simulation system, it needs to be consistent with the mental model at all times. Figures that can be easily calculated by any reader were chosen. The numbers in table 14 are changeable in the simulation based on the rate of the variable. Initial simulation is run to show the behaviour of graduate simulation over time.

### 5.14 RESULTS OF SIMULATION

The first rounds of simulation were done with a reference mode which displays the present circumstances, the Synthesim simulation attribute in Vensim, in order to simulate the interactivity between the variables in the model. The information in this first simulation may seem like a best guess, but experience and research shows that the graph matches reality very well.

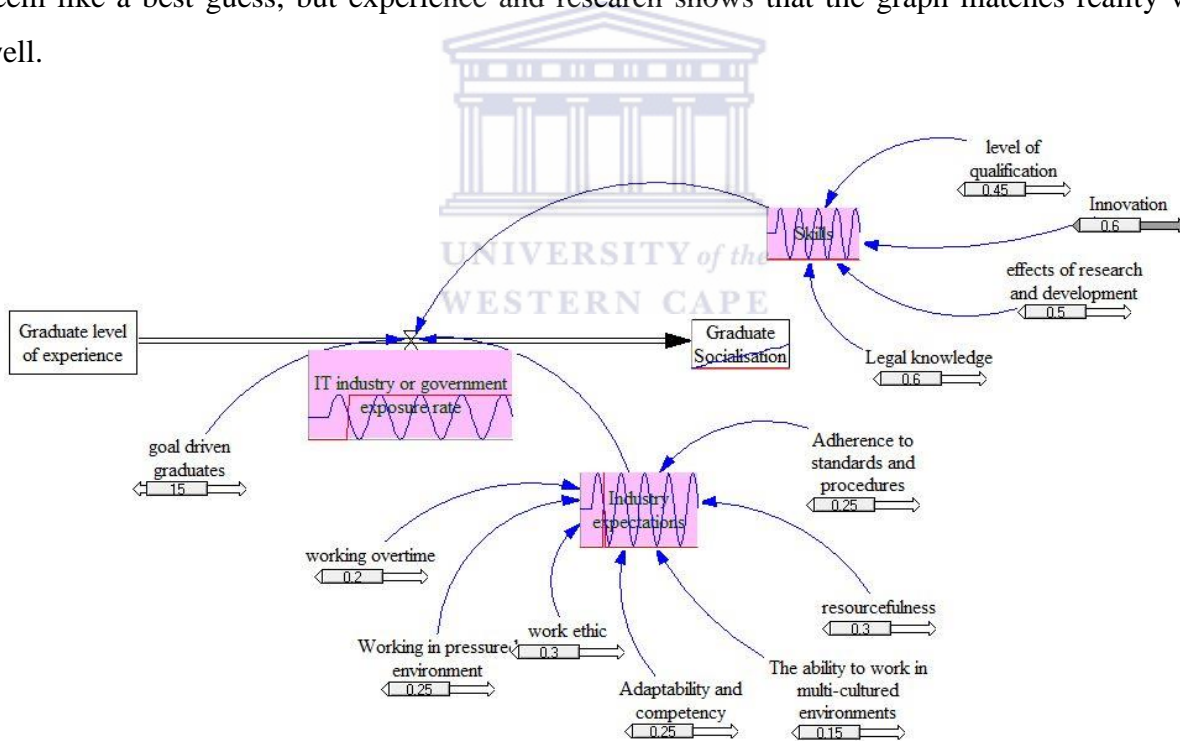


Figure 21. First round of simulation

The round shows a positive influence on all the effects from the auxiliary variables to the levels and then to the stocks. The 3 highlighted levels ‘IT industry or government exposure rate’, ‘industry expectations’ and ‘skills’ display a sine wave that represents the smooth repetitive

oscillation. The wave goes up as the auxiliary variables influencing them to increase. In turn this leads to graduate socialisation increasing incrementally over time. If the auxiliary variables cause a decreasing effect on the 3 levels, then graduate socialisation decreases.

Universities test memory and industry tests problem solving and decision making; knowledge is created by individuals interacting, but organisations play a major role in this process. The skills shortage in the IT sector means that graduates are open to a world of opportunity. By using the tactics, the organisation exposes the newcomer to an environment of knowledge sharing.

Graduates are exposed to group work, peer mentoring, positive feedback, time controlled tasks etcetera. This is all for the purpose of encouraging knowledge sharing in and amongst the organisation in order for the organisation to become competitive in industry. However, Graduates need to want to work at the organisation. The nature of reciprocity should not be taken lightly. This simulation only shows the first round. Corrections and more causal links need to be included adjusted to prepare for the second round.

**Equations for socialisation simulation model**

**Initial:**

Graduate level of experience=INITIAL(IT industry or government exposure rate)

Goal driven graduates = 15

**Constants:**

working overtime = 0.2

Working in pressured environment = 0.25

work ethic = 0.3

Adaptability and competency = 0.25

"The ability to work in multi-cultured environments" = 0.15

Resourcefulness = 0.15

Adherence to standards and procedures = 0.25

Legal knowledge = 0.6

effects of research and development = 0.5

Innovation = 0.2

level of qualification 0.45

**LEVELS:**

IT industry or government exposure rate = INTEG (IT industry or government exposure rate) + Initial value ( goal driven graduates + Industry expectations + Skills)

<b>Equations for socialisation simulation model</b>
<p>Graduate Socialisation = INTEG (IT industry or government exposure rate) initial value = 0</p> <p><b>Normal Auxiliary:</b></p> <p>Skills= effects of research and development + Innovation + Legal knowledge + level of qualification</p> <p>Industry expectations = Adaptability and competency + Adherence to standards and procedures+ resourcefulness + "The ability to work in multi-cultured environments" + work ethic + Working in pressured environment + working overtime</p>

Figure 22. Equation for socialisation model

### 5.15 MODEL VALIDATION

This subsection presents a test for model validation and validity. The main purpose of this subsection is to show the confidence through certain steps to create a sound and useful model. It employs three sets of tests, namely:

- Tests for model structure
- Test of model behaviour
- Tests of policy implementation



Table 15: Tests for model validation and validity (Forrester & Senge 1979)

<b>Tests for model structure</b>	
Structure verification	Is the model structure comparable to the structure of reality?
Parameter verification	Do the parameters (constants) apply to the observations in the real system?
Extreme conditions	Are the extreme conditions appropriate to the model and does it permit extreme levels (state variable in the model)?
Boundary adequacy	Does the model include all structural relationships to please the model?
Dimensional consistency	Can the model be scalable to be dimensionally consistent; does the model include parameters that have little or no real life meaning?
<b>Tests of model behaviour</b>	
Behaviour reproduction	How well does the model behave to predict the future behaviour of the real system
<b>Tests of policy implications</b>	
Changed behaviour prediction	How well will the system behave to a change if a governing policy is altered?

By testing, validating and verifying the model, authors mean to compare the model with empirical reality for purposes of refuting or correcting the model (Forrester & Senge 1979).

Model validation involves external participants that were not part of the initial model building. Externals need to have the same mental image towards the model as the modeller had for the structure, behaviour and implications in order to be a success.

The models figure 20 and 21 were put through several tests to confirm the validity of the model.

- a) Is the model structure comparable to the structure of reality?

The structure witnessed in this figure 20 and 21 represents reality as closely as possible from a case study perspective. The model was developed in a way that could leave opportunity for additional variables.

- b) Do the parameters (constants) apply to the observations in the real system?

The parameters of the system do apply to the constants in the system but the synthesim was developed to change the inputs of the system at any time. For example, if goal driven graduates increased from 15 to 30.

- c) Are the extreme conditions appropriate to the model and does it permit extreme levels (state variable in the model)?

The likely chance that extreme conditions will be seen in the socialisation model is highly likely. Therefore the model catered for these changes in the all the stock, levels and auxiliary variables.

- d) Does the model include all structural relationships to satisfy the model?

At a closer inspection the boundary of the model could have been expanded to include other disciplines, however, this was not the aim of the study, and the boundary showed the structural relationships displayed in the figure.

- e) Can the model be scalable to be dimensionally consistent; does the model include parameters that have little or no real life meaning?

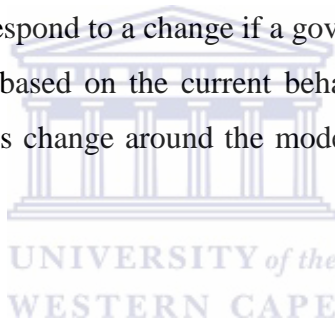
Along with the behaviour reproduction, this was perhaps the most important test for the model as the nature of IT is forever changing dimensions, and the equations for the dimensions had to be consistent, with or without parameters that have meaning or no meaning in real life.

- f) How well does the model behave to predict the future behaviour of the real system?

This is the most important step in the validation and verification of the model. This was the purpose of the model, to show the behaviour onetime and show the hidden factors that graduates will need in industry. The behaviour would have been more stable if the number of graduates had been more; however, it displays the behaviour as best even when graduates are few.

- g) How well will the system respond to a change if a governing policy is altered?

The model was generated based on the current behaviour of the system. The first run showed that even if policies change around the model, the model itself will rewrap and change accordingly.



## 5.16 PROPOSITIONS

With regard to the research questions, propositions were compiled for each.

### *PROPOSITION 1*

This study has shown the causal relationship that Non-IT graduates can become IT graduates. However, only some of these graduates become successful IT practitioners. Future studies should look at passion, work-ethic, adaptability, logic, and written and verbal skills.

### *PROPOSITION 2*

The study tested the second research question and came to a promising assumption. It demonstrated that IT graduates are genuinely interested in the working world, because of their

enthusiasm and eagerness to put theory into practice. However, this is not reflected in the initial interactions with the industry. Early difficulties stunt confidence and give the impression that there is a disinterest from the graduates. Future studies should look at making the initial interaction much friendlier.

*PROPOSITION 3*

Graduates coming into industry are seldom able to add value immediately. This study shown that industry does hire based on their requirements but it is not always consistent. Industry and governmental agencies have different requirements ranging from personal to technical. However, from the single case in this study there were graduates that displayed these abilities but then still remained jobless. Future studies should look at the consistency of industry and government requirements overtime.

*PROPOSITION 4*

This study developed a model for advising what graduates need to learn in order to fit into the competitive IT environment. The model was able to incorporate the concepts from table 9 and 12 to develop the CLD and Stock and flow model.

However, some elements were excluded from this research in order to show simplicity and not confuse the reader. Future research should use these excluded variables to show more causal links that could bridge the IT skill-expectations gap.

In addition, the study revealed the first round of simulations. For the second round exogenous and excluded variables should be included for the second round of simulations, in order to compare results.

## 5.17 CHAPTER SUMMARY

This chapter discussed the findings and discussions from phase I and phase II of the data analysis. It discussed the psychological contract, organisational socialisation tactics and the knowledge creation in the qualitative analysis part I. Thereafter, part II was the system dynamics CLD model, highlighting the major interaction between the variables and then quantifying and simulation the endogenous variables in a stock and flow model to show the behaviour of socialisation overtime. Validation and verification tests to build confidence were listed in order to reproduce the model in future. Finally, propositions for the research questions were presented.



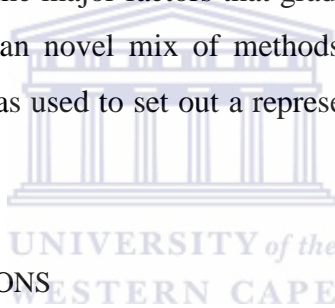
## CHAPTER 6 CONCLUSION

### 6.1 INTRODUCTION

This chapter summarises the major findings and theoretical implications of graduate exposure to the IT industry. It provides the, design contribution, research contributions, limitations of study, direction for future research and the final parting advice the study.

### 6.2 DESIGN CONTRIBUTION

This thesis was designed to study the major factors that graduates are lacking to get a job in the working world. The study used an novel mix of methods and a stringent system dynamics methodology. The methodology was used to set out a representation of the real world as closely as possible.



### 6.3 RESEARCH CONTRIBUTIONS

This study was the first to explicitly express socialisation tactics and system dynamics as well as psychological contract and system dynamics methodology. The element that made the most contribution to the thesis is that graduates are willing and excited about the prospect of the real working world.

Graduates develop a strong psychological contract even for a few weeks of working exposure. They would like to turn the theory from academia into practice. IT is an inviting field, and graduates were inspired to start up their own refurbishing companies from the skills that they learnt.

However, graduates need to learn that organisations reward hard work and increase tenure based on passion, innovation, work ethic, problem solving, critical thinking abilities, adaptability,

competency, critical observation, legal knowledge, teamwork, collaboration, conflict resolution and negotiation.

The IT refurbishing company examined in this study used both institutional and individual organisational tactics to integrate the graduates. For example, collective, individual, formal, informal, sequential, fixed, and serial tactics were noticed. The negative, character crushing route from random, variable, disjunctive and divestiture was not seen in this study, as well as investiture. In terms of knowledge creation, both the IT industry and governmental agencies use similar types of socialisation and integration methods to manage knowledge in the organisation.

This study combined three theories together, namely: the psychological contract, organisational socialisation tactics and the knowledge creation theory. The psychological contract and organisational socialisation tactics theories are mainly from a human resources background but when used together with the knowledge creation theory in the information technology context they provide great contribution to the skill-expectations gap.

Each of these theories have successfully been used to test newcomer adjustment and integration in industry (Silverthorne 2004) tacit knowledge has been transferred successfully from graduates to seasoned employees. Literature has not shown the combination of these three theories before. This is the first time they have been used together.

#### 6.4 LIMITATIONS OF THE STUDY

This study only looked at the IT skills-expectations gap to an extent. The study was limited to one case, specifically concentrating on the needs for Infrastructure and Application Management. Further limitations were the target population. The original number of graduates was 25. However, priorities and personal requirements decreased the size to 15 graduates. An increased number of interviews would have been convenient as well; nevertheless, most organisations were too busy or were simply not interested.

In addition, data from the online job adverts were introduced; however, not all the variables could be modelled as the model would become too complex and would dilute the main research question in the study. These excluded variables may have generated additional links that the

system dynamics modelling may have related; however, this would complicate the model. These may possibly be further avenues for investigation. The study was restricted to first round results from the simulation.

## 6.5 DIRECTIONS FOR FUTURE RESEARCH

Due to the complex and dynamic nature of this research, the combination of the three theories and system dynamics sets an important contribution by providing a good starting point for introducing a number of new research avenues for future investigation.

Organisational socialisation and graduate integration, including the skill-expectations gap, can be greatly extended upon. In terms of the system dynamics modelling and simulation, academia and organisations should think of the causal analysis, why graduates need these skills, as opposed to functional analysis, which purely aims to state what graduates need.

Researchers should look into the behaviour from the interviews as well since graduates reach an interview and, in most cases, a potential employer gives them 30 minutes to assess fit. 30 minutes is simply not enough time for the graduate to fully display his/her skills set. Furthermore, there is also a lot of power dynamics in supply of jobs from industry and government. For example, industry advertises the job post fully knowing that they already have the post filled, or they might already have a suitable candidate in place. Modelling the corruption and transparency of supply and demand from academia to industry could be a fruitful avenue of investigation. Directions for second round simulations should include more variables to compare results overtime through the years to see how things change.

## 6.6 IN CONCLUSION

The research questions in this study were one part of the greater problem. The bigger problem set out to answer deeper questions such as:

1. Is it possible to convert graduates from Non-IT backgrounds into IT graduates, and then IT practitioners, within a year?
2. Is it easier to teach the graduate about tasks or is it easier to do it with the graduate?

3. Would graduates be able to go into the working environment and apply what they have learnt from academia?
4. Would the program be a success, and could it be duplicated in years to come?

No single one of the research questions, nor all of them together, can solve the IT skills-expectations gap. It takes time, effort, collaboration and constant feedback from Industry, government and academia. It requires collaboration though criticism and advice for improvement from all parties concerned. Interested parties seldom need coercion; therefore the transition to increase the skilled IT labour market by Academia converting Non-IT graduates, is a worthwhile exercise, if a story is told. This study tells such a story.



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## APPENDICES

## APPENDIX I : SYSTEM DYNAMICS MODELLING AND SIMULATION SOFTWARE TOOLS

Table 16: System dynamics Simulation software tools Extended from Rizolli (2005)

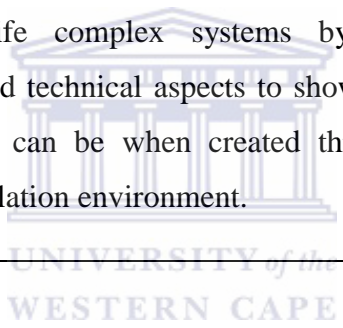
No	Software package	Description	Open source/ Commercial/ Free Software
1	AnyLogic	Supports managerial process visualization. It allows for strategic planning and optimisation. Developed by XJ technologies the tool proposes to support a wide range of modelling approaches.	Commercial
2	ASCEND	Developed by the ASCEND team this open source software can solve numeric linear and non-linear problems.	Open Source
3	Consideo	Advertised by the developers Consideo GmbH as a tool which makes planning and decision making easier, this software incorporates not only SD but as well other strategic decision making tools such as concept maps for seamless planning and decision making.	Commercial
4	Arena	A product of Rockwell software the package works through visual basics to allow the modelling of business process engineering in industries such as manufacturing.	Commercial
5	DYNAMO	One of the oldest SD modelling and simulation software packages. Created in 1986 the historical suite	Commercial

Appendixes

		is no longer distributed commercially.	
6	Forio Simulations	Forio is an online web based simulation software for system dynamics practices.	Commercial
7	Insight Maker	Insight maker is a multi-feature, multi-user tool that operates directly inside the web browser.	Open source
8	iThink	Created by IEEE Systems along with Stella, this allows for simulation and analysis from SD mapping for business rather than education (Academia).	Commercial
9	JDynSim	Is a more programming targeted simulation tool, which works in Java for System dynamics frameworks.	General Public License. (GPL)
10	Mapsim	Open source software created by Sourceforge. Mapsim is an engine for system dynamics which works across multiple Operating systems.	GNU Library or Lesser General Public License version 2.0 (LGPLv2)
11	MyStrategy	A tool for strategy dynamics, Mystrategy is used as a substitute for the conventional spread sheets. Allows users to be flexible between modelling the business environment, in other words clients, increasing revenue, competitors and suppliers.	Commercial
12	NetLOGO	Although System dynamics is used in NetLOGO as a secondary feature the package is a multi-agent and is programmable. Programmable for different modelling environments. For instance academia, between graduates, teachers and researchers all over the world.	GPLv2

13	OptiSim	Software license is free for educational use on this web based tool educators can use traditional system dynamics software to model their setting.	Commercial
14	Powersim Studio	Powersim software provides a Software development kit (SDK), produced by Powersim Software. The kit allows for modelling a whole range of problems and executes it through simulation and modelling.	Commercial
15	Simile	Simile was created by simulistics developed and sells Simile as a commercial system dynamics and object based modelling and simulation tool. Used in life sciences and environmental affairs.	Commercial
16	Simulink	This software created by Mathworks is incorporated with MATLAB for complex modelling and simulation of which results are taken and expanded upon using block libraries, project management tools, programming tools. For instance, C and C++ languages.	Commercial
17	Sphinx SD Tools	Created by the same developers as mapsim, Sphinx SD tools are a collection of tools to create the SD environment. With features such like multi-project approach and textual system dynamics model editor amongst others is included in this free software.	Apache License, Version 2.0
19	Stella	Similar to ithink, Stella is produced by IEEE systems; however Stella is aimed at Academia and research rather than the dynamic business environment.	Commercial

20	SystemDynamics	Another product developed by Sourceforge, this web-based tool provides the fewest features as compared to its competition. It's used to execute SD models through java application, visualization and execution.	GPL
21	TRUE (Temporal Reasoning Universal Elaboration)	Possibly the most advanced SD simulation package available with features like 3D modelling, 4D virtual prototyping, TRUE sets itself apart. Using advanced intelligence functions and feedback algorithms in Robotics and Multi-body Dynamics Simulation.	Free version (need Internet checking) & commercial version (using usb dongle)
22	Vensim	Created by VENTANA systems Vensim is aims to solve real life complex systems by integrating managerial and technical aspects to show how useful spread sheets can be when created through a rich dynamic simulation environment.	Commercial/PLE free



## APPENDIX II: CAUSAL LINK TABLE OF VARIABLES

Table 17: Variable causal link of variables and source

No	Variable 1	Causality	Variable 2	Source
1	Ability to work in multi-cultural environment	+/-	Work ethic	(Pnet pty 2013) & (IT Web Limited 2013)
2	Adaptability and competency	+	Soft Skills	(Pnet pty 2013)
3	Adaptability and competency	+	Ability to work in multi-cultural environment	(IT Web Limited 2013)
5	Adherence to standards and procedures	+	Graduate socialisation	(Pnet pty 2013) & (Austin 2002)
6	Administrative skills	+	Hard skills	(IT Web Limited 2013)
7	Analytical thinking	+	Business and letter writing knowledge	(Pnet pty 2013) & Data analysis
8	Analytical thinking	+	Client liaison	(Pnet pty 2013)
	Analytical thinking	-	Working overtime	(IT Web Limited 2013)
9	Business and letter writing knowledge	+	Graduate level of experience	Data analysis & (IT Web Limited 2013)
10	Client liaison	+	Industry expectations	(Pnet pty 2013) & (Weligamage & Siengthai 2003)
	Conflict resolution and negotiation	+	Graduate socialisation	(Pnet pty 2013) & (Cooper-Thomas et al. 2012)
	Critical acumen	+	Demonstrate abilities show results or something tangible	(Pnet pty 2013) & data analysis
	Critical observation	+	Client liaison	(Pnet pty 2013)
	Demonstrate abilities show results or something tangible	+	Potential to develop	Data analysis
	Effects of research and development	+	Innovation	Data analysis & (Harker 2007)
	Effects of research and development	+	Critical acumen	Data analysis & (Pnet pty 2013)
	Goal driven graduates	+	Working overtime	(Pnet pty 2013)
	Goal driven graduates	+	Client liaison	(Pnet pty 2013)
	Graduate level of experience	+	Graduate socialisation	(Cooper-Thomas et al. 2012)
	Graduate Socialisation	+	Legal Knowledge	(Cooper-Thomas et al. 2012)

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	Hard skills	+	Skills	(Villiers et al. 2012)
	Industry expectations	+	Skills	(Fajar & Hidajat 2012)
	Industry expectations	+	Goal driven graduates	(Daud et al. 2011)
	Industry expectations	+/-	Potential to develop	(Daud et al. 2011) & Data analysis
	Industry expectations	+	Working in pressured environment	(Fajar & Hidajat 2012) & (IT Web Limited 2013)
	Innovation	-	Working Overtime	(Trow 2012)
	Lack of practical IT exposure	-	Business and letter writing knowledge	(Hagan 2004) & Data analysis
	Lack of practical IT exposure	-	Legal knowledge	(Mutula & Brakel 2007) & (Pnet pty 2013)
	Lack of practical IT exposure	-	Graduate socialisation	(Fortenberry 2011) &
	Lack of practical IT exposure	-	Conflict resolution and negotiation	(Aasheim et al. 2009) & (Pnet pty 2013)
	Lack of practical IT exposure	-	Critical observation	(Aasheim et al. 2009) & (Pnet pty 2013)
	Legal knowledge	+	Conflict resolution and negotiation	(Pnet pty 2013)
	Legal knowledge	+	Adherence to standards and procedures	(Pnet pty 2013)
	Level of qualification	+	Analytical Thinking	(IT Web Limited 2013)
	Level of qualification	+/-	Legal Knowledge	(Pnet pty 2013)
	Level of qualification	+	Skills	(Pnet pty 2013) & (Villiers et al. 2012)
	Level of qualification	+	Logical Thinking	(IT Web Limited 2013) & Data analysis
	Level of qualification	+	Critical observation	(IT Web Limited 2013)
	Logical thinking	-	Working overtime	Data analysis &
	Logical thinking	+	Client liaison	Data analysis & (Pnet pty 2013)
	Passion for IT	+	Goal driven graduates	(IT Web Limited 2013)
	Passion for IT	+	Working overtime	(Pnet pty 2013)
	Passion for IT	+	Work ethic	(IT Web Limited

Appendixes

				2013)
	Problem solving and critical thinking skills	+	Soft Skills	(IT Web Limited 2013) & (Joseph et al. 2010) & data analysis
	Problem solving and critical thinking skills	+	Innovation	(IT Web Limited 2013) & (Harker 2007)
	Resourcefulness	-	Working overtime	Data analysis & (IT Web Limited 2013)
	Resourcefulness	+	Client liaison	Data analysis & (Pnet Pty 2013)
	Skills	+	Graduate socialisation	(Fortenberry 2011) & (Cooper-Thomas et al. 2012)
	Soft skills	+	Skills	(Cooper-Thomas et al. 2012)
	Technical skills	+	Hard skills	(IT Web Limited 2013) & (Barber et al. 2012)
	Understanding organisation value system and culture	+	Problem solving and critical thinking skills	Data analysis & (Pnet Pty 2013)
	Understanding organisation value system and culture	+	Adherence to standards and procedures	Data analysis & (IT Web Limited 2013)
	Work in pressured environment	+	Understand business processes	(IT Web Limited 2013) & Data analysis
	Working in pressured environment	+	Understand financial services industry	(IT Web Limited 2013) & Data analysis
	Working in pressured environment	+	Resourcefulness	(IT Web Limited 2013) & Data analysis
	Work ethic	+	Adaptability and competency	(Pnet Pty 2013)
	Working overtime	-	Work in pressured environment	(IT Web Limited 2013)
	Working overtime	+	Potential to develop	(IT Web Limited 2013) & data analysis

### APPENDIX III: BALANCING AND REINFORCING LOOPS

Balancing loop number 1 of length 2

Resourcefulness

Working overtime

Working in pressured environment

Balancing loop number 2 of length 5

Resourcefulness

Client liaison

Industry expectations

Goal driven graduates

Working overtime

Working in pressured environment

Balancing loop number 3 of length 2

Ability to work in multi-cultural environments

Work ethic

Adaptability and competency

Reinforcing loop number 1 of length 2

Industry expectations

Goal driven graduates

Client liaison

Reinforcing loop number 2 of length 3

Resourcefulness

Client liaison

Industry expectations

Working in pressured environment

Reinforcing loop number 3 of length 2

Conflict resolution and negotiation

Graduate Socialisation

Legal knowledge

Reinforcing loop number 4 of length 2

Adherence to standards and procedures

Graduate Socialisation

Legal knowledge

Reinforcing loop number 5 of length 1

Effects of research and development

Innovation

Reinforcing loop number 6 of length 2

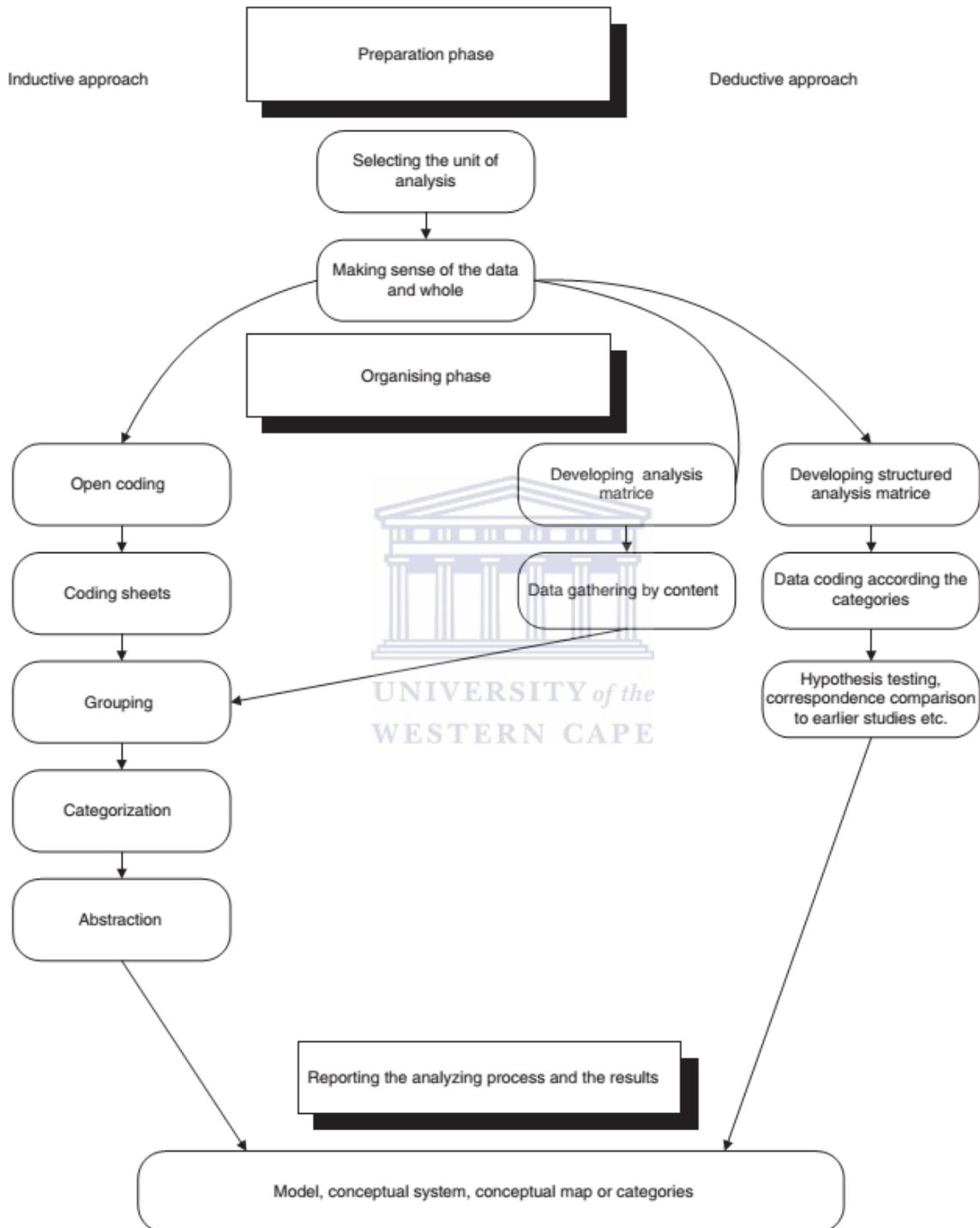
Ability to work in multi-cultural environments

Work ethic

Adaptability and competency



Appendix IV: content analysis approach from Elo & Kyngas (2007)



## APPENDIX V: ETHICS CLEARANCE

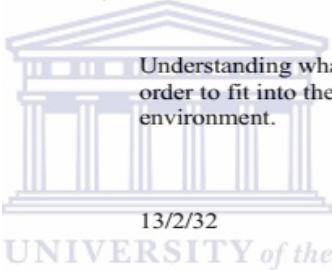


### OFFICE OF THE DEAN DEPARTMENT OF RESEARCH DEVELOPMENT

12 April 2013

#### To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape has approved the methodology and ethics of the following research project by:  
Mr R Tjikongo (Information Sciences)

Research Project:  Understanding what students need to learn in order to fit into the competitive IT environment.

Registration no: 13/2/32

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The Committee must be informed of any serious adverse event and/or termination of the study.

*Ms Patricia Josias  
Research Ethics Committee Officer  
University of the Western Cape*

## APPENDIX VI: INTERVIEW QUESTIONS



### Interview questions

1. Seeing that IT changes all the time:
2. What do you think graduates need to learn in order to fit into an IT environment?
3. How do you manage knowledge within the organisation?
4. How many people are in your IT Application and Infrastructure group, and what do they do?
5. How will the people in your company influence the graduates?
6. How do you manage graduates
7. How do you manage big groups?
8. Have you ever had a (graduate) internship and how did you onboard them?
9. Do you allow group collaboration for a newcomer or do you do this individually?
10. What has been the most difficult way to induct one of these interns to the culture?
10. Based on what features do you hire graduates? E.g. skills, knowledge, and competencies etcetera?
11. How do you motivate a depressed Graduate?
12. Can anyone become an IT practitioner?

APPENDIX VII: LETTER OF CONSENT



Department of Information Systems  
23 May 2012

To whom it may concern

**Re: INFORMATION SYSTEMS RESEARCH  
STUDENT: Ricardo Tjikongo**

Dear Sir/Madam

At the department of information systems we place strong emphasis on individual growth and encourage students to further their studies beyond undergrad level. The department supports this growth with regards to research and development 100 percent. Therefore, at a master's level we require that our students to be initiative and adapt to change which will make it easier for them to move onto PhD or join the workforce.

In the masters program students are required to choose a relevant and persisting topic within the IT/IS environment which will contribute to the body of knowledge and be of benefit to the field. Ricardo Tjikongo, has chosen, to investigate the asymmetrical pattern of industry demand and academia supply with regards to IT graduates in South Africa. His main question is, **“What do students need to learn to fit into a competitive IT environment?”** Furthermore, the relationship between industry and academia is extremely dynamic, especially in the IT disciple. Ricardo will aim to understand the problem in an endogenous manner from both sides of the coin. In an attempt to find the hidden relationships that determine a behavior of the complex system.

In addition, this research will only not benefit students in understanding the hidden factors that their potential employers require, but as well, it will be greatly beneficial to curriculum development and lowering the unemployment rate of IT graduates in the long run.

I therefore respectfully request your kind assistance in this regard. All the gathered information will be kept anonymous, and company names will not be mentioned for ethical reasons. All information will be treated in the strictest confidence.

Kind regards

.....  
Ricardo Tjikongo  
Masters Student (B.Com Hon)

.....  
Interviewee Signature

.....  
Date:

## Appendix VII: Turnitin Receipt

### Turnitin Originality Report

First draft review by RICARDO TJKONGO

From First draft review (Masters in Information Management)

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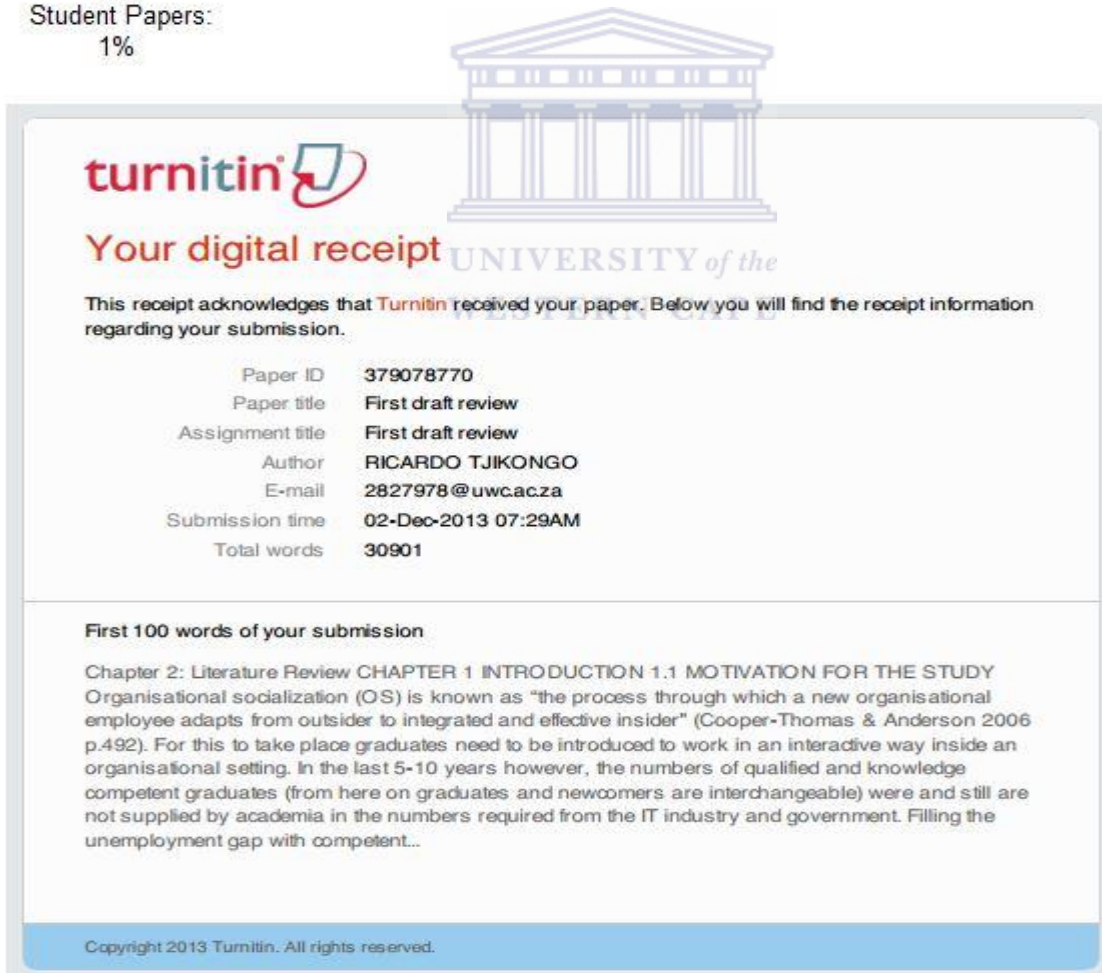
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E-mail	2827978@uwc.ac.za
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Total words	30901

**First 100 words of your submission**

Chapter 2: Literature Review CHAPTER 1 INTRODUCTION 1.1 MOTIVATION FOR THE STUDY  
Organisational socialization (OS) is known as "the process through which a new organisational employee adapts from outsider to integrated and effective insider" (Cooper-Thomas & Anderson 2006 p.492). For this to take place graduates need to be introduced to work in an interactive way inside an organisational setting. In the last 5-10 years however, the numbers of qualified and knowledge competent graduates (from here on graduates and newcomers are interchangeable) were and still are not supplied by academia in the numbers required from the IT industry and government. Filling the unemployment gap with competent...

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