FACTORS AFFECTING COMSC PERFORMANCE IN THE NATIONAL STUDENT SURVEY & NATIONAL LEAGUE TABLES

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1.Abstract

This project describes and evaluates the factors affecting Cardiff's School of Computer Science & Informatics (COMSC) performance in both the National Student Survey (NSS) and the National League Tables. The project will be based on a Systems thinking approach called "System Dynamics". This study will aim to understand the problem area of School policy and procedure, and how policy can impact the scores COMSC receive from such entities as The Guardian and the National Student Survey. Throughout the project a selection of Statistical and System Dynamics tools will be included; the creation of an influence diagram, coupled to a quantifiable model will be outlined and evaluated. Alongside the System Dynamics section there, which will also be statistical review of how the Nation league tables are created. The models will then be discussed and reinforced with past and present data to show where policies could be crafted. The quantifiable model will be created in IseeSystems' I-think. This model will be interactive and will allow the author to show how changes in the model affect real world data. Select polices will then be tested and discussed further to show how they can improve such performance of COMSC. The project will conclude with the author outlining future work on the problem area and his learning experiences.

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2. Background & Context

Every year Cardiff's School of Computer Science & Informatics (COMSC) have an uphill battle to get the scores they feel they deserve in both the National Student Survey (NSS) and from University ranking entities. Although in recent years it has started to rise again, the scores for COMSC have not been fantastic and have been slipping across the board, in particular, the assessment and feedback section of the NSS was at an all time low, where it received a score of just 56%.

> "effective assessments of student learning should be at the heart of any integrated approach to student learning"
> (Harvey, 1993)

There are two types of students, undergraduate and postgraduate. Recruitment for each is currently entirely separate at COMSC. During this study I will be looking solely at the undergraduate section. For undergraduates, there are basically two types 'home' and 'international'. Home students numbers are capped (for all UK universities) by government(s), and the university decides how many of its students places go to each School. These numbers normally fluctuate per School depending on previous performance indicators (for example number of applicants, retention rate of the pervious year, etc).
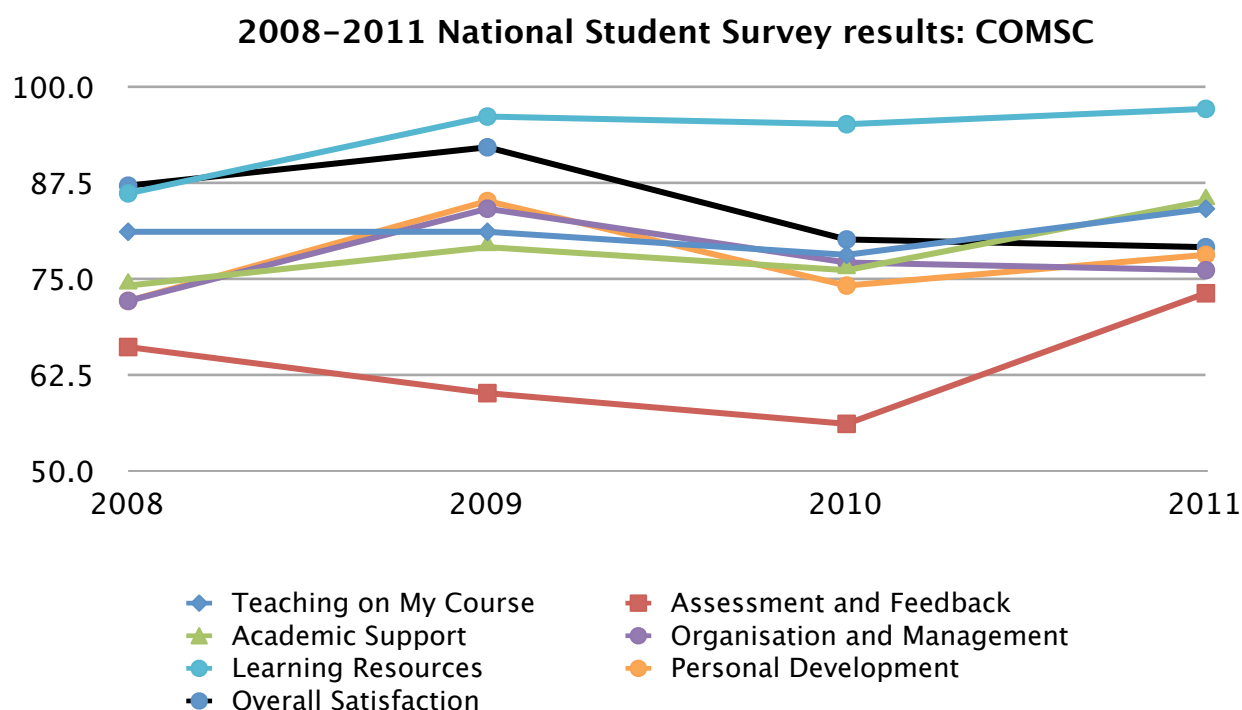
Last year all Schools saw an initial reduction in numbers (after UK government announcements) which were later (partly) reversed by Welsh Government policy. COMSC currently has 118 FTE students. (FTE = Full Time Equivalent, a student studying one of our degrees counts as 1 FTE, a student studying a joint degree with another School counts as 0.5 FTE).

The target of 118 FTE home students for COMSC has a 1% error allowed by the University. Go over and the University is penalised, dip below and it means lost revenue. If a School under-performs one year, its FTE numbers are often reduced in the next year. (In practice the University keeps back a buffer of FTE places to account for School's that exceed their FTE numbers, allowing the University as a whole to meet - or get closer to - its FTE numbers)

International student do not count towards home FTE limits. A School can recruit as many international students as its resources (staff/lecture and lab space, etc) allow.

COMSC management are also trying to attract more students, especially students from overseas. Students are the School's major source of income, and if student expectations are not being met, the school is not going to receive the marks it wants in the NSS, This in turn will have an effect on such a ranking scheme as the Guardian University guide. This obviously has the knock on effect of deterring students from COMSC.

Below is a graph to outline COMSC performance in recent years, although it is now on the up, a huge slump has still not been fully rectified.

2008-2011 National Student Survey results: COMSC

Legend:
- Teaching on My Course
- Academic Support
- Learning Resources
- Overall Satisfaction
- Assessment and Feedback
- Organisation and Management
- Personal Development

[fig 1. Source: CARDIFF COMSC 2008-2011 NSS results]

Lower NSS scores cause collateral damage, harming COMSC performance in such rankings as the Guardian and the Times University Guides. The NSS score actually makes up 25% of The Guardian's Ranking that it publishes year on year.

As mentioned, The Guardian publish a comprehensive guide on an annual basis, the guide ranks: all full time, undergraduate courses at higher education institutions in England, Scotland, Wales and Northern Ireland. The main aim of the guide is to give advice and insight for prospective students. Although the NSS marks make up 25% of the ranking given by The Guardian, there is also 15% given to each of the below factors.

The other factors that are included in The Guardian's marking scheme are :

- Employability (Career after 6 months) - This looks at graduate jobs only. So although Cardiff COMSC can boast an employability percentage of 86% for the academic year 2010/11 the score The Guardian take into account only treats students in full time further study or a graduate occupation as having a positive outcome. This vastly changes the percentages of this field. There must be a minimum of 25 respondents to make this section of the ranking valid.

- Student to staff Ratio - This is given a score regarding how many students there are to one member of staff. The higher the number the lower the score a Degree scheme will gain.

- Spend per student - This is the amount of money an institution spends to provide a course to a student. It excludes cost of staff as they are already accounted for in the student staff ratio. Added to this is the amount of money an institution has spent on academic services, this including library and computing services.

- Value added score (VAS) - Using a sophisticated indexing methodology VAS looks at the estimated level of success any one student is going to have. The students are put into particular bands depending on what their highest qualification is previous to coming to University.

- Average entry tariff - This is simply the average UCAS entry tariff for the particular establishment, calculated by taking all degree schemes' current entry requirements and making an average across the board.

There is obviously a variety of parties interested in this study for one reason or another. Viewpoints and matters of importance change depending on who you ask. This problem is at the real heart of this study. Students have a very different outlook on the University experience compared to that of an academic or research fellow . To outline what view points have been taken into consideration and where information has been gained from, below is a list of COMSC entities which have been considered throughout the study and who are impacted when policy is adjusted.

Groups who take a keen interest in the problem area:

Total COMSC Students - circa 435
Total UG students - circa 320
Professors - 11
Director of teaching - 1
Readers & Senior Lecturers - 6
Lecturers - 19
Associate Lecturers & Teaching Associates - 4
Technical Staff - 5
Research Fellows, Associates & Assistants - 20
Admin Staff - 10

Throughout the research of this study there has been the constant reminder of the restraint time, or lack of it, and the effect it has on possible policy creation. Whenever a policy or action needs to be tested it currently takes too long to gain an idea of its effectiveness. Either 12 or 36 months are used, depending on the action that is being trialled. This means that decisions are always being made using lagging indicators.

There is also the issue of this problem area being untouched by undergraduate members in the past. This is largely due to the red tape surrounding academic change. I have kept an open mind throughout the project to allow for new ideas not to be crushed by current processes.

3. About This Study

This project will aim to produce policies and advice on increasing both the scores from the NSS and the annual ranking COMSC are receiving from the Guardian's university guide. This will in turn, hopefully, boost the intake of students and the academic profile of Cardiff COMSC. The information used in these policies will be sourced from inside and outside the boundaries of Cardiff COMSC and will be supported by both historical and newly found data.The study will be crafted using a Systems Thinking approach. With both qualitative and quantitative sections.

A Systems Thinking approach is a process of understanding how things influence each other, be it in business or in nature, it is the process of looking at sub-systems and how control and action can change a system's overall working. There is a need to consider all factors that may affect decision making as a whole. If it affects the end goal or behaviour of the system along the way, it needs to be monitored and taken into consideration. Traditional analysis focuses on breaking a problem down into parts and looking at them. individually, whereas Systems Thinking uses a holistic approach to get a better overview and understanding of the problem area in it its entirety. It allows the author to use a mixture of qualitative and quantitative approaches, both supporting each other and the argument as a whole. The method used has a natural flow from start to finish and each section of the study strengthens when more information is added. A Systems Thinking approach also gets stronger in time allowing the author to review previous decisions and find alternate evidence.

Systems Thinking also takes into consideration how systems change and mould over time. This is why a System Dynamics approach was chosen over other forms of Systems Thinking. It allows for constant review of complete systems, and their sub-systems, in an analytical way. It does this by using a quantitative approach, using hard data to model things based on the real world. To support this, the approach also uses a qualitative approach of influence diagrams, to show how elements of a system impact on each other, it allows the author to understand what information needs there are. It can even give insight on how to go about finding the information that is needed. Although every effort has been made to ensure this study is unbiased, it has to be stated at this point Systems Thinking, especially influence diagrams are from the view point of the author, meaning although assumptions will be justified they are the authors own assumptions.

An explanation of System Dynamics, in its entirety, is beyond the scope of this project, and therefore a knowledge of System Dynamics by the reader is assumed.
This study will be following R.G. Coyle's framework of System Dynamics (Coyle, 1996)

There are five stages to consider when using the Systems Dynamics approach when working on a case study. All five of the stages need to be considered and evaluated to have a beneficial result . Each stage of the procedure supports the other five. A complete understanding of the problem area is the desired outcome and this can then be engineered into advice and possible policies for COMSC to consider in the future. Below are the five outlined stages applied to the issue of COMSC performance in NSS and Guardian ranking;

The **first** step of the study will outline and understand the issue as a whole. This is largely highlighted within the Background section of the report but will be laced throughout the study. **Secondly,** a qualitative approach will be used, in this instance an influence diagram(s), this allows the author to understand the different relationships within the problem area. It will also unearth parts of COMSC which are currently not measured, or taken into consideration when analyzing performance.The **third** step will be an analysis of the qualitative approach. This means breaking down the influence diagram, outlining all assumed relationships and supporting these relationships with evidence or future work. this step also fuels the research for step four, making sure the right data is collected to help model the problem area. **Fourth**, is the the quantitative step of Systems Dynamics. This section uses simulation modeling to portray current or future versions of the system, manipulating data to vary the outcome. This section works as a testing ground for policies and management action. It should highlight what factors affect change and the severity in which they affect the system.The **fifth**, and final step is an analysis of the Quantitative approach. This is where the policies are finally sculpted and reflection on the problem area is crafted from. this will also outline future work and how the model can be further tested to help prove other policies.

4. Approach

There has been much debate over the two methods I will be attempting to use throughout this study. Both qualitative and quantitative have been argued at length, with advantages and disadvantages being highlighted for both.

" The only conclusion I have been able to make is that this debate is "much ado about nothing" To say that one or the other approach is "better" is, in my view, simply a trivialising of what is a far more complex topic than a dichotomous choice can settle."
William 2006

Both qualitative and quantitative come from tried and tested backgrounds, used in a variety of disciplines to help support and possibly prove arguments. Within this study I will deploy both techniques which will hopefully support each other in proving policies and methods for improvement.
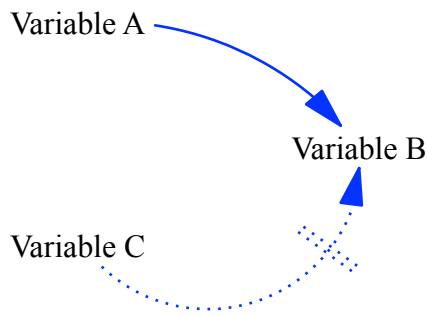
Qualitative Approach

Qualitative research originates from the social sciences but has in recent years become prevalent in market research. This form of study allows for greater depth to be found within a problem area. It does not just look at the what, where and when, but also helps to outline the inherent questions of "how" things are linked. This gives a good foundation for this study because it will help circle what information needs are to be unearthed for support later in the study. Due to the high level of detail required at this stage, it is usual for smaller sample sizes to be used in a "focused" manner, as opposed to a large scattering of a sample. Qualitative research only produces information on that particular study, and if they are used to make general conclusions, they are only regarded as informed assertions. This is again the reason System Dynamics sits so well in this project, the simulation modeling is a perfect example of supporting qualitative data with a quantitative approach.

The form of qualitative research used in this study is the System Dynamics approach of influence diagrams. Although they are seen as a support for the simulation modeling, they are also an incredibly powerful tool in their own right, for both evaluating and understanding a system and any sub-systems which are discovered within.

The qualitative section of this project was a large one. There were much iteration of particular influence diagrams, some encompassing the whole system that the project was looking at, and some to just reinforce a point or justify thinking.

The mechanics of influence diagrams used in this study are displayed below.

Variable A

Variable B

Variable C

Influencing Variable

+

Variable Influenced

-

<Ghost Variable>

[fig 2. Mechanics of influence diagram]

A solid arrow represents a physical flow.

A dashed line represents information transmission, Control action, nature of Behaviour.

Two lines through an arrow indicate there is a delay of some kind.

A positive sign indicates that when the variable at the tail end of the arrow changes, the variable at the arrow end changes in the same direction.

A negative sign indicates that when the variable at the tail end of the arrow changes, the variable at the arrow end changes in the opposite direction.

A ghost variable is used to duplicate a variable that already exists in the influence diagram, It can aid the author by meaning fewer arrows cross, and thus the influence diagram is less confusing.
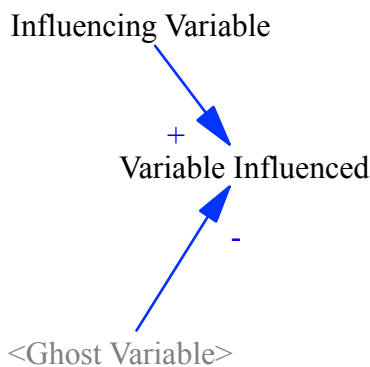
Throughout the study the author made various influence diagrams of the same system, gaining understanding, and differing levels of detail were understood. Every time you add something to an influence diagram it infers something, and this leads you to find more out, collecting evidence and making assumptions based on that evidence. It is always building stronger and creating more information to be used at the end of the project. (

4.1 Factors Affecting COMSC

A natural beginning when evaluating the problem area within COMSC is too look at factors affecting the number of students at COMSC and what decision are made because of the number(s) of students or staff at a particular establishment.
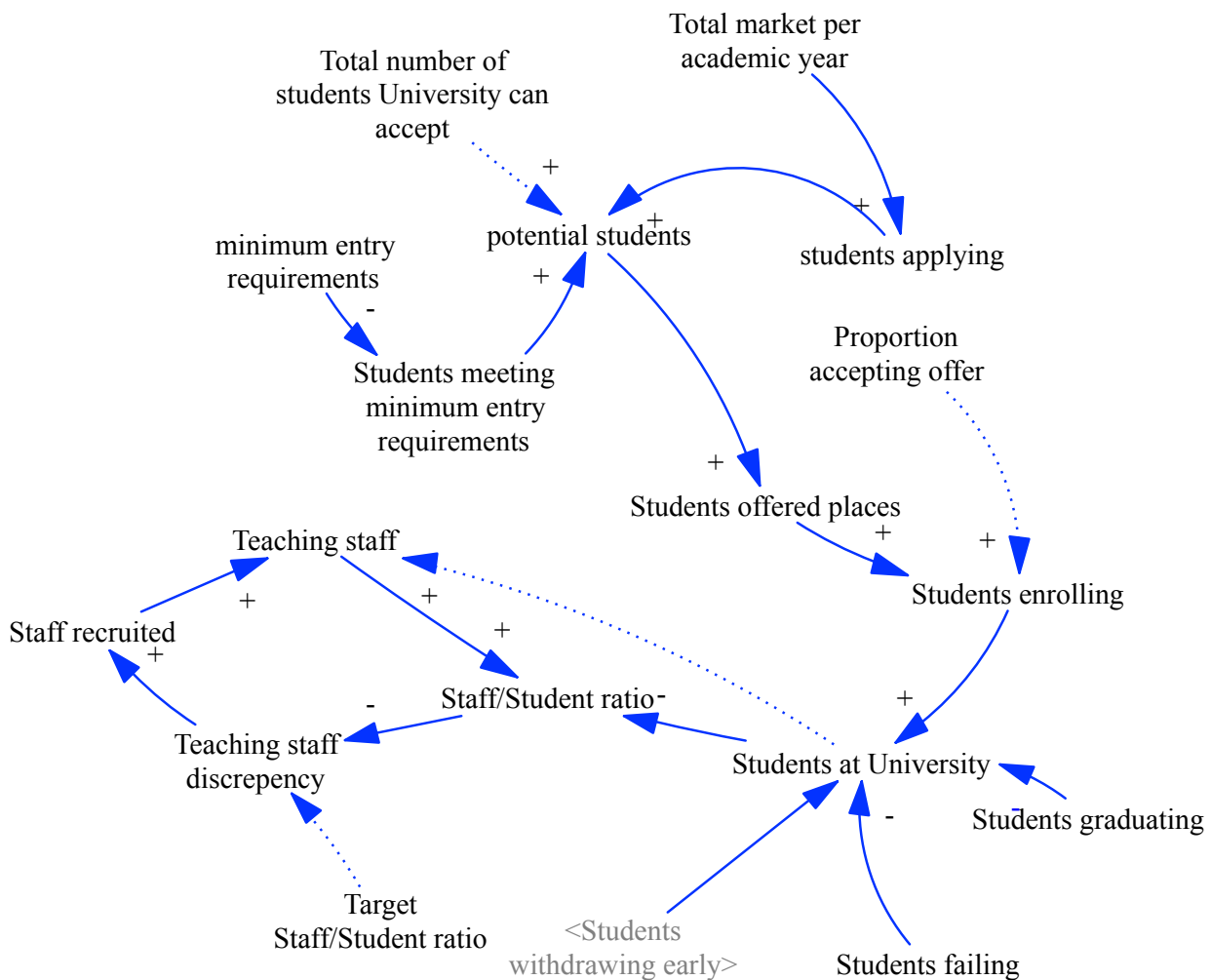
fig 3. Influence diagram: Students at university]

As soon as it came to reviewing the section of the influence diagram shown above *[fig 3. Students at university]* it was clear certain metrics had appeared that could be obtained and evaluated.

Students at University - The number of students at any institution varies from year to year, it also varies throughout the academic year due to ; student enrolling, students graduating, student dropping out and students failing. Cardiff University currently has 16505 students studying at an undergraduate level. It is outlined in more detail below but all schools within a university are given a quota to meet each year. At the time of this study there were 320 under graduate (UG) students enrolled in COMSC.

Total number of students university can accept - There are two types of student that COMSC accept every year; a "home: student or an "international" one. The number of students COMSC can accept can vary due to two factors. Firstly, all "home" student

numbers are capped throughout universities in the UK. Each University decides how to allocate its student places to each school. COMSC currently receives **118 FTE** (Full Time Equivalent) One student studying an undergraduate course in COMSC is equal to 1 FTE, and a student studying a joint honours counts as 0.5 FTE. If a school underperforms and does not reach its FTE quota, the next year the university will review number of places allocated to that school. International students do not affect the FTE quota so can be recruited freely, obviously taking into consideration the school's resources, and their limits. This is the second restriction when looking at number of students. COMSC, like all schools, has a theoretical limit, when looking at the number of students it can accommodate for. It can only take as many students as equipment, staffing and available lecture space can allow. Currently COMSC has 435 full time students.

Minimum entry requirements - Minimum entry requirements are a set standard across all higher education institutions within the UK. They help the university outline the believed education required for a student to be successful within a particular field of study. at the time of this paper going to print the average UCAS (a numerical format to show how different qualifications compare and convert into access into higher education) points needed to join Cardiff COMSC at an undergraduate level were equal to **ABB at A-level**

Target Student to staff ratio - All universities aim for a target number when looking at number of students per member of staff. When looking from a very high level view, less students per staff member are seen as a positive addition to a school's arsenal. Although there is no guarantee that adding academic staff will add to the quality of teaching. The more academics a university employs, the closer the students are watched and supported, meaning they can gain more value out of their time at university. **COMSC current student to staff ratio is 435:41 or 10.6:1.** This does include post graduate students, but is a fair representation of the student staff ratio as all academic staff are shared over both UG and PG.

A further point of evaluation is looking at the key issue of COMSC performance within social metrics and measures of performance that influence the public (largely prospective students and their families). In *[fig 4.]* the concept of COMSC being rated is outlined in what individual elements affect the position of COMSC.
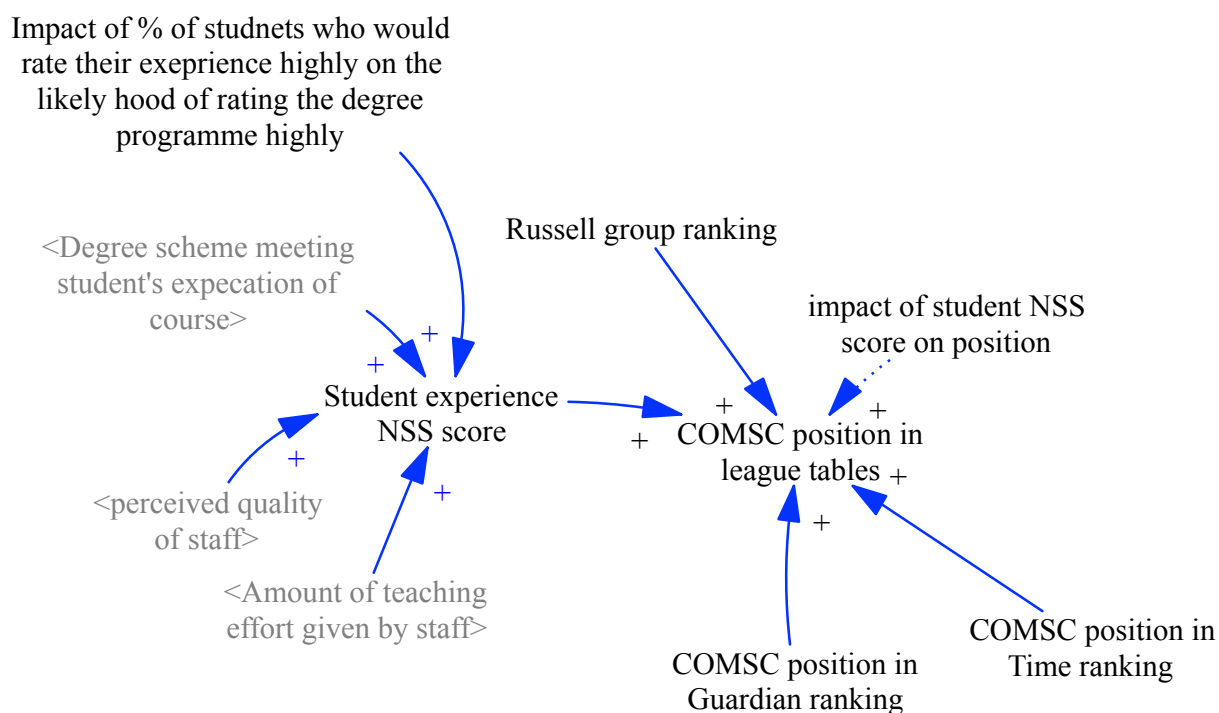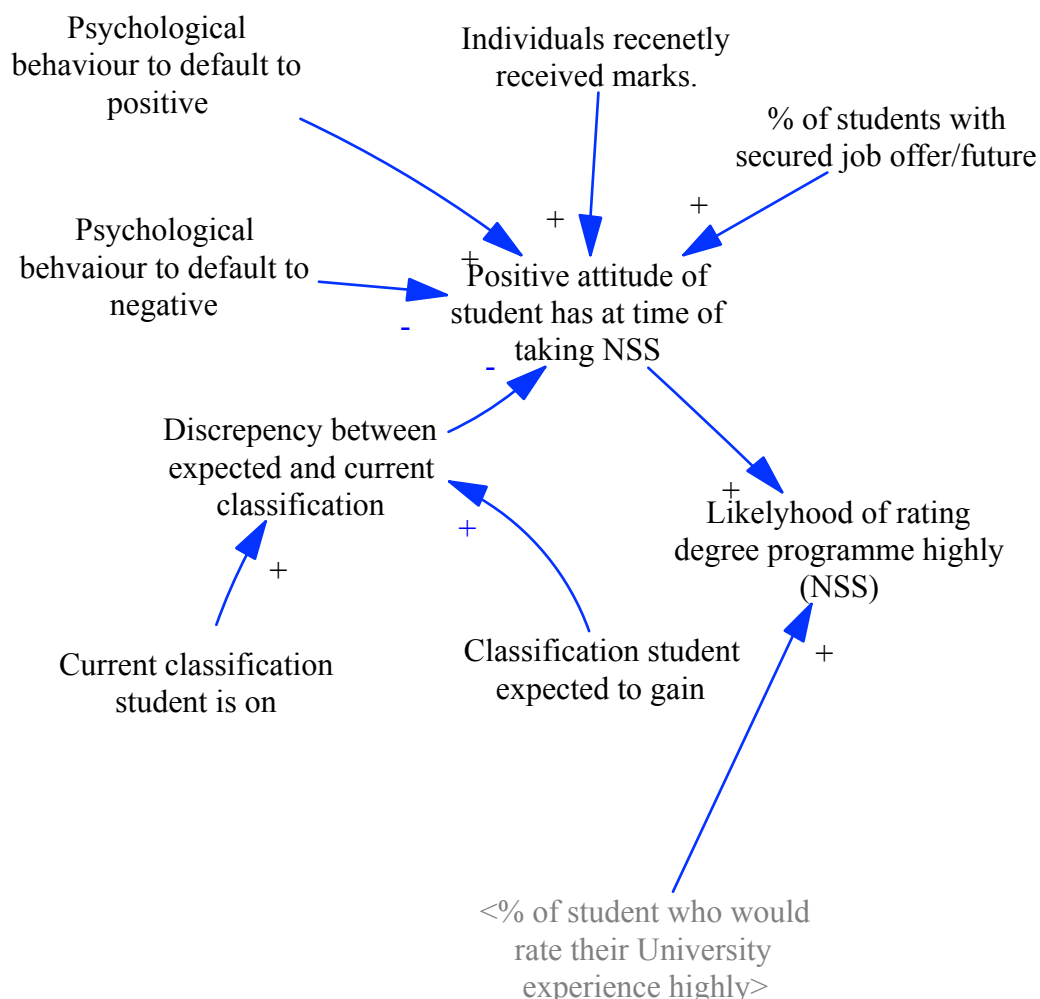
[fig 4. Influence diagram: COMSC position in league tables]

Student Experience NSS Score - This section forms one of the corner stones of this study. This particular aspect is so important because it highlights so much about a particular university or, more specifically, a particular school such as COMSC. Firstly, it gives a non-academic view of an institution. The National Student Survey (NSS) is undertaken by final year UG students. They are questioned on three main areas; satisfaction with course, satisfaction with teaching, satisfaction with feedback. These sections are broken down into a variety of questions to get a thorough and fair representation of a student's experience. These sections are also cumulated to give an overall satisfaction score. As shown in *[fig 5.]* below the standard questions are marked on a sliding scale, allowing students to agree or disagree with differing levels of assertion. Alongside the type of question below there is also opportunity for students to leave positive or negative comments on their learning experience or their institution as a whole. These scores are published for prospective students to see, the results are also distributed to universities, to be used internally for best practice and improvement throughout. A further way in which the NSS scores affect COMSC performance is their inclusion within Times and Guardian "University Guides". The NSS results make up a section of the aforementioned guides and thus have a direct effect on where the school sits in national league tables.

The teaching on my course						
	Definitely agree	Mostly agree	Neither agree nor disagree	Mostly disagree	Definitely disagree	Not applicable
Staff are good at explaining things.	○	○	○	○	○	○
Staff have made the subject interesting.	○	○	○	○	○	○
Staff are enthusiastic about what they are teaching.	○	○	○	○	○	○
The course is intellectually stimulating.	○	○	○	○	○	○

[fig 5. Example question from Nation Student Survey]

Psychological behaviour to default to positive

Individuals recenetly received marks.

% of students with secured job offer/future

Psychological behvaiour to default to negative

+

+

+

-

Positive attitude of student has at time of taking NSS

-

Discrepency between expected and current classification

+

Likelyhood of rating degree programme highly (NSS)

+

Current classification student is on

+

Classification student expected to gain

+

<% of student who would rate their University experience highly>

[fig 6.
Factors affecting student decision making when taking NSS]

Positive Attitude At Time Of NSS - Whether a student has a positive attitude at the time of taking the NSS, could affect the scores they give to their department. The NSS albeit a small part of a student's influence on the course as a whole, does affect how the course is moulded in the future, and what prospective students think of the course offered in future years.The author has outlined the factors he believes may affect such decisions, and has discussed, in detail what he believes to be influencing factors. We also have to consider the concept of alumni and ex students supporting the institution they were taught by.

Students Rating University Experience Highly - This section is involved with both academic and extra-curricular aspects of a student's experience. It covers such aspects as; nightlife, quality of accommodation, availability of sports and clubs. Although these aspects are not covered in the NSS or Guardian rankings, they all add to the students experience. This is especially important when a student is casting back through memories to give an overall rating for their course or subject. Such elements as nights out with

course mates or weekends away with the computer science club could have a positive impact on the overall rating.

Classification Student Expected to Gain - This element of the influence diagram is actually made up of many parts. We have to consider how well a student or prospective student has researched the course they are enrolled on. If it was not a good fit for them from the beginning, it is unlikely they are going to rate their experience highly, unless they have moulded to the course and bonded well. We also have to consider the aspirations of students and how they vary from person to person, as well as the support they have sought during a time when their classification was not matching with their expected marks.

Psychological Behaviour to Default to Positive/Negative - Different students have different outlooks on life. These outlooks can span to such a review as the NSS. Some students will give a positive review of their course and others a negative one.
Tarran (1999) explained that individuals look to identify with whatever they are reviewing. So if a student identifies with the graduate employment he or she has just gained, the likelihood is that they will reflect on their time at COMSC with a positive response. However, if a student identifies with the negatives of low marks being received for course work, poor feedback from a tutor. They are likely to respond in a negative way.

Russell Group Status - Although it does not have a specific value attached to it, being a part of a bespoke group does have its advantages. The Russell Group represents the top 20 UK universities, who are committed to quality research and maintaining a high standard of academia through teaching and learning. The accolade of being within this group is something that Cardiff university prides themselves on and this is obvious from the amount of marketing that includes the information about their admission to the group.

COMSC Position In Times & Guardian Rankings - Both the Times and the Guardian are highly respected national newspapers. The information they decide to publish carries a lot of weight throughout the UK. The university league tables they create demand the same respect. The league tables are viewed by (add figures from matt if he gets back to me) The league tables centre on a number of aspects of an institution's performance from average entry requirements to spend per student. These figures, coupled with the NSS results give an institution it's overall ranking. This allows prospective students to see where a particular university or department lie, which is then comparable against their other choices or universities they were not aware of. Where a university sits in these tables depends on what sorting criteria you select. If a subject area is not selected the Guardian will default and show you rankings of universities as a whole, by averaging all the schools rankings. The other option is to sort by subject or discipline. These rankings can be very different to the "average" as particular schools specialise in subject areas that larger and older universities may not.

5. Assessment of Qualitative Approach

Throughout the qualitative research of this project the author was presented with influence diagrams that posed questions and highlighted discrepancies in the current field of information. Although this statement skews to the negative, it supported the notion that the influence diagrams have aided the study in a positive manner, by outlining possible avenues of research. From the influence diagrams in the approach coupled with the complete influence diagram *[fig 8. Influence diagram: Whole system]* it was clear each section had to be looked at on a system by system level, before the whole system could be reviewed. This would circle what impact each subsystem has on the study, what information needs to be gathered and what conclusions could be made. The first assessment that took place was the creation of an assumptions table. This allowed the author to explicitly outline his assumptions, which would be supported by the evidence within this document. The assumption table *[fig 9. Assumptions table]* reviewed all relationships within the completed influence diagram.

When reviewing the qualitative research, it was clear that the influence diagrams pointed to two areas of research and further decomposition.

Firstly, the problem of the NSS results always being a lagging indicator. At best the 2011 results were 9-12 months out of date, and applied to last year's students. This led to a bespoke questionnaire which would give leading indicators surrounding the information sought by the NSS. This would give information on the current "feeling" within COMSC, review could be made on how that differed from last year's responses and if any comparisons could be drawn.

Secondly, when reviewing the influence diagrams, and looking at the elements which had a lot of activities surrounding them, it was clear the same elements were present in the influence diagrams and The Guardian's ranking. This meant decomposing the ranking, finding out how the Guardian reached its scores and how this information could be obtained to benefit this study. Originally I saw the Guardian's ranking as just a factor within the study, but quickly it became apparent that it had potential for aiding policy creation.

5.1 My Own Questionnaire

One section of research was clear from very early on in the qualitative research. It was necessary to gain leading indicators about the information that was gathered from the NSS. To do this the author would need to create their own questionnaire, which would be completed by current COMSC students. Possibly including all years, this would show if there was any change in opinion throughout the years, and as students progress, coming closer to graduation. This would hopefully create a datastore of information regarding the student's feelings and how they want to see change in the future. This information can then be used to support positive growth in regards to teaching, support and feedback. The questionnaire had to be in keeping with the style of the NSS questionnaire, which would make sure that the information gained, would be similar to the real survey. Due to this being the case there were limitations in regards to choices of questionnaire. I did not want to limit the potential of the questionnaire and I also did not want unmanageable data. For this to be the case, a structured, non-disguised questionnaire was used. This meant questions are listed in a prearranged order, helping with the flow of questioning by grouping questions. Also respondents are told the purpose of the study and what the

information will be used for. Closed ended questions were used, meaning participants had to choose from predefined answers. This meant data could be quantified when organised into a spreadsheet. The answering technique allowed was based on a sliding scale method, meaning participants could agree or disagree with varying amounts of severity, with an example shown below.

Question	Definitely agree	Mostly Agree	Neither agree nor disagree	Mostly disagree	Definitely disagree	N/A

[fig 10. Example question]

To support the quantitative and data centric nature of the questionnaire I wanted to have an additional session with the participants to gain feedback, extra information and answers to questions not yet posed. After research it was evident a focus group would be the ideal format to carry out this extra study.

Powell et al defines a focus group as:

> "A group of individuals selected and assembled by researchers to discuss and comment on, from personal experience, the topic that is the subject of the research"
>
> (Powell et al 1996)

Further to choosing a questionnaire technique, the author had to decide how the questionnaire was going to be carried out. It was a decision between electronically distributing the questionnaires or to be there in person and hand them out to a particular group. It was decided that preselected groups would be targeted in person. First and foremost this would allow for the focus group to take place. It would also mean the questionnaire session could be invigilated each time, meaning error rates should be low and assistance was on hand for participants that needed it. This approach did obviously have the negative of limited distribution attached to it. The researcher could only gather information when people were willing to fill out a paper copy of the questionnaire, and predefined meetings needed to be arranged for the focus groups to take place.

To keep data interference to a minimum it was decided the questionnaire would be filled out on an individual basis, meaning no conferring of any sort. The group would then be reassembled for the focus group section of the research. This would allow the researcher to revisit questions while they were fresh in the minds of the participants, ask for extra detail and commence conversation on topics which were particularly prevalent, such as feedback time within an institution. The researcher would then note down information which was being discussed by the group, trying to not interrupt their flow, but gain maximum value from the group by probing throughout the session. It also meant the researcher could obtain further detail from the questions posed, unlike with an online

survey, where you are limited to the questions you send out and how the participant interprets them. As already mentioned, in-person questioning, also means cutting down on false or invalid answers that can be common on online questionnaires. The obvious negative of this approach is the sample size, but you have to accept what is available and use it to the best of your ability.

The author was always present at the questionnaire sessions, unlike many approaches (survey monkey) and it gave a level of support for the participants. From these sessions it was clear students had a lot more to say than just answering the questionnaire. This also validated focus groups as a positive source of information.

5.2 The Guardian Ranking

When looking at the two large ranking agents; TheTime and The Guardian, one had to be chosen to look at in detail. They are comprised of important information when looking at an institution's performance and it was clear the deconstruction of one or other would make for important information during this study. It was decided to use The Guardian's ranking, as it was intrinsically linked with the NSS, and the other factors which were deemed of importance through research. To confirm the assumption that the Guardian was viewed as the premier entity to rank subjects, a survey was carried out asking students which institution they looked to when reviewing courses and subject before coming to university
[fig 11. Potential student resources]
The problem with the Guardian ranking is an accessibility issue. Although they make the data that they use available, it is not known how the scores are mathematically calculated. If I wanted to continue to use the Guardian's ranking as a source for this study I would have to understand its inner workings in more detail. This meant contacting the Guardian directly to try and gain an insight to the ranking.

The response I gained was excellent, the Guardian gave me direct contact with the personnel that deal with creating the ranking. From this contact I was able to understand the ranking in its entirety and examine which sections carried more weight than others and vice versa. The ranking is broken down as follows:

Rating	Previous Year Rating	Name of Institution	Guardian score /100	Satisfied overall (%)	Satisfied with teaching (%)	Satisfied with feedback (%)	Student: staff ratio	Spend per student (FTE)	Ave entry tariff	Value added score/10	Career after 6 mths
1	2	Cambridge	100.0	91	90	72	11.7	9.76	556	6.0	82
2	1	Oxford	97.9	94	93	70	10.8	10	535	7.2	81
3	4	St Andrews	85.3	93	95	68	13.3	7.25	484	7.2	73
4	8	London School of Economics	84.7	80	81	63	11.8	8.45	512	6.0	81
5	5	UCL	82.5	87	87	62	9.7	8.43	474	7.5	77

"How they get to a score out of 100"

[fig 12. Example of Guardian Rankings]

Although they display percentages and other statistics, what they actually use are standardised scores which reflect the mean and standard deviation for each measure in each subject. This is typically on a range of (-3, 3).

They then apply weightings to these standardised scores, each measure is weighted as 15%, except the 3 NSS scores (Satisfied overall, Satisfied with teaching, Satisfied with feedback) which collectively contribute 25%. This gets you to a range of about (-2,2).

For cosmetic reasons, they want to get the top institution to score 100 and all others a proportion thereof. The way they do this is to identify the weighted S-score of University X (X), the best weighted S-score in the subject (Y) and the worst weighted S-score in the subject (z). Then, for University X they calculate:

$$100 \times (X + (-2 \times Z)) / (Y + (-2 \times Z)).$$

" All UK universities ranked by the Guardian according to teaching excellence"
(Guardian,2012)

Although the Guardians ranking is skewed towards teaching excellence, there are many sections that make the ranking what it is, as you can see from [fig 12.], the ranking is made up of:

3 x NSS scores
Student to staff ratio
Spend per student (FTE)
Average entry tariff
Value added score (VAS)
Career after 6 months

When discovering where they source their information from, it instantly became more apparent the importance of the ranking and how much of its work coincided with this study. From research it was found three of the sections are gained directly from the NSS results. The Guardian use the Higher Education Statistics Agency "HESA" data set [fig for HESA] to gain the data they need to build the ranking as you see it online.

"HESA is the official agency for the collection, analysis and dissemination of quantitative information about higher education" (HESA, 2012)

The Guardian also rely on individual institutions to put forward information and statistics. Where there are blanks in the ranking is because of one of two reasons, either where an institution has not met a minimum requirement, such as the minimum requirement of 50% completion for the NSS, or they have not supplied any data whatsoever.

When compared to [fig 8] an early influence diagram, it is obvious that all the information I am looking for is portrayed in some way through the Guardian's ranking. Deconstructing and understanding the ranking was a huge step towards understanding and explaining possible policy action.There were discrepancies between information I had gained about Cardiff COMSC and what the Guardian was portraying. A particular note was the percentage displayed in the ranking for "Employability". From COMSC's own records the employability figure for 2011 COMSC students was 86%, whereas the Guardian noted a score of 57%. The difference is due to how each institution looks at "employability" The

Guardian's score only looks at graduate level employment or people who are in full time further study, whereas Cardiff accept all levels of employment as successful, hence the percentage being higher.

Since joining the school in 2009 the author has seen the ranking performance of Cardiff COMSC in decline. When applying in 2008 Cardiff COMSC was sitting in the twenties as a school of computer science and information systems. In the figure below it is clear to see COMSC has not had the same high results from the Guardian in the past three years.

2010 ranking (2009)	Name of Institution	Guardian score/ 100	% Satisfied with teaching	% Satisfied with feedback	Spend per student (FTE)	Student: staff ratio	Career prospects	Value added score/ 10	Average Entry Tariff
50	Cardiff	67.2	69	65	6	15.4	82	2	320

[fig 13. COMSC 2010 ranking]

Rating	Name of institution	Guardian score /100	Satisfied with course (%)	Satisfied with teaching (%)	Satisfied with feedback (%)	Student: staff ratio	Spend per student (FTE)	Ave entry tariff	Value added score /10	Job after 6 mths
38	Cardiff	60.6	92	81	60	12.2	4	344	3	65

[fig 14. COMSC 2011 ranking]

Rating	Name of institution	Guardian score /100	Satisfied with course (%)	Satisfied with teaching (%)	Satisfied with feedback (%)	Student:staff ratio	Spend per student (FTE)	Average entry tariff	Value-added score /10	Career after 6 mths
46	Cardiff	57.2	80	79	56	11.3	6	347	3	57

[fig 15. COMSC 2012 ranking]

Points to be taken from the above information:

- Guardian ranking score is at an all-time low (negative)
- Student to staff ratio is at a three year low (positive).
- Satisfied with feedback is at an all-time low (negative)
- Entry requirements are slowly rising
- Career after 6 months is at an all-time low (negative)

From the above data the author has made inferences between the information. If the student to staff ratio is in a better position than the past years, why has the feedback score been in decline? By using the questionnaire in the proceeding section the author will gain evidence on this topic.

The Guardian scoring system is obviously not perfect. For some of its sections it requires institution and individual (student) feedback. If it does not gain this feedback the scores are calculated on what was put forward, even if it meets minimum requirements. An example of this is that to to gain valid NSS scores the survey has to be filled out by a minimum of 50% of the institution participants. A further example is that of VAS, where to gain this score an institution has to have a minimum of 35 FTE or equivalent students enrolled. If individual students do not respond to contact from their university, the school has to go without information regarding employment. There is also a further issue of the Guardian changing their metrics for how they score universities. Although they have changed over the years, the information gained for this study is in line with how they currently calculate their rankings.

COMSC market the NSS and it's completion to third year students throughout their final year, with the importance of completing the survey and "having your say" being reinforced throughout the year. Obviously it is important to complete the survey and help define the qualities of a subject area. Again an assumption, first found in the influence diagram below.

[fig 16. Influence diagram: The NSS & Guardian impact on perceived attractiveness]
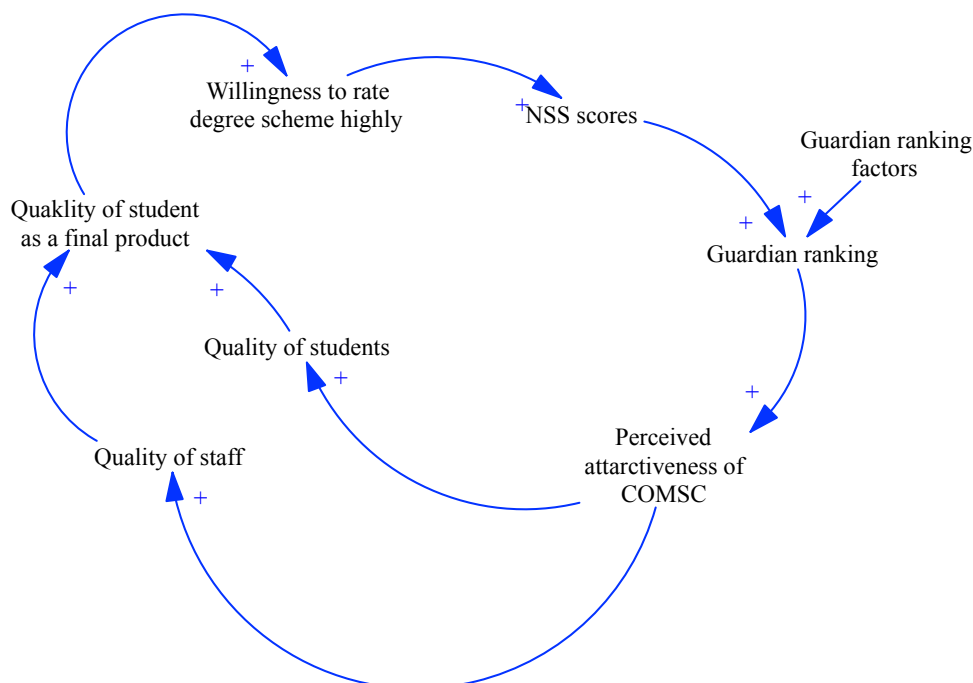
 is that the ranking system makes a positive feedback loop with NSS scores, so it is assumed focusing on not just the NSS responses, but other factors making up the Guardian ranking would, in turn improve the NSS scores. Again this is partially dependent on the Guardian being the premier destination for prospective students when considering universities.*[fig 17.]* If the questionnaire supports the authors assumption it will also

support the fact that the Guardian's yearly ranking is the process COMSC need to focus on, not solely promote completion of the NSS. Although it makes up 25% of the overall Guardian ranking, it means there is 75% still being decided using other factors. A particular factor that will be focused upon in this study, as it is very low *[fig 13,14,15]* is COMSC's Value Added Score (VAS) as it is currently the lowest or joint lowest when comparing to COMSC competitors.

Local competition's VAS:

UWIC: 4
Glamorgan: 3
Swansea: 6

National Competition's VAS:

Southampton: 9
Manchester: 3
Bournemouth: 10
Surrey: 6
Edinburgh: 9

Cardiff COMSC: 3

5.3 Minimum entry requirements & VAS

Minimum entry requirements and Value Added Score (VAS) are two of the components that make up the Guardian's ranking. Each of the components are weighted, and each make up 15% of the total score. From the influence diagram *[fig 8.]* it was assumed the minimum entry requirements and VAS are linked due to the relationship outlined in *[fig 9.]* where boundaries to enter are lower, and the market share can change in a positive direction.According to Alan Millburn:

" A-levels alone were not a "foolproof" way of predicting future academic success and state school pupils with worse results often did better at university than privately educated peers, he said"

(Millburn, 2011)

Based on this view, there is no reason students from different background can achieve the same outcomes. This said if COMSC accommodated for these students, it could have a positive impact on their Guardian ranking due to a heightened VAS score. If the entry requirements are lower an institution has the potential to open its doors to a wider spread of potential students, including widening access students and mature students. Widening access is a funding incentive put in motion by Higher Education Funding Council for Wales. They claim, widening access is about increasing opportunities for people from diverse backgrounds within the UK, so they can benefit from higher education (HE). This information will be investigated using simulation modeling to see if either have an effect and can be lobbied when regarding future policy. It is hoped the VAS can be increased by changing the view of COMSC undergraduate student entry. Through
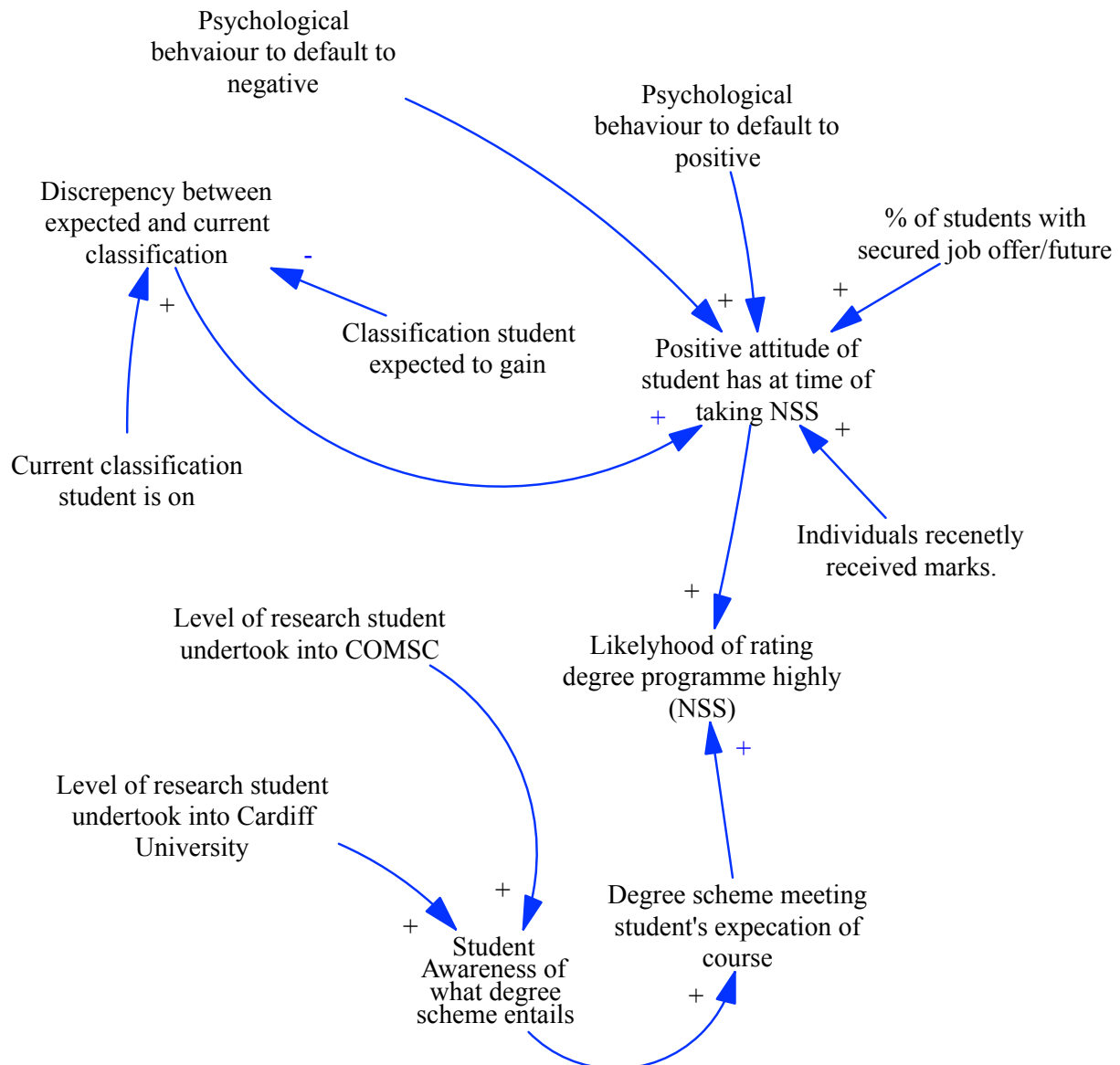
modeling and evidence it will answer " what are the affects of lowering entry requirements" and how can it be managed in a positive way to increase the attractiveness of COMSC.

 VAS is awarded on a per student basis and then the department will gain a VAS Guardian ranking score based on an average of all students in that department. To understand the VAS fully, the author will need to understand how the VAS system is created and what banding is used to divide students into different categories.
From the information gained from contacts at the Guardian it was clear how much of an affect VAS and entry requirements can subsequently have on a universities overall scores, especially if they have a knock on impact to the NSS ratings students then give. This will be investigated and tested using simulation modeling in a later chapter.

5.4 Analysing what influences students decisions when completing NSS

Further evidence will need to be collected to support the assumptions within the influence diagram [fog the dig} outlining student response to NSS and decisions behind giving the scores and remarks that they do.

Psychological behvaiour to default to negative

Psychological behaviour to default to positive

% of students with secured job offer/future

Discrepency between expected and current classification

Classification student expected to gain

Positive attitude of student has at time of taking NSS

Current classification student is on

Individuals recenetly received marks.

Level of research student undertook into COMSC

Likelyhood of rating degree programme highly (NSS)

Level of research student undertook into Cardiff University

Student Awareness of what degree scheme entails

Degree scheme meeting student's expecation of course

[fig 18. Influence diagram: influencing factors on student decision making]

As is stated in the influence diagram above, assumptions have been made on what influences a student's decision process, and this will need to be supported and validated through the NSS focus group sessions. The author hopes to gain information from both final year students and a mixture of first year and penultimate year students to see if opinions differ depending on where a student is on the undergraduate timeline.

Support and feedback is a further factor which will be analysed both with the NSS style survey *[fig 17.]* and the focus group sessions. Aspects of feedback that will be reviewed are methods of feedback, quality of feedback, timeliness of feedback. The evidence will outline and examine the boundaries of this problem area which is clear from the scores currently received in the Guardian ranking *[fig 19.]*

The author does have knowledge regarding some aspects of the inner workings of COMSC due to being on the Student and Staff Panel (SSP). During his time at Cardiff he has seen change in how feedback is given and the process that is taken. The SSP put a policy in place that all coursework marks were given back within 2 weeks of the course work being handed in. This policy will be reviewed in the evidence section, with the impact of this change will also being reviewed. The quality of teaching will also come under review along with the how staff implements giving feedback and support. This has particular relevance when examining the link between quality of feedback and students from wider access and mature backgrounds. When inspecting possible policy it has to be observed that there is a tremendous amount of "red tape" throughout any university institution. From his time in the SSP the author has realised, policy change, even when a small matter, is a timely process. According to Flood (1999) a concept of "systems of meaning" needs to be valued and evaluated this is a key issue that again will be confronted through this study. Flood explains the quality of feedback is in the eye of the beholder. Flood's view outlines if one person (student) has not got the correct relationship with another individual (lecturer or teaching staff) and they do not agree on the system of meaning, one or both parties are not going to be satisfied with the outcome, which in this case is the method and timeline for feedback and support to be delivered.

6. Data &Information Requirements

This section of the study outlines the author's information requirements, where he collected data from, and the assumptions which were supported by the gathered information.

The first thing that needed to be verified was the author's assumption of the Guardian being a leading resource in the decision making process for potential students. To complete this research the author sent out a simple questionnaire asking first year students which resource they found most valuable when choosing to come to University. The survey gained 32 participants in total and the outcome of the survey is outlined below.
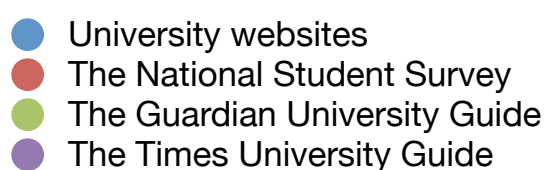
[fig 11. Year 1 student response when asked about information resources regarding choosing university options]

It was clear that the Guardian's university guide, and their ranking system were widely used by potential under graduates. The survey also highlighted how little is known about the NSS until you are a final year student. Also the importance of a university's own website getting plenty of review.

6.1 Questionnaire encompassing NSS content

The questionnaire is made up of a series of statements. These statements are designed to allow the participant to give an emotive response, without leading them to a particular answer. This is done by providing the sliding scale system of response choices.

The questionnaire in it's natural and full state is in the appendix *[fig 17]*, but the questions are below and they fall into the following categories:

Staff & Course
-Staff are good at explaining things
-Staff have made the subject interesting
-Staff are enthusiastic about what they are teaching
-The course is intellectually stimulating

Assessment & Feedback
-The criteria used in marking have been clear in advance
- Assessment arrangements and marking have been fair
-Feedback on my work has been prompt
- I have received detailed comments on my work
-Feedback on my work has helped me clarify thing I did not understand

Learning Resources
-The Library resources and services are good enough for my needs
- I have been able to access general IT resources when I needed to
- I have been able to access specialised equipment/facilities/rooms when I needed to

Personal Development
-The course has helped me present myself with confidence
-My communication skills have improved
-As a result of the course I feel confident in tackling unfamiliar problems

Careers
-As a result of my course choice I believe that I have improved my career prospects
-Good advice is available for making career choices
-Good advice is available on further study choices

Course delivery
-Learning materials made available on my course have enhanced my learning
-The delivery of my course has been stimulating
-Practical activities on my course have helped me to learn.

Workload
-The work load on my course is manageable
-This course does not apply unnecessary pressure on me
-The volume of work means I can always finish work to a satisfactory level
-I am generally given enough time to understand the things I have to learn.

The students agreed or disagreed on a sliding scale as shown below, there was an opportunity to give an N/A non applicable answer. If the student did tick this box in the focus group later in the session, they were asked about that particular question.

Questionnaire Breakdown

The questionnaire results were then collated and analysed. The full break down can be viewed in *[fig 20.]* Below is an evaluation of the information that outlines particular precursors to potential policy, or supports the current information regarding, the areas that COMSC is struggling to gain NSS results in.

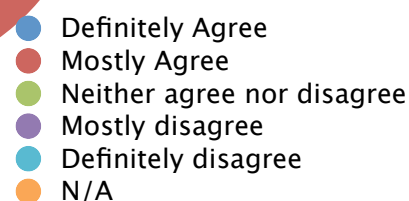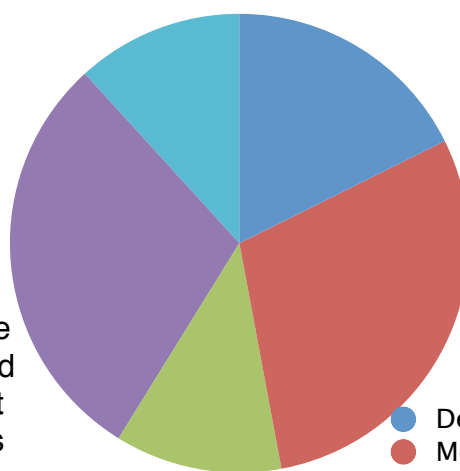# feedback on my work has been prompt
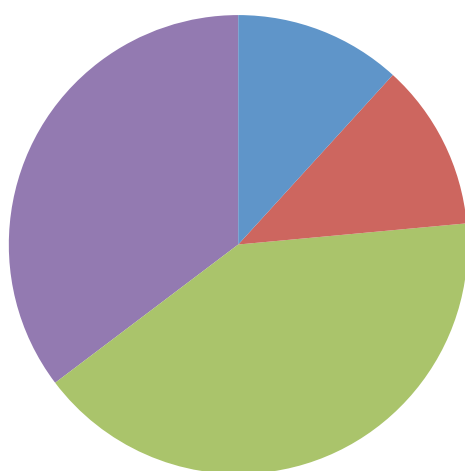
With 35% of participants disagreeing with this statement, and a further 41% neither agreeing or disagreeing, it is clear to see the currently quality and level of feedback is not satisfactory. Students explained during the focus group, that work was handed back after the agreed timescale on a number of occasions.

- Definitely Agree
- Mostly Agree
- Neither agree nor disagree
- Mostly disagree
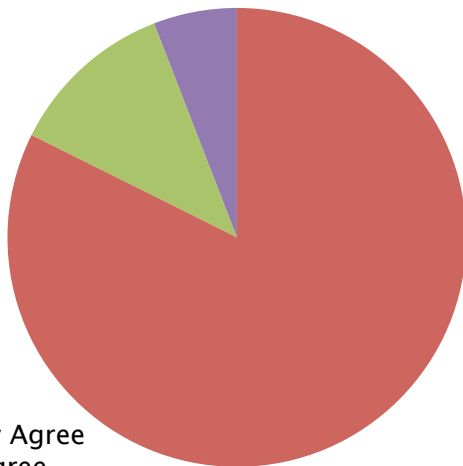- Definitely disagree
- N/A
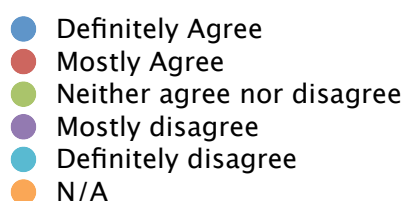
I have received detailed comments on my work

The above notion of quality of feedback is reinforced with the question regarding comments on formal work, with 41% of participants either disagreeing or strongly disagreeing with the statement. This leads the author to review the concept outlined by Flood (1999) Although it has been SSP policy to get work returned to students within 2 weeks, it is clear they are not receiving the work promptly enough and if they are the level of detail in regards to comments is not to a high enough standard. The system of meaning needs to be reviewed, until both student and staff are happy with the level of feedback being implemented.

- Definitely Agree
- Mostly Agree
- Neither agree nor disagree
- Mostly disagree
- Definitely disagree
- N/A

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staff are good at explaining things

With a resounding 82% agreeing to the above statement, it is clear students appreciate the level of detail staff go into when explaining problem areas. This same devotion needs to be reflected in comments and feedback on formal work.

- Definitely Agree
- Mostly Agree
- Neither agree nor disagree
- Mostly disagree
- Definitely disagree
- N/A

the delivery of my course has been stimulating

Only 53% believe the delivery of the course is stimulating. With 30% disagreeing with the statement, believing that material delivery is slow. Focus groups also highlighted that many staff members do not add value to lectures, by reading slides.
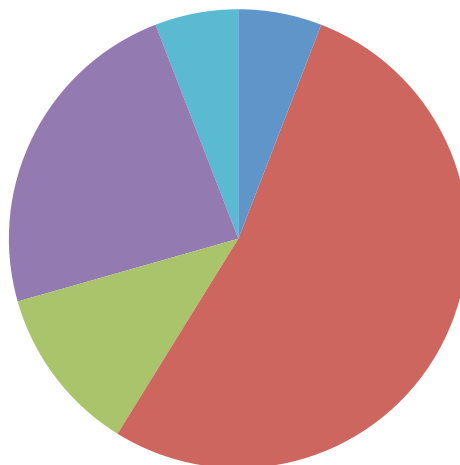
- Definitely Agree
- Mostly Agree
- Neither agree nor disagree
- Mostly disagree
- Definitely disagree
- N/A

practical activities on my course have helped me to learn

- Definitely Agree
- Mostly Agree
- Neither agree nor disagree
- Mostly disagree
- Definitely disagree
- N/A
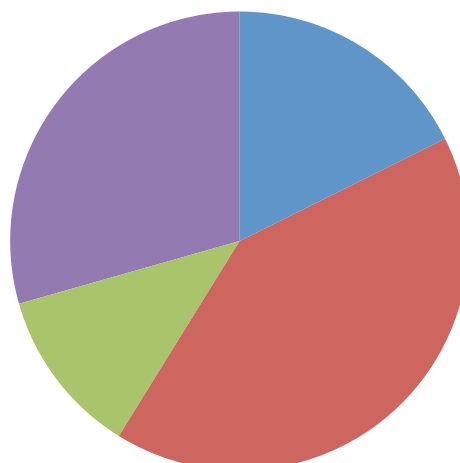
Although 61% agree with practical activities helping them to learn, 29% disagree. This point was discussed during focus group session 1. It was found the technical elements of practical work do not present themselves early enough in the degree scheme and students outlined the need for more technical skills to be taught earlier, allowing students to progress to more technical and interesting projects in the final year.

6.2 Focus Group

There were two focus groups in total. The first was year two students, a mixture of computer science and information systems students; there was a mixture of ages and a total sample size of 9 students. The second focus group was of final year students and again a mixture of computer science and information systems and varying in age. The following sections will recount the focus groups in their entirety , It will outline how the conversations developed and how the author steered conversation when needed.

Year 2 focus group undertaken on 1/3/12

As shown in the questionnaire evaluation above, students critiqued the questions after completion of the survey, with this being completed on a group basis.

Following a review of the questionnaire the focus group started, with individuals explaining why they had chosen Cardiff as their chosen institute to study at undergraduate level. All students had put Cardiff COMSC as their number one choice and had the following reasons for choosing it:

Four students said they came for geographical or funding reasons. Due to staying within wales, home students pay a decreased rate for tuition, as well as the Welsh baccalaureate helping them gain entry.

One student chose Cardiff because of the research and pervasive nature of the course

Two students had come to Cardiff because of the unique element IS had in the job market and because of the positive reviews they had read about the course.

Two students chose to come to Cardiff because of family influence, be it an older sibling or a parent that had been to the university.

Matter discussed in detail:
Students were disappointed that their expectations had not completely aligned with the reality of studying at COMSC, lots of mundane content meant students were disappointed with how lecturers read the slides word for word and did not add value during lectures. A further criticism was made that modules and the course as a whole were not as pervasive as marketed

A criticism was made of students not being taught learning tools early enough to be effective, and students would have liked to have more technical modules earlier on, allowing them to have more complex and interesting final year project.

A further point was made on the differing views relating to feedback. Students understood the importance of quality of feedback and support. This was in line with the author's assumptions. He believed it was not just the speed of response, when giving feedback on work but also the quality. The assumption extended from the student staff panel putting the "two week" policy in place regarding handing back of coursework results. This meant staff had two weeks from when the work was submitted to give the work back marked. This put increasing pressure on staff, and the complaints regarding quality of feedback did not subside. This was reflected in both focus groups. Students outlined the need for greater

substance in feedback This meant it was not just the speed of returning a mark, but a review of the students' work which was important.

" Channels of feedback" were discussed in both sessions. In the year two group, they remarked about the quality of feedback they had received in Omar Rana's module "Communication Networks" CM2302. Omar runs a Facebook page for the module, readily answering questions and putting links to content, exam papers and current course work. All in the focus group agreed that this method added value to the feedback process.

Year 3 focus group undertaken on 8/3/12

The year three focus group consisted of eight final year students:

One students chose Cardiff because of past experiences attracting them to Cardiff.

Three students said they came for geographical or funding reasons. By staying in Wales to study, home students pay a decreased rate for tuition, as well as the Welsh bachollaurete helping them gain entry.

Two student chose Cardiff because of the unique element IS gave to a student looking to proceed into the graduate job market.

Two students chose to come to Cardiff because of family influence, be it an older sibling or a parent, or family friend that had been to the university.

A major point of contention that was raised was regarding the expectations students had. It was a split down the middle of the group, half of the students, had researched the course and subject area to some degree, and were therefore not particularly surprised about the course content, a note of mundane examples within modules being. The other half of the group, who had done less research, and had come without knowing much background information about Cardiff, had found the course more technical than they had hoped, leaving them wanting more business elements. They also agreed with the note of mundane content being included in modules.

The statement of "boring content was continued, with final year students outlining that they wanted content directly linked with what is seen in the current graduate job market of current day. A student highlighted how the web development they had been taught using frames to create web pages was dated and not completely relevant when compared to the task being completed by current graduates.

The question of "What influenced students decisions when partaking in the NSS", was then broached, and there were both positives and negatives. Three of the students outlined their dissatisfaction with the school and how they would be honest about the teaching and feedback quality, potentially being more negative due to their own personal experience.

 The others came to the subject of them soon becoming alumni. They realised it would only be positive for them to support the school by becoming a part of the alumni. This meant joining through LinkedIn and being an active part of discussions where possible.

"We are alumni. Why would we bad mouth the brand we represent"
Year 3 IS Student

One student outlined how they were less concerned about reviewing NSS they were after gaining confirmation they had a graduate position at a company. Two students agreed with this opinion. The same was outlined for the other end of the spectrum, with a student outlining the concern on a recently received mark (poor) and how they would be critical when it came to NSS.

Communication channels were discussed in the focus group. The author mentioned Professor Rana's module from the previous year, and all agreed on quality of feedback being very high. IS students then went on to cover the importance of the " Year 3 IS " Facebook page that a fellow student set up. It allowed them to discuss work, problems and support each other throughout the year. This was remarked as adding tremendous value to the community.

6.3 Assumptions & Information Taken From Focus Group

Students' reasons for coming to Cardiff were very different than first assumed. Word of mouth was inherently powerful, as many students had come because of siblings or parents. Another reason that the author did not predict would have such a profound effect was the amount that chose Cardiff due to geographical reasons. Either they had jobs they did not want to lose, home was close by, and thus a cheap living option, or they were Welsh natives and the financial incentive to stay in Wales was too large to refuse.

Several students had benefited from the hindsight of siblings who had studied at Cardiff COMSC, the potential for using word of mouth for marketing COMSC was becoming clear, the school has a strong alumni network and with social networks such as LinkedIn only growing, the strength and potential use of alumni is becoming ever stronger.

When supporting the assumptions taken from the focus groups, the author found Dr Oliver Grasl's concept of market development increasingly significant.[fig below] As highlighted below, the model signifies the importance of marketing through word of mouth. It also highlights the concept of a total market alongside a notion of changing entry requirements, and the affect it may have of total market size.
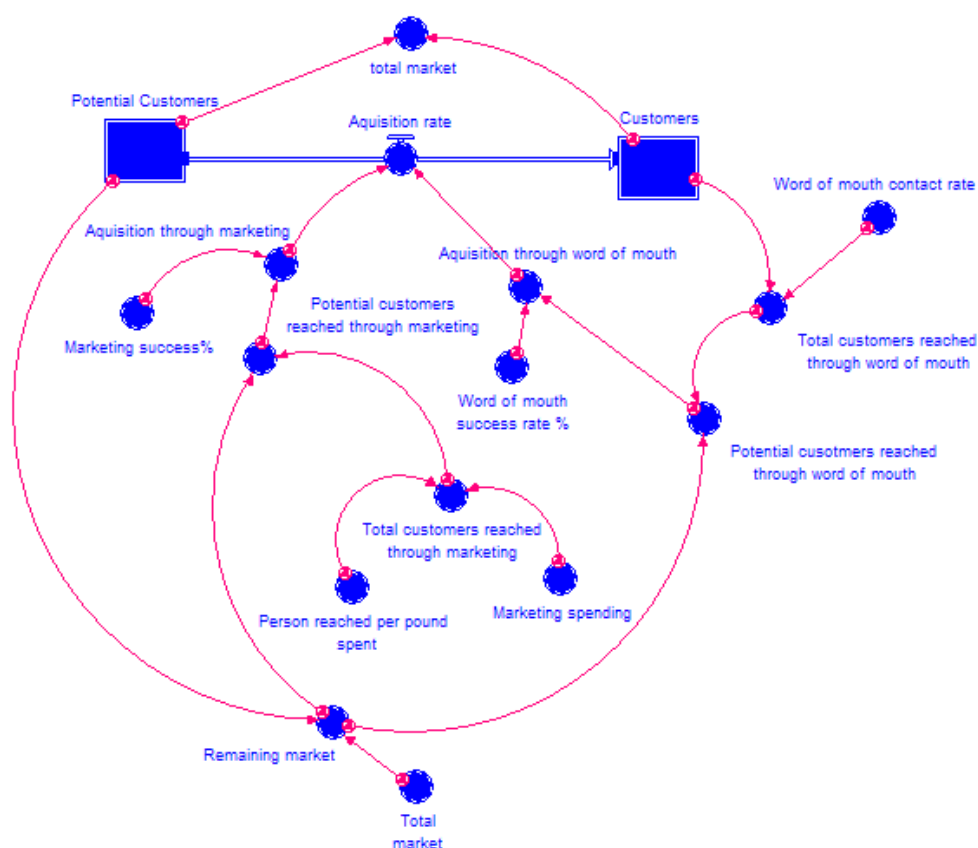
[fig 21. Dr Grasl's version of The Bass diffusion Model of market development]

The importance of past students, alumni members, and the people attached to prospective students were all realised. The possible strength of an alumni network was also highlighted. The author, since embarking on this study, has become an alumni member and tracked the use of LinkedIn, throughout the community. Discussions are started regularly on this social network. They cover topics from "importance of subject taught at university" to "managerial styles in commerce" fand rom the level of response the group gains, it is fair to assume the alumni network have a large part of the UK canvassed in regards to where past students have now put down foundations.

Further to this, the focus group also circles the possible use of an alumni network when coupled with the evidence of students and ex-students having an emotional attachment to the brand that is Cardiff university.

According to Thomson (2009) "Over the course of their lives, consumers interact with thousands of brands, but they develop attachments to only a few"

This is particularly noticeable with the attachment shown from students to their university or establishment, where they gained their bachelor's degree. This is because it has a large impact on moulding them as a person, and aligning them to the world of work. This tremendous attachment could possibly be harnessed by COMSC to help market their courses and school as a whole.

6.4 Value Added Score

[fig 22. Classification of entry bands]

Entry band	Grouping for Use in Calculations	Highest qualification on entry
1	Higher degree of UK institution	(01) Higher degree of UK institution
2	Postgraduate Qualifications	(02) Postgraduate diploma or certificate, excluding PGCE (03) PGCE with QTS/GTC Registration (04) PGCE without QTS/GTC Registration (05) Postgraduate equivalent qualification not elsewhere specified
3	First degree of UK institution	(11) First degree of UK institution
4	Degree equivalent (EU, OS, or with QTS)	(10) Undergraduate qualifications with QTS (12) Graduate of EU institution (13) Graduate of other overseas institution (16) Graduate equivalent qualification not elsewhere specified
5	GNVQ levels 4&5	(14) GNVQ/GSVQ level 5 (15) NVQ/SVQ level 5 (26) GNVQ/GSVQ level 4 (27) NVQ/SVQ level 4
6	HE Credits	(21) O.U. credit(s) (22) Other credits from UK HE institution
7	CertEd or DipED	(23) Certificate or diploma of education (i.e. non–graduate initial teacher training qualification)
8	HNC or HND	(24) HNC or HND (including BTEC and SCOTVEC equivalents)
9	Dip HE.	(25) Dip HE.
10	Other HE qualification of less than degree stand	(30) Other HE qualification of less than degree standard
11	ONC or OND	(41) ONC or OND (including BTEC and SCOTVEC equivalents)
12	Foundation Degree	(31) Foundation Degree
13	Foundation course at HE level	(29) Foundation course at HE level
14	Foundation course at FE level	(43) Foundation course at FE level (72) Diploma in Foundation Studies (Art & Design)
15	Access Course	(44) Access course (QAA recognised) (45) Access course (not QAA recognised) (48) ACCESS course (Code only available if COMDATE before 01/08/2002).
16	Baccalaureate	(47) Baccalaureate
17	GNVQ levels 2&3	(37) GNVQ/GSVQ level 3 (38) NVQ/SVQ level 3 (57) NVQ/SVQ level 2
18	Other non–advanced qualification	(56) Other non–advanced qualification, (94) Advanced Modern Apprenticeship
19	GCSE/'O' level qualifications only	(55) GCSE/'O' level qualifications only; SCE 'O' grades and Standard grades
20	Professional qualifications.	(28) Professional qualifications.
21	Mature Students (admitted on prior experience)	(93) Mature student admitted on basis of previous experience (without formal APEL/APL) and/or institution's own entrance examinations
22	Other non–UK qualification, level not known	(97) Other non–UK qualification, level not known
23	Not Known, None or APL	(92) Accreditation of Prior (Experiential) Learning (APEL/APL) (98) Student has no formal qualification (99) Not known
24–50	See Tariff Score banding below	(39) 'A' level equivalent qualification not elsewhere specified (40) Any combinations of GCE 'A'/SCE 'Higher' and GNVQ/GSVQ or NVQ/SVQ at level 3

The above [fig 22] is the "Classification of Entry Bands" used by the Guardian for their ranking system, in regards to value added score (VAS) There are 50 entry bands in total (column 1) which are then grouped together for use in the Guardian's calculations (column 2) and each qualification is described in (column 3) which is a description of the students highest achieved qualification to date.

Below is a simulation of how the Value Added system works*[fig 23.]*, using an example of a small department. You can alter the drop-down values to see how different types of student would score.

The data draws upon the HESA dataset of qualifying full time first degree students in 2009/10. Each student is assigned to an entry band according to their highest qualification on entry or, if their highest qualification on entry is A-levels / Scottish Highers, the tariff that they achieved. Each band carries a probability of 'success'. If the student achieves a 1st or 2:1 they score the reciprocal of the probability, otherwise they score zero.

Student Ref	Highest Qualification on Entry	Tariff	Entry Band	Probability of Success	Degree outcome	VAS	Count for score denominator
S1	(30) Other HE qualification of less than degree standard	120 to 139	29	47%	1st	2.14	1
S2	(31) Foundation Degree		12	50%	2:1	2.01	1
S3	(44) Access course (QAA recognised		15	53%	2:2	0.00	1
S4	(40) GCE Alevels	140 to 159	30	42%	1st	2.41	1
S5	(47) Baccalaureate		16	76%	unclassified	0.00	0
S6	(40) GCE Alevels	200 to 219	33	47%	1st	2.13	1
S7	(37) GNVQ/GSVQ level 3		17	57%	2:1	1.75	1
S7	(40) GCE Alevels	360 to 379	41	76%	1st	1.32	1
Value Added Score for Department:				**1.6798**		**11.75**	**7**

[fig 23. Example of VAS being calculated]

Student scores are averaged across the department, but students with unclassified awards are excluded. Scores above 1 are 'good' (the students have exceeded expectations) and scores under 1 are 'bad' (fewer students achieved 1st's and 2:1's than expected). However, when using this data, it must be realised, we need to be sensitive to different subject expectations. The model shows how easily a department's VAS can change depending on which students they recruit, or have enrolled on a course.

Tariff Points Being Awarded to Entry Bands 24-50

Tariff	Entry Band
1 to 39	24
40 to 59	25
60 to 79	26
80 to 99	27
100 to 119	28
120 to 139	29
140 to 159	30
160 to 179	31
180 to 199	32
200 to 219	33
220 to 239	34
240 to 259	35
260 to 279	36
280 to 299	37
300 to 319	38
320 to 339	39
340 to 359	40
360 to 379	41
380 to 399	42
400 to 419	43
420 to 439	44
440 to 459	45
460 to 479	46
480 to 499	47
500 to 539	48
540+	49
Unknown	50

[fig 24. Relationship between UCAS tariff and entry bands]

The Guardian represent each band (24-50) from the classification of entry band document *[fig 22.]* Giving each student an amount of tariff points (UCAS), this allows for a sliding scale, meaning that students with A-level or equivalent can be supported with tariff points to apply to university. For the Guardian it allows a student to have a success rating attached to them. This then is factored into the VAS for the ranking.

The standard banding completed by the Guardian was an elongated banding system, totaling 50 bands in all. This obviously allows acute detail to be applied. It was decided that such a banding system would not be suitable if the author wanted to model this data further. Due to this, banding was then ordered as you can see below[fig below]. This made the banding data manageable for use in a system dynamics simulation.

[fig 24. Original banding]   [fig 25. New banding]

Banding	Probability
1	70.30%
2	59.10%
3	73.10%
4	62.80%
5	46.50%
6	62.90%
7	55.20%
8	54.90%
9	49.00%
10	55.70%
11	49.90%
12	49.70%
13	48.00%
14	63.60%
15	53.30%
16	75.50%
17	57.10%
18	57.60%
19	58.00%
20	62.20%
21	60.60%
22	60.00%
23	58.90%
24	49.80%
25	49.90%
26	52.50%
27	44.50%
28	46.30%
29	46.80%
30	41.50%
31	42.60%
32	45.40%
33	47.00%
34	51.00%
35	54.90%
36	57.90%
37	61.10%
38	64.90%
39	68.80%
40	72.40%
41	75.70%
42	78.20%
43	81.30%
44	84.10%
45	81.90%
46	85.00%
47	88.10%
48	87.10%
49	89.50%
50	62.90%

(1)
The banding was ordered by probability of a student getting a 2:1 or higher (What is seen by the Guardian as a successful pass)

(2)
This probability was then separated into 5 sections, giving an average probability for each.

(3)These 5 sections were then put into bands: A-E, this made the sections identifiable, and would allow for manageable use when put into the simulation model in the Ithink program.

Each band was then given a per student value added score:

A = 2.19
B = 1.92
C = 1.71
D = 1.51
E = 1.21

This figure would contribute in the simulation modeling.

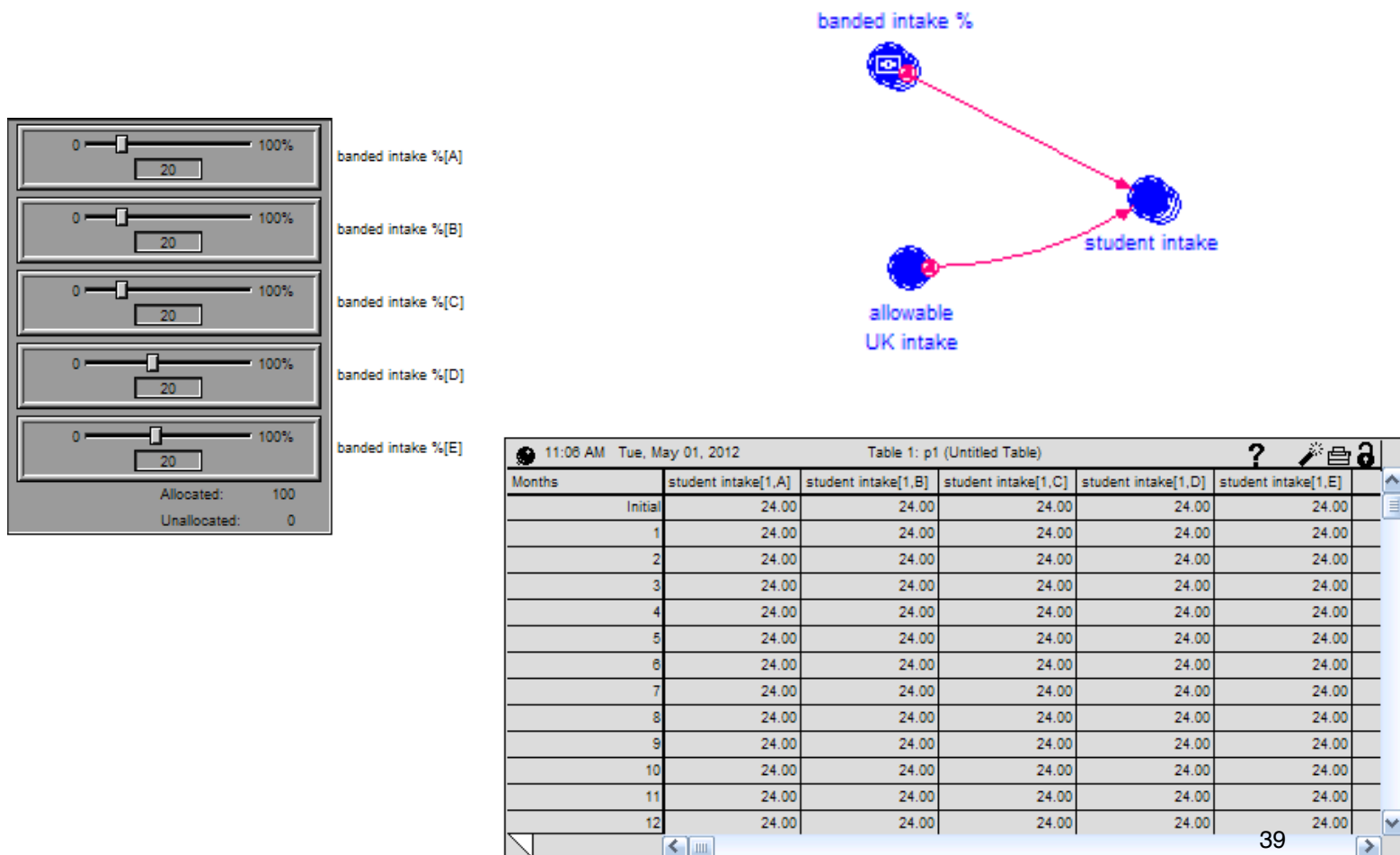| Banding	Probability (1)	Average Probability(2)	New Band(3)
30	41.50%		
31	42.60%		
27	44.50%		
32	45.40%		
28	46.30%	45.76%	band A
5	46.50%		
29	46.80%		
33	47.00%		
13	48.00%		
9	49.00%		
12	49.70%		
24	49.80%		
11	49.90%		
25	49.90%		
34	51.00%		
26	52.50%	52.11%	band B
15	53.30%		
8	54.90%		
35	54.90%		
7	55.20%		
10	55.70%		
17	57.10%		
18	57.60%		
36	57.90%		
19	58.00%		
23	58.90%	58.60%	band C
2	59.10%		
22	60.00%		
21	60.60%		
37	61.10%		
20	62.20%		
4	62.80%		
6	62.90%		
50	62.90%		
14	63.60%		
38	64.90%	66.39%	band D
39	68.80%		
1	70.30%		
40	72.40%		
3	73.10%		
16	75.50%		
41	75.70%		
42	78.20%		
43	81.30%		
45	81.90%		
44	84.10%	82.64%	band E
46	85.00%		
48	87.10%		
47	88.10%		
49	89.50%		

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6.5 Modeling The Value Added Score

The author created a simple representation of the COMSC department, in an effort to outline the effects on value added scores, and what impact these scores could have on the school as a whole. The model consisted of an intake, which was created using an array data set. This data set was gained from the Guardian metrics team. The data gave a representation of what each "band" of student is likely to achieve (probability of a 2:1 or higher) when undertaking undergraduate education. The model relied on estimated figures when applying a dropout rate, as this information was not readily available so an estimate was used in its place. The model tracked year one, two and three students from intake to graduation, while also factoring in job seeking and successfully gaining a career within six months. The figures used for this success rate were from the Guardians 2011/12 data set. The students remaining at the end of three year, who had graduated were then reviewed. By using an array the author could track individual bands through the model and look at the value added score at the end of a cycle. The assumption was made that the dropout rate was applied evenly over all bands, no onus was put on any one band in particular.

The value added score is marked out of ten. In the 2012 Guardian rankings for Computer Science and IT Bournemouth University are at the top of the chart with maximum marks. Cardiff in the same academic year scored three.

Firstly, the array needed to be tested, to make sure it was distributing students correctly. The maximum intake for students that affect VAS is 120 FTE, and this was set as the upper limit. Bands A-E were then controlled using a slider input device, allowing the author to distribute the 120 students as a percentage over the five bands.

[fig 26. Testing banded intake array]

Months	student intake[1,A]	student intake[1,B]	student intake[1,C]	student intake[1,D]	student intake[1,E]
Initial	24.00	24.00	24.00	24.00	24.00
1	24.00	24.00	24.00	24.00	24.00
2	24.00	24.00	24.00	24.00	24.00
3	24.00	24.00	24.00	24.00	24.00
4	24.00	24.00	24.00	24.00	24.00
5	24.00	24.00	24.00	24.00	24.00
6	24.00	24.00	24.00	24.00	24.00
7	24.00	24.00	24.00	24.00	24.00
8	24.00	24.00	24.00	24.00	24.00
9	24.00	24.00	24.00	24.00	24.00
10	24.00	24.00	24.00	24.00	24.00
11	24.00	24.00	24.00	24.00	24.00
12	24.00	24.00	24.00	24.00	24.00

Table 1: p1 (Untitled Table) — 11:06 AM Tue, May 01, 2012

As shown above in the model, the intake is sufficiently restricted to 120 students. The array is dispersing the correct amount of students throughout the array. This was executed using the sliders on the left hand side of fig 26. It allowed the author to distribute the students across the bands as he tested different aspects of the policy.

The complete model used for testing value added scoring:

Intake bands: data from the HESA 2011 data set was taken by the Guardian and put into 50 bands. The author then simplified this banding system in to 5 bands.

Dropout rate: were defined as predetermined figures -
     Year 1 - 10%
     Year 2 - 5%
     Year 3 - 2.5%

Progressing: this is calculated using the year one total intake - year one drop outs. The second year is calculated in the same fashion, year 2 students - year 2 drop outs, and so on.

Seeking employment: it is assumed that all graduates will be seeking employment, be it in a graduate role or within further education.

On Career path: this calculates the estimated number of students to be on a career path within 6 months. This is calculated from -
     the total number of graduates x employment rate. This figure is again taken from the Guardian data set.

Students achieving success is calculated from total number of banded students x the success rate of their band.

Value added: this is then calculated using the value scores for each student depending on which band they originated from.

This is then summed and ranked to stay in line with the Guardians default method of analysis.
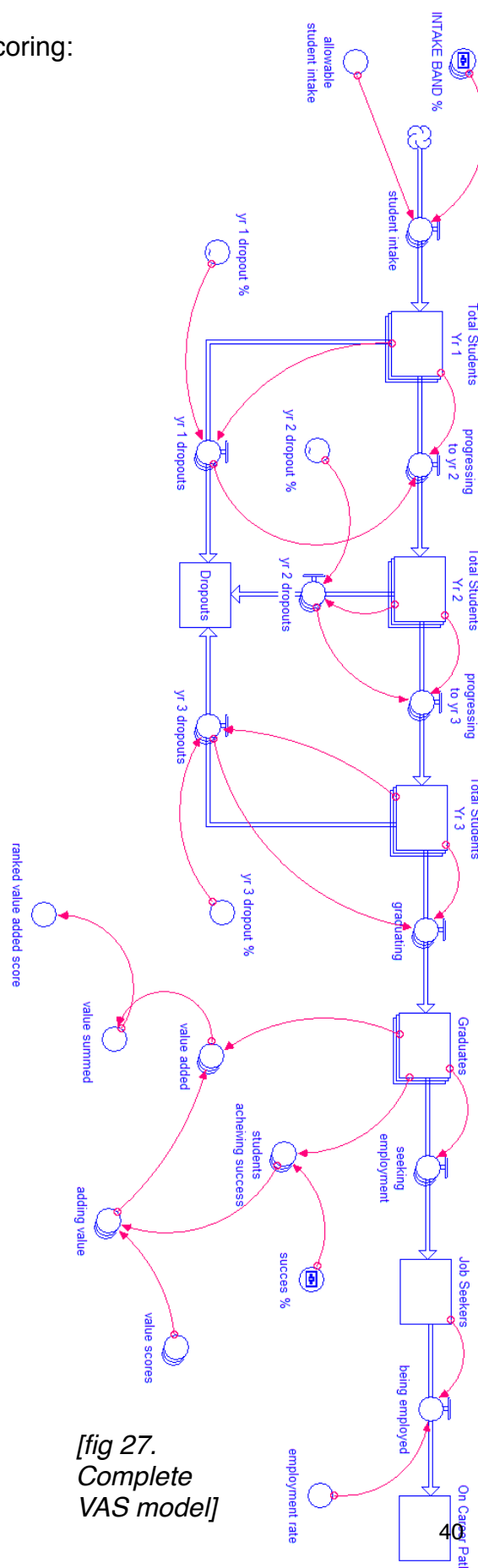
[fig 27. Complete VAS model]

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The concept of allowing different students from different educational background was then tested. The success % of students getting a 2:1 or higher was calculated from COMSC historical data shown below.

Year	Students graduating with 2:1 or 1st	Total student graduating	Success rate shown as %
07/08	53	117	45
08/09	66	132	50
09/10	58	113	51
10/11	54	88	61

Value added is calculated using the likelihood of a student achieving a 2:1 or 1st. For the purpose of this project the value has been mapped to one of five bands based on entry criteria *[fig 22.]*

- Band A = 45.7% giving a score of 2.19 per student
- Band B = 52.1% giving a score of 1.92 per student
- Band C = 58.6% giving a score of 1.71 per student
- Band D = 66.4% giving a score of 1.51 per student
- Band E = 82.6% giving a score of 1.21 per student

The modeling ran diagnostics for all four of the above years of data. Within these four runs, four lines were plotted on each graph.

Run 1 = Equal distribution over all five bands (blue)
Run 2 = Weighted distribution towards A and B (red)
Run 3 = Weighted distribution towards bands D and E (pink)
Run 4 = Weighted distribution towards band C (green)

The run time used on the models is a a three year period. This allows for the band of students to go through each academic year, allowing the dropout rate to take effect, and for graduates to be produced on the other side of the model. The distribution of students through the bands was again executed using the sliders seen in *[fig 26.]*. Although the Y axis changes in value, all of the bellow graphs are set to the same scale.
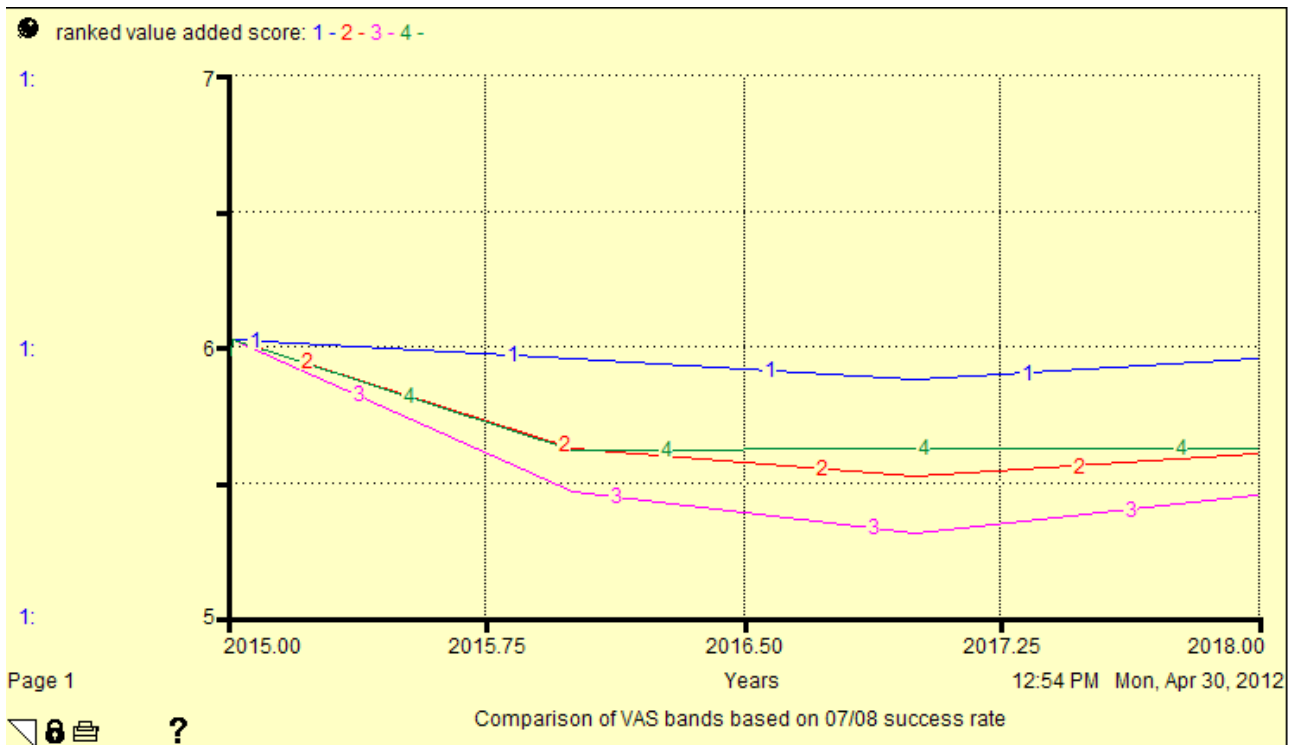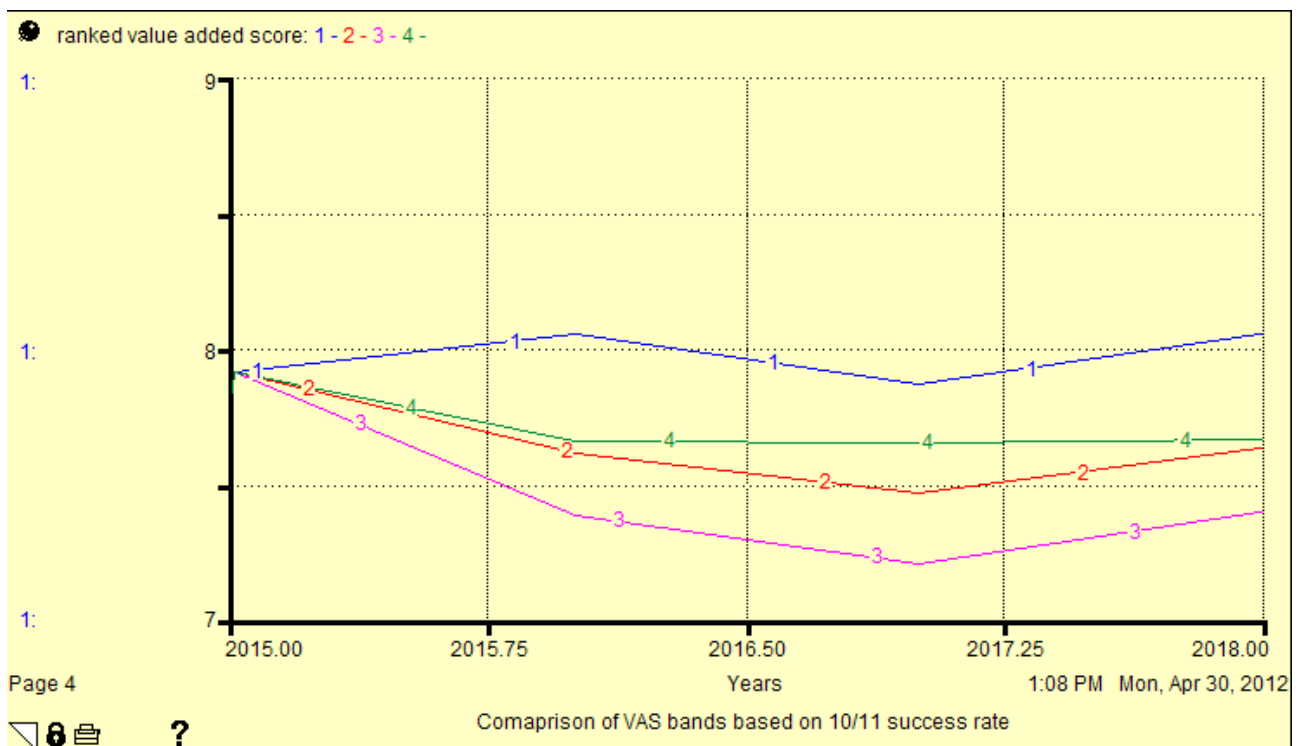
[fig 28. Ranked value added score using success rate: 07/08]
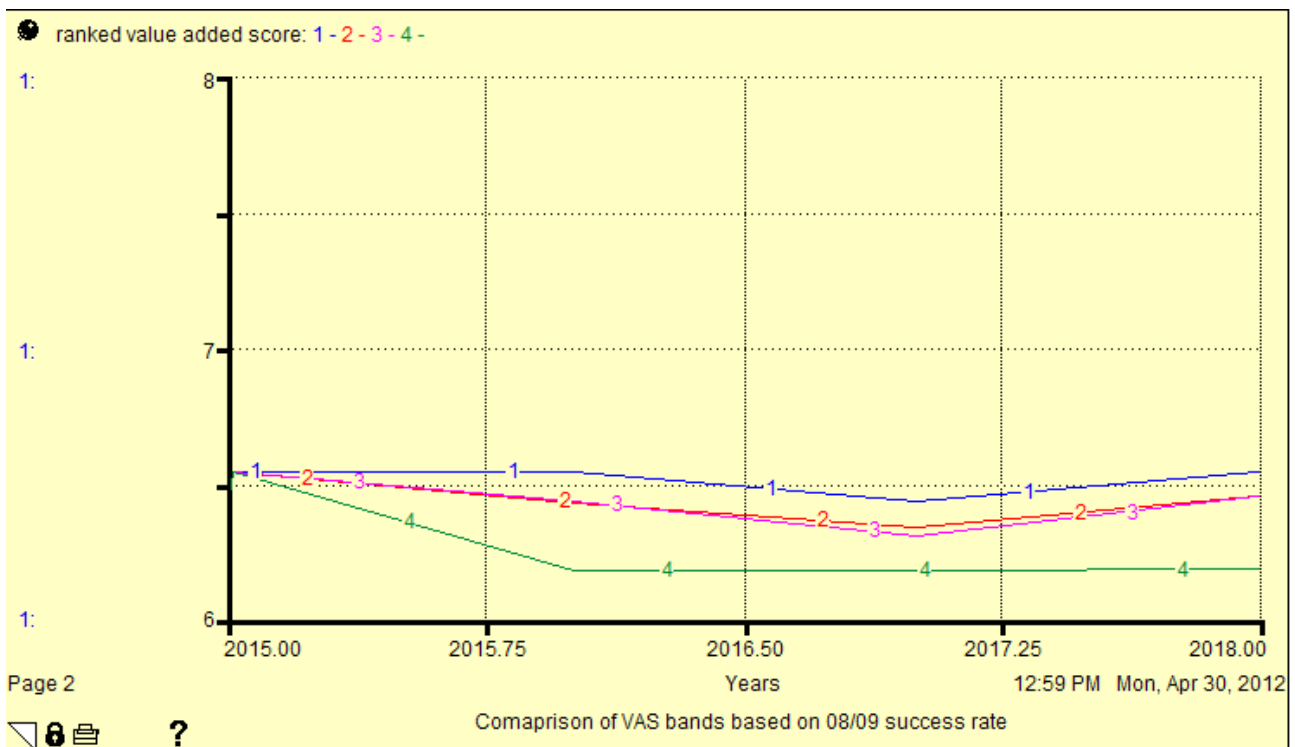
[fig 29. Ranked value added score using success rate: 08/09]
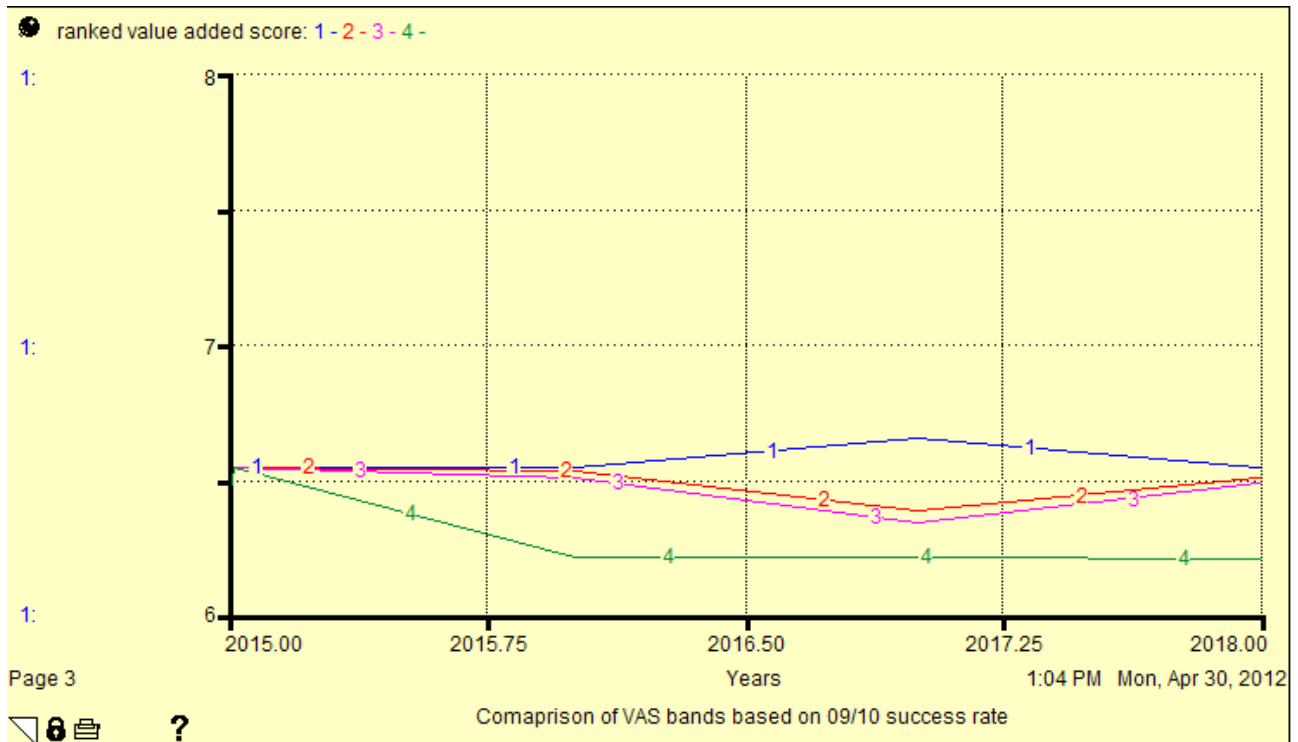
[fig 30. Ranked value added score using success rate: *09/10]*

[fig 31. Ranked value added score using success rate: 10/11]

All graphs show that an even distribution throughout the banding system gives a positive increase in VAS score for overall Guardian rankings.

Weighting towards D and E, which are seen as the more standard entry routes for students (A levels, BTEC), is not always necessarily a positive decision. As outlined in graph 07/08 with the VAS mark per student almost a whole point lower.

An interesting conclusion was found when looking at 08/09, where the success rate was at 50%, both weighting towards A and B, and C and D were a very similar value added score. This lead to the assumption that the success rate was also a point to review in future work.

Throughout all years of data it is clear to see that, as the success rate increases, the choice of equal distribution through all bands is the most viable option. When the success rate is at its highest *[fig 31]* the distributed option (blue) is adding almost a whole point more value per student. This point is reinforced when reviewing the progress of Run 3 which tracks weighting towards band C. As seen in the final graph, this option also becomes more viable as the success rate increases, ranking above A+B and C+D weighting.

When comparisons are made between each academic year conclusions can be drawn regarding the effect of success rates. When looking at 07/08 and a success rate of 45% the average VAS is 5.75 per student, taking all banding approaches into consideration. Compare this to 10/11 where the success rate was 61%, the average VAS was 7.75 per student. That is two whole value added points higher. When taking this information and putting it into conjunction with the Guardian's scoring system, a jump of two value added points can make a significant difference. The COMSC department currently has a score of 3 for VAS. If this could be raised to just 5 it would be a huge progression, benefiting the ranking within the Guardian scoring system.

Although the exact distribution of student, through different VAS bands could be further investigated, this modeling outlines the concept that to review and be conscious of student banding can have a positive affect on your Guardian scoring. It can also have a positive effect whilst not being detrimental to the number of total students graduating with satisfactory degree classifications.

By increasing the entry bands of band A or B students, the value added score can be increased considerably. However, that is assuming those students can be encouraged and supported into achieving the desired grades. This included appropriate support on course material, feedback and constructive criticism on course work. Now knowing the VAS element could have a positive impact on the schools overall Guardian score , the author would like to see, through future work, an investigation into success rates and why the COMSC success rate varies so much year on year.

7. Future Work

As mentioned within the conclusion, the potential scope if this project was gigantic. The author had to take a small section of the problem area and investigate that. This left the door open for a vast amount of future work.

One piece of work that would be included in future iterations of study would be the concept behind modeling the Guardian's ranking system as a whole. Due to the staff at the Guardian explaining the mathematics of the problem area, the author believes with time to research and gain appropriate data, the whole ranking system could be modeled. Metrics such as spend per student were too complicated to make accurate without further data. This model would allow data to be input to any one of the six influencing factors in the scoring system. A possible concept of the model in I-think:
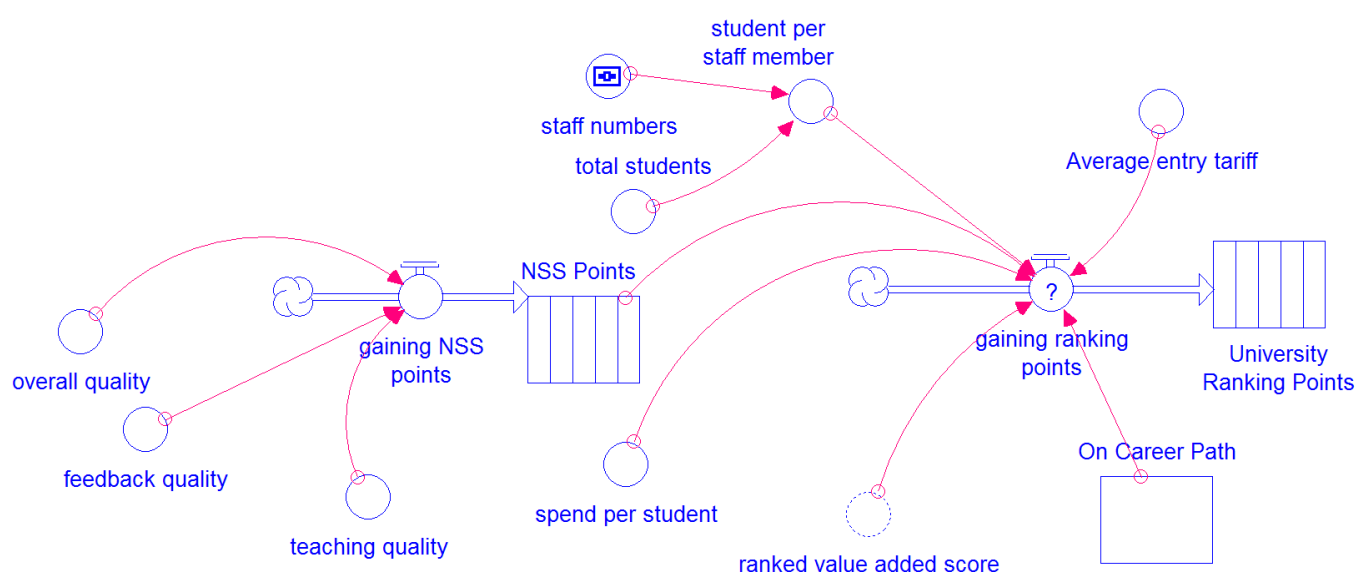
Component	Value
teaching weeks	24
exam weeks	6
hrs per module	80
number of modules	12
staff work weeks	48
staff work hours	40
teaching hrs	10
research hrs	10
number of students	120
coursework	12
exams	12
total admin hrs	2880
total number of staff	40
student work hours per week	32
staff work hours per yr	38400
remaining hrs per week	51200
total staff hours	76800
teaching hours	9600
admin hrs (inc. marking)	2880
Annual hours remaining	64320
per week	1340
support hrs per student	11.1667

A further investigation would also be carried out regarding the support hours available within university institutions. Research would go into the hours staff have available to offer to students and these support hours could be used for feedback, supporting with course content. Investigation would also feed into the impact of student to staff ratio and, total support hours available per student. The knock on affect of support hours onto drop out rate would be studied in detail.

The document alongside, outlines some estimations for available support hours. The figures are no more than estimations, but are based on genuine weeks and hours that staff and students attend COMSC, be it to work or to study.

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8. Conclusion & Policy Recommendation

The scope for this project was always very large. The author has taken elements of the entire problem area, evaluated them, researched and gained information requirements, then tested policy. As will be explained in the future work section, this project's possible size means it could have been conducted over several years rather than the months that were allocated for final year projects. This said, below are conclusions and information regarding policy review for COMSC management.

A recommendation for COMSC is: To review what band of home FTE students they offer places to each year. Furthermore dvised review of the value added score each student would supply COMSC with, when graduating with a 2:1 or higher. This score will obviously differ depending on student, meaning the whole value added score for the department could change depending on the students within a particular years intake. The review of value added score, especially as it is currently so low at Cardiff COMSC could be a way to improving the overall ranking awarded by the Guardian. From modeling it was clear scores can change drastically just by weighting the intake towards a particular band of student.

From review of both the questionnaire and the focus group ran within this study there are points of recommendation regarding the the national student survey (NSS) score, that COMSC receive annually. Firstly a reviewed system of meaning (Flood 1999) needs to be actioned. This is whereby the staff and the students come to an agreement on how feedback and support should be handled. This includes but is not limited to:
- The timescale in which course work is handed back to a student
- The feedback which is included with, or on the work itself. This includes the manner and medium in which the coursework is returned (email, in person etc.)
- The communication channels which are available for staff and students to liaise through. This includes the use of social networks and interactive forums (blackboard) for information to be readily available on.

The above list, although not extensive, are definite angles for COMSC to review and potentially improve on. The general feedback from all of the participants in the focus group centred on one salient point, which was, the quality of the feedback, and mainly the length of comments and support with work, were not met. If COMSC could focus on those two points, I feel the evidence shows that their NSS score would improve.

Further improvement of the NSS and general marketing of COMSC as a degree scheme can be implemented through the use of Cardiff's strong alumni network. This could include the use of LinkedIn to spark popular conversation amongst prospective students and alumni members. It could also be used for Alumni to inform potential students of the benefits gained for having a degree from COMSC. This could include alumni members explaining where they are now in their careers, or the options made available to them due to choosing Cardiff COMSC as an undergraduate platform.

9. Reflection on Learning

A title change in this project cam quite late on. From the ongoing information I was receiving from studying influence diagrams, I realised it was not just the NSS I needed to be aware of, but the Guardian ranking as well. All the information in my influence diagram that I wanted to research and delve deeper into was apparent in the Guardian ranking system. Changing the title, although widening my scope even further, was a positive addition to the project, as it allowed me to research the areas that mattered and not be limited to areas that did not.

Learning to note down trains of thought was a skill I did not have at the beginning of this project. I would be thinking of an idea late at night and say to myself "I'll type that up in the morning", but morning came around and the idea had completely gone. Soon I learned, regardless of the time or place, note your thoughts down, and take note of evidence or sources used. As the project progressed I realised how much this process helped me.

Learning new techniques and the mechanics of new programs were harder than first imagined. Throughout this project I used two pieces of software I had not used before. The first was Vensim PLE, which I constructed my influence diagrams in. This was quite a straight forward piece of software, but nonetheless it took time to adapt and be efficient at using the software, and benefit from all it's features.
The second piece of software was far harder to get to grips with, IseeSystems' Ithink., which I used for my qualitative modeling. The piece of software is very complex when using it for tasks which require great detail. The UI is good but not everything is obvious, also the program is relatively buggy, so I had to learn my way around that. The time used just to master the software was way beyond my estimated time. This meant many extra hours modeling than first thought.

A further skill I learnt was asking questions, and how it is a very powerful asset to possess. Take for instance the Guardian metric for calculating the rankings. Without asking about it, I would have never known the ins and outs of the university guide. A simple email, and a very friendly response, meant I could understand the system I was looking at.

My final point I would like to reflect on is scope, and scope creep. I realised from the feedback I had received from the interim report, that my outlined scope was originally way too large. I wanted to model the whole guardian ranking system, this was just not realistic. I decide to focus on VAS, which is largely an unknown subject and the concept of feedback and support (NSS) . I felt I researched, outlined and modeled it well. In a perfect world I would have modeled the whole ranking, but knowing when you have taken on too much is a good skill to possess. I feel I completed a project to the best of my abilities and have solid ideas for future work.

10. References, Appendices & Figures

References

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Coyle, R.G (1996). System Dynamics Modelling. Florida: Chapman & Hall. Whole book.

Flood, R (1999). Rethinking The Fifth Discipline: Learning Within the Unknowable. London: Routledge. 110-115.

HESA data set available at : http://www.hesa.ac.uk/ accessed April 2nd 2012.

Norton, T. (2007). Enhancing the Student Experience. Available: http://www.1994group.ac.uk/documents/public/SEPolicyReport.pdf. Last accessed 20th April 2012.

Steen, P. (2011). Do all unis offer value for money on £9k tuition fees?. Available: http://conversation.which.co.uk/money/tuition-fees-universities-9000-value/. Last accessed 21st April 2012.

Wilson, B (2001). Soft System Methodology. West Sussex: John Wiley & Sons. 2-11.

NB; Larger appendices and figures are attached as separate PDF's

Appendix 1. Evidence For Assumption Table

1. Information for international students:
Cardiff University. (2012). 10 Good Reasons to Choose Cardiff University. Available: http://www.cardiff.ac.uk/for/prospective/inter/study/lifeatcardiff/10goodreasons/index.html. Last accessed 20th April 2012.

Home students: University of Birmingham. (2011). Living starts here. Available: http://www.birmingham.ac.uk/Documents/students/accommodation/University-of-Birmingham-accommodation-guide.pdf. Last accessed 20th April 2012.

2. From research both in the Cardiff area and other University residences, it is clear, as long as you choose your letting agency wisely, that extra money increases the quality of living (how rooms are finished, quality of furniture, general level of cleanliness throughout) Coupled with this, extra cost gets you a property with better amenities and superior location for access to university buildings

3. Norton, T. (2007). Enhancing the Student Experience. Available: http://www.1994group.ac.uk/documents/public/SEPolicyReport.pdf. Last accessed 20th April 2012.

4. social life and extra curricular activities high on student wish list for prospective universities: The Times. (2011). My Wish List. Available: http://www.timeshighereducation.co.uk/story.asp?storycode=311362 . Last accessed 20th April 2012.

5. Uni of nottingham have put work into studying quality of staff reflecting in national and international rankings: True, H. (2011). University Profile. Available: http://www.whatuni.com/degrees/university-uk/University-Of-Nottingham-ranking/3756/page.html. Last accessed 21st April 2012.

6. Below is a list of staff and their primary interest areas. Not only does this indicate the breadth of research in the department, it is a good guide for prospective students looking for specialist supervision for their research project.: Department of philosophy . (2012). Staff Research Interests. Available: http://www.dur.ac.uk/philosophy/research/research_interests/. Last accessed 21st April 2012.

7. Quality of staff and student relationship: Blaga, L. (2008). The Quality of Academic Staff: Student Assessment versus an evaluation of the emotional intelligence. Available: http://www.sefi.be/wp-content/abstracts2009/Dusequality.pdf . Last accessed 21st April 2012.

8. Focus group outlined students who had researched Cardiff and COMSC were not as shocked when discovering course content and what the degree scheme entailed.

9. During focus group reasons were given that students who had dropped out earlier in the year or during year 1 had not completed core elements of the course well, and had not understood what the COMSC degree scheme fully entailed

10. From background - when deconstructing Guardian league table it showed NSS makes up 25% of total marks awarded.

11. From evidence in questionnaire one *[fig 11.]* it shows that the Guardian is the premier resource for prospective students to use, closely followed by the Times.

12. google analytics showed first time viewers of site that website was affective resource, also talking to head of budget, large amount of the budget are spent on advertising material.

13. focus group outlined how much of an impact word of mouth had on students decision to study at Cardiff COMSC, siblings, parents and close friends all impacting on decision making.

14. bass diffusion method shows that as the total market increases, possible customers increase *[fig 21.]*

15. focus group outlined importance of geographical location and competition within that geographical location.

16. information of value for money and tuition fees : steen, P. (2011). Do all unis offer value for money on £9k tuition fees?. Available: http://conversation.which.co.uk/money/tuition-fees-universities-9000-value/. Last accessed 21st April 2012.

17. Graduate premium: BBC Education. (2009). Graduate premium 'just £100,000'. Available: http://news.bbc.co.uk/1/hi/education/8401267.stm . Last accessed 21st April 2012.

18. Focus group outlined that course content needed to be in line with graduate jobs to help with natural progression through a graduate scheme

19. Paton, G. (2011). Government tsar claims universities should lower entry requirements for students from poorest backgrounds. Available: http://www.telegraph.co.uk/education/8748479/Government-tsar-claims-universities-should-lower-entry-requirements-for-students-from-poorest-backgrounds.html. Last accessed 21st April 2012.

20. VAS metric example [fig 23. Example of VAS being calculated]

21. Davies, R. Rob Davies . Final Year Project: Student Numbers. 7th November 2011.

22. course difficulty leading to students leaving university: Davies, P. (1999). Student retention in further education: a problem of quality or of student finance?. Available: http://www.leeds.ac.uk/educol/documents/00001257.htm . Last accessed 21st April 2012.

23. focus group outlined assumption that if career path confirmed you would be less critical on NSS, if not confirmed or bad marks being fed back there would be concerned and more critical.

24. Positive negative behaviour :Marrant, M (2004). Explanations for positive and negative behavior: the intergroup attribution bias in achieved groups. Switzerland: springerlink.